

LOUIS C. GAPENSKI

# UNDERSTANDING HEALTHCARE FINANCIAL MANAGEMENT

FIFTH EDITION



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**UNDERSTANDING HEALTHCARE  
FINANCIAL MANAGEMENT**

**Fifth Edition**

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# **UNDERSTANDING HEALTHCARE FINANCIAL MANAGEMENT**

Fifth Edition

Louis C. Gapenski

In Collaboration with George H. Pink

Health Administration Press, Chicago, Illinois  
AUPHA, Washington, DC

AUPHA  
HAP

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# BRIEF CONTENTS

Preface xiii

## **PART I The Healthcare Environment**

- 1** Introduction to Healthcare Financial Management . . . . . 3
- 2** The Third-Party-Payer System . . . . . 41

## **PART II Basic Financial Management Concepts**

- 3** Time Value Analysis . . . . . 79
- 4** Financial Risk and Required Return . . . . . 115

## **PART III Capital Acquisition**

- 5** Debt Financing . . . . . 153
- 6** Equity Financing and Investment Banking . . . . . 191
- 7** Securities Valuation, Market Efficiency, and Debt Refunding . . 221
- 8** Lease Financing . . . . . 261

## **PART IV Cost of Capital and Capital Structure**

- 9** Cost of Capital . . . . . 293
- 10** Capital Structure Decisions . . . . . 333

## **PART V Capital Allocation**

- 11** The Basics of Capital Budgeting ..... 377
- 12** Project Risk Analysis..... 423

## **PART VI Financial Condition Analysis and Forecasting**

- 13** Financial Condition Analysis ..... 463
- 14** Financial Forecasting ..... 501

## **PART VII Other Topics**

- 15** Working Capital Management ..... 539
- 16** Business Valuation, Mergers, and Acquisitions ..... 575
- 17** Capitation, Rate Setting, and Risk Sharing ..... 613
- 18** Financial Risk Management ..... 647

Glossary 679

Index 697

About the Authors 715

# DETAILED CONTENTS

Preface xiii

## PART I The Healthcare Environment

### 1 Introduction to Healthcare Financial Management . . . . . 3

The Role of Financial Management in the Health Services Industry, 6; Current Challenges, 8; Alternative Forms of Business Organization, 8; Hybrid Forms of Organization, 11; Alternative Forms of Ownership, 13; Organizational Structures, 17; Organizational Goals, 20; Tax Laws, 24; Depreciation, 32

### 2 The Third-Party-Payer System . . . . . 41

Insurance Concepts, 42; Generic Reimbursement Methods, 49; Major Health Insurers (Third-Party Payers), 56; Other Issues, 69

## PART II Basic Financial Management Concepts

### 3 Time Value Analysis . . . . . 79

Time Lines, 80; Future Value of a Lump Sum (Compounding), 81; Present Value of a Lump Sum (Discounting), 87; Opportunity Costs, 90; Solving for Interest Rate and Time, 92; Annuities, 94; Perpetuities, 99; Uneven Cash Flow Streams, 100; Using Time Value Analysis to Measure ROI, 102; Semiannual and Other Compounding Periods, 105; A Review of Interest Rate Types, 110

### 4 Financial Risk and Required Return . . . . . 115

The Many Faces of Financial Risk, 115; Introduction to Financial Risk, 116; Portfolio Risk and Return, 124; Portfolio Risk of Business



Investments, 133; Portfolio Risk of Stocks (Entire Businesses), 139; Portfolio Betas, 140; Relevance of the Risk Measures, 141; Interpretation of the Risk Measures, 143; The Relationship Between Risk and Return, 143; Some Thoughts About Beta and the CAPM, 147

### **PART III Capital Acquisition**

#### **5 Debt Financing . . . . . 153**

The Cost of Money, 153; Interest Rate Levels, 155; Long-Term Debt, 156; Term Loans, 157; Bonds, 158; Short-Term Debt, 163; Debt Contracts, 169; Credit Ratings, 171; Credit Enhancement, 174; Interest Rate Components, 175; The Term Structure of Interest Rates, 180; Economic Factors That Influence Interest Rate Levels, 182; Advantages and Disadvantages of Debt Financing, 184

#### **6 Equity Financing and Investment Banking . . . . . 191**

Preferred Stock, 191; Rights and Privileges of Common Stockholders, 194; Classified Stock, 197; Selling New Common Stock, 198; The Decision to Go Public, 203; The Decision to List, 205; Advantages and Disadvantages of Common Stock Financing, 206; Securities Regulation and the Investment Banking Process, 207; Equity in Not-for-Profit Firms, 214

#### **7 Securities Valuation, Market Efficiency, and Debt Refunding . . 221**

The General Valuation Model, 222; Debt Valuation, 223; Preferred Stock Valuation, 236; Common Stock Valuation, 237; Security Market Equilibrium, 247; Informational Efficiency, 248; The Risk/Return Trade-off, 251; Debt Refunding, 252

#### **8 Lease Financing . . . . . 261**

Lease Parties and Types, 261; Tax Effects, 264; Financial Statement Effects, 266; Evaluation by the Lessee, 269; Evaluation by the Lessor, 277; Lease Analysis Symmetry, 279; Setting the Lease Payment, 280; Leveraged Leases, 280; Motivations for Leasing, 282; Additional Issues, 285

### **PART IV Cost of Capital and Capital Structure**

#### **9 Cost of Capital . . . . . 293**

Overview of the Cost of Capital Estimation Process, 293; Estimating the Cost of Debt, 295; Estimating the Cost of Equity to Large

Investor-Owned Businesses, 298; Estimating the Cost of Equity to Not-for-Profit Businesses, 311; Estimating the Corporate Cost of Capital, 316; An Economic Interpretation of the Corporate Cost of Capital, 318; Flotation Costs, 321; Divisional Costs of Capital, 322; Warning! Warning! Warning!, 323; Cost of Capital Estimation for Small Businesses, 324; Factors That Influence a Business's Cost of Capital, 327

**10 Capital Structure Decisions . . . . . 333**

Impact of Debt Financing on Risk and Return, 334; Business and Financial Risk, 337; Capital Structure Theory, 341; Criticisms of the MM and Miller Models, 350; Financial Distress Costs, 351; Trade-off Models, 352; Asymmetric Information Model of Capital Structure, 355; A Summary of the Capital Structure Models, 357; Application of Capital Structure Theory to Not-for-Profit Firms, 359; Making the Capital Structure Decision, 361; Capital Structure Decisions for Small Investor-Owned Businesses, 364; The Debt Maturity Decision, 365

**PART V Capital Allocation**

**11 The Basics of Capital Budgeting . . . . . 377**

Project Classifications, 378; The Role of Financial Analysis in Health Services Capital Budgeting, 379; Overview of Capital Budgeting Financial Analysis, 380; Cash Flow Estimation, 381; Cash Flow Estimation Example, 389; Breakeven Analysis, 397; Return on Investment Analysis, 399; Some Final Thoughts on Breakeven and Profitability Analysis, 405; Evaluating Projects with Unequal Lives, 406; Economic Life Versus Physical Life (Abandonment Value), 410; Capital Budgeting in Not-for-Profit Businesses, 412; The Post-Audit, 416; Using Capital Budgeting Techniques in Other Contexts, 416

**12 Project Risk Analysis . . . . . 423**

Types of Project Risk, 424; Relationships Among Stand-Alone, Corporate, and Market Risks, 425; Risk Analysis Illustration, 427; Sensitivity Analysis, 429; Scenario Analysis, 432; Monte Carlo Simulation, 435; Qualitative Risk Assessment, 438; Incorporating Risk into the Decision Process, 439; Final Risk Assessment and Incorporation for the MRI Project, 442; Incorporating Debt Capacity into the Decision Process, 443; Adjusting Cash Outflows for Risk, 444; Real (Managerial) Options, 446; The Real Option of Abandonment, 449; An Overview of the Capital Budgeting Decision Process, 453; Capital Rationing, 455

## **PART VI Financial Condition Analysis and Forecasting**

### **13 Financial Condition Analysis . . . . . 463**

Financial Reporting in the Health Services Industry, 464; Financial Statement Analysis, 470; Ratio Analysis, 470; Tying the Ratios Together: Du Pont Analysis, 481; Common Size Analysis, 483; Percentage Change Analysis, 484; Operating Indicator Analysis, 485; Limitations of Financial Statement and Operating Indicator Analyses, 489; Economic Value Added, 491; Benchmarking, 492; Key Performance Indicators and Dashboards, 494

### **14 Financial Forecasting . . . . . 501**

Strategic Planning, 501; Operational Planning, 504; Financial Planning, 504; Revenue Forecasts, 507; Creating Forecasted Financial Statements, 510; Constant Growth Forecasting, 511; Factors That Influence the External Financing Requirement, 517; Problems with the Constant Growth Approach, 520; Real-World Forecasting, 521; Computerized Financial Forecasting Models, 525; Financial Controls, 526; The Cash Budget, 527

## **PART VII Other Topics**

### **15 Working Capital Management . . . . . 539**

Cash Management, 540; Marketable Securities Management, 544; Long-Term Securities Management, 546; Receivables Management, 547; Credit Policy, 553; Supply Chain Management, 556; The Economic Ordering Quantity Model, 559; Accruals, 563; Accounts Payable (Trade Credit), 564

### **16 Business Valuation, Mergers, and Acquisitions . . . . . 575**

Level of Merger Activity, 575; Motives for Mergers: The Good, the Bad, and the Ugly, 578; Types of Mergers, 582; Hostile Versus Friendly Takeovers, 583; Merger Regulation, 584; Mergers Involving Not-for-Profit Businesses, 588; Business Valuation, 590; Unique Problems in Valuing Small Businesses, 596; Setting the Bid Price, 598; Structuring the Takeover Bid, 600; Due Diligence Analysis, 602; The Role of Investment Bankers, 602; Who Wins? The Empirical Evidence, 604; Corporate Alliances, 606; Goodwill, 607

**17** Capitation, Rate Setting, and Risk Sharing ..... 613

An Overview of Capitation, 614; Provider Incentives Under Capitation, 615; Financial Risk Under Capitation, 617; Development of Premium Rates, 626; Risk-Sharing Arrangements, 634

**18** Financial Risk Management ..... 647

Fundamentals of Financial Risk Management, 648; Risk Management of Capitated Contracts, 651; Debt Portfolio Immunization, 657; An Overview of Derivatives, 661; Options, 663; Futures, 668; Swaps, 671; The Use and Misuse of Derivatives, 673

Glossary 679

Index 697

About the Authors 715



# PREFACE

**A**fter years of teaching corporate finance and writing related textbooks and casebooks, I began teaching the healthcare financial management course in the University of Florida's Graduate Program in Health and Hospital Administration. The first thing that struck me was that no textbook was available that truly focused on healthcare financial management. To me, financial management primarily involves analysis and decision making, yet the textbooks available at the time mostly covered accounting and institutional detail, with only a very limited number of pages devoted to financial management.

Thus, I set about creating a textbook that emphasized (1) financial management rather than accounting and (2) analysis and decision making rather than institutional detail. In creating this textbook, I set out to do two things. First, I adopted a very broad definition of the health services industry that included medical practices, managed care organizations, nursing homes, and home health care providers, in addition to hospitals. Today, more and more health services administration students are electing careers outside the hospital industry, and it is important that a textbook on healthcare financial management presents a broad range of provider settings. Second, I identified the environmental factors that are unique to the health services industry and hence make healthcare financial management different from corporate finance. Then, I made sure that these factors played an important role in the textbook discussions.

## Concept of the Textbook

My goals in writing the first edition were to create a textbook that provided health services administration students with (1) an operational knowledge of financial management theory and concepts, (2) the opportunity to apply these ideas to real-world healthcare business settings, and (3) the opportunity to use spreadsheet analyses to help make better financial decisions. Additionally, I wanted to create a textbook that could be used as a reference during internships and residencies as well as after graduation. Finally, I wanted a textbook that students would find user friendly, meaning one that they would enjoy

reading and could learn from on their own. If students don't find a textbook interesting, understandable, and useful, they won't read it!

This fifth edition of the textbook continues to meet those goals. It begins with basic concepts about both the health services industry and financial management. The textbook then progresses to show how financial management theory and concepts can be applied to healthcare businesses to help managers make better decisions, where "better" is defined as promoting the financial well-being of the organization.

## Intended Market and Use

The textbook is targeted for the healthcare financial management course required in graduate programs in health services administration. Students typically have some background in basic business topics such as financial and managerial accounting, probability and statistics, spreadsheet analysis, and perhaps even corporate finance. However, the textbook contains a great deal of background information in these areas, and it can be used in programs where students have not had prior exposure to business topics. The textbook is useful also to healthcare professionals, including both those holding general management positions and those working as members of financial staffs.

## Alternative Course Formats

There is no single best approach to teaching a healthcare financial management course. The optimal approach varies with students' backgrounds, instructors' interests, class contact hours, and the role of the course in the overall curriculum. Because these factors change, most instructors vary their approaches over time. Still, it may be useful to adopters to learn how the textbook has been used at the University of Florida.

In the Florida program, students first take an introductory healthcare finance course that covers both accounting and financial management. The healthcare financial management course is the second, and final, finance course in the curriculum unless a student elects to take an advanced independent study course. The second financial management course in any curriculum generally is taught either as a theoretically based lecture course, as a pragmatically based pure case course, or as a blend of theory and practice where lectures are combined with some cases. Over time, I have used all three approaches, but the one that I have found best is a blend of theory and practice, but with a strong bias toward practice. Thus, I lecture occasionally but use a large number of cases to provide insights into the complex financial decisions faced by practicing healthcare managers.

*Understanding Healthcare Financial Management* provides both the theory and concepts behind financial decision making in the health services industry and the "nuts and bolts" tools required to implement the theory

and concepts. Students learn the theory and concepts of healthcare financial management from the textbook and periodic lectures and then implement the material by working cases. In the first two editions, the cases were contained in the textbook. However, the editorial and production burden of having both textbook and casebook in a single edition created constraints that became too confining. The publisher and I agreed that the optimal solution to this problem was to separate the cases from the textbook, which we implemented in the third edition. I will have much more to say about this decision later in the preface.

I cover most of the textbook, along with 12 cases (one per week, after some introductory material), in a one-semester course. In addition, I typically include a few accounting-oriented cases from the casebook as a refresher. However, the dominant theme is financial management because a well-grounded understanding of financial decision making is more important for most students than a better understanding of accounting. Also, our students are studying to be general managers, not financial staff specialists, and hence I am willing to sacrifice depth to expose students to a large range of topics. The course runs fast and furious, but this tends to keep students, and instructors, on their toes and in high gear.

Although the textbook is designed for use in the second course in financial management, a great deal of introductory material has been included. In spite of the fact that the Florida students have already had one finance course, I have found that many of them still do not have a good grasp of the basic fundamentals of financial management. Thus, they appreciate the fact that *Understanding Healthcare Financial Management* reviews basic concepts in addition to presenting new material. After all, repetition is the key to learning.

Because the textbook contains so much introductory material, it is also suitable for use in courses in which students have not had an introductory finance course, including two-course sequences. In this situation, I would tend to go slower to give students more time to digest the material, and the lectures would be more frequent and extensive to ensure that students really know the fundamentals before working the cases, which would be fewer in number. In a two-course sequence, instructors can easily supplement the textbook with outside readings and/or additional cases.

## Changes in the Fifth Edition

Since the fourth edition of the textbook was published, I have used the textbook several times in courses I have taught and have received many comments from users at other universities. Furthermore, Health Administration Press has solicited and received a number of thoughtful reviews. The reaction of students, other professors, and the market in general has been overwhelmingly positive—every comment indicates that the basic concept of the textbook is



sound. Even so, nothing is perfect, and the health services industry is evolving at a dizzying pace. These circumstances have led to a number of changes to the textbook; the most important of which are listed below:

- First and foremost, this edition was written in collaboration with George H. Pink, a well-known healthcare finance professor at the University of North Carolina at Chapel Hill. George brings new insights to the book that, over time, will have a profound and positive impact.
- Time value calculations, particularly in Chapter 3, now focus exclusively on spreadsheets, with pictorials used to illustrate solution techniques. Students overwhelmingly state that because they do not use financial calculators for time value problems, the inclusion of calculator solutions was a distraction. Note, however, that a calculator tutorial is available as an ancillary to the text.
- Many students, as well as instructors, have asked that a glossary be added to the book. This edition has one.
- A new chapter, Chapter 19: Distributions to Owners: Bonuses, Dividends, and Repurchases, has been added as an ancillary. It is available online.
- Short introductions have been added to each part page to introduce the topics contained in the chapters of that part.
- All aspects of the text discussion as well as references have been updated and clarified as needed. Particular care was taken to include the most recent reimbursement changes and to update the real-world examples.
- New sections have been added or existing sections have been expanded for the following topics: municipal bond pools, cost of capital for not-for-profit and small businesses, modified IRR, subjective risk assessment, supply chain management, stop-loss insurance, current challenges for healthcare managers, and health savings accounts.

## Ancillary Materials

Several ancillary materials have been designed to enhance the learning experience associated with this text.

### *Materials for Instructors*

Two very useful ancillaries are available to instructors who adopt this text:


1. **Slideshow.** A set of PowerPoint® slides that cover the essential topics contained in each chapter is available. Concepts, graphs, tables, lists, and calculations are presented in about 40 slides per chapter, much as an instructor might do on a blackboard. However, the slides are more crisp, clear, and colorful and can be displayed on a screen almost instantaneously. Furthermore, hard copies of the slides can be provided to students for use as lecture notes, which I have found that students truly appreciate. Many

instructors will find these slides useful, either as is or as customized to best meet unique course and student requirements.

2. **End-of-chapter problem solutions.** As indicated below, a set of problems in spreadsheet format is available for most chapters. These problem sets, which focus on key concepts, can be assigned as graded homework or used in any way that the instructor desires. A section at the end of each chapter indicates when problems are available.

### *Materials for Students and Instructors*

Four useful ancillaries are available to students (and instructors) who use this text:

1. **Text models.** Most of the chapters in the text have accompanying Excel® models that illustrate the text calculations as well as additional calculations that are relevant to the chapter material. The purpose of these spreadsheet models is twofold. First, students can learn the material better because they can more easily visualize how various input factors influence a particular calculation. For example, the spreadsheet model for capital budgeting allows students to change input values, such as volume and average reimbursement, and immediately see the effects on profitability. Second, the spreadsheets permit students to learn the mechanics of spreadsheet analysis in a less challenging context than the cases (discussed below) because these models typically are not part of a graded assignment. Note that sections of the text that have accompanying models are designated by a web icon: . Also, a section at the end of each chapter indicates when text models are available.
2. **End-of-chapter problems.** A set of problems in spreadsheet format is available for most chapters. The problems may be assigned by the instructor as homework or worked by students on their own to gain an additional understanding of the topics in the chapter. A section at the end of each chapter indicates when problems are available.
3. **Calculator tutorial.** A short tutorial is available for those students who use financial calculators to solve time value problems.
4. **Chapter 19.** This chapter, Distributions to Owners: Bonuses, Dividends, and Repurchases, is available online either to instructors for coverage in class or to students for independent learning.

### *Obtaining the Ancillary Materials*

All student ancillary materials can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5). Instructor ancillaries, which are contained in a secure area, are available only to adopters of this text. For access information, e-mail [hap1@ache.org](mailto:hap1@ache.org).

### *The Casebook*

In addition to the free ancillaries, many adopters pair this textbook with its accompanying casebook, *Cases in Healthcare Finance*. Of course, the most realistic application of healthcare finance occurs within health services organizations, and there is no substitute for on-the-job experience. The next best thing, and the only real option for the classroom, is to use cases to simulate, to the extent possible, the environment in which finance decisions are actually made. Cases provide students with the opportunity to bridge the gap between learning concepts in a lecture setting and actually applying them on the job. By using cases, students can be better prepared to deal with the multitude of problems that arise in the practice of healthcare financial management.

*Cases in Healthcare Finance*, 3rd edition, contains 30 cases that focus on the practice of healthcare finance, including accounting, within provider organizations. In general, each case addresses a single financial issue, such as a capital investment decision; but the uncertainty of the input data, along with the presence of relevant nonfinancial factors, makes each case interesting and challenging. The case settings include a wide variety of provider organizations, including integrated delivery systems and managed care organizations. In addition to cases that focus purely on financial decisions, the casebook contains eight mini-cases on ethics. The mini-cases are not quantitative in nature but rather are designed to promote discussion about a finance situation that has potential ethical implications.

In general, cases may be classified as directed or nondirected. *Directed* cases include a specific set of questions that students must answer to complete the case, while *nondirected* cases (as I use the term) contain only general guidance to point students in the right direction. Most of the cases in the casebook are nondirected. The primary advantage of nondirected cases is that they closely resemble how real-world managers confront financial decision making because they require students to develop their own solution approach. The disadvantage is that students who stray from the key issues of the case often do not obtain full value from their effort.

I have found that students with more advanced finance skills gain the most from nondirected cases, while students that have had less finance exposure gain most from directed cases. The online *Instructor's Manual* for the casebook contains a set of case questions that can be used to convert each nondirected case to a directed case. Thus, instructors have the option of using the nondirected cases in either way, depending on the experience of the students, the objectives of the course, and the extent to which cases will be used.

Spreadsheet analysis has become extremely important in all aspects of healthcare finance. Students must be given the opportunity to develop computer skills and be allowed, or required, to use spreadsheet programs to assist in case analyses. If students have not previously learned about spreadsheets,

they must be exposed to them because functional literacy in any area of management today means at least some knowledge of spreadsheet modeling. Furthermore, spreadsheet models can reduce the amount of “busywork” required to perform the required calculations and hence leave students with more time to focus on financial management issues.

Because of these factors, I developed well-structured, user-friendly spreadsheet models for those cases where models would help to create a more efficient analysis. Most of the cases can, of course, be done with a calculator, but the spreadsheet models are far more efficient and hence big time-savers, especially when conducting risk assessment using techniques such as sensitivity and scenario analyses. In addition, spreadsheet models allow students to easily create graphics and other computer outputs that enhance the quality of both the analyses and any required presentations.

The student versions of the case models are complete in the sense that no modeling is required to obtain a base case solution. However, zeros have been entered for all input data, and hence students must identify and then enter the appropriate input values. When this is done, the model automatically calculates the base case solution. However, the models do not contain risk analyses or other extensions such as graphics, so students must modify the models as necessary to make them most useful in completing the cases.

The instructor versions of the case models are similar to the student versions, except that the input values are intact. Thus, instructors can view the base case solution without entering any data. In addition, some instructor version models have additional modeling, such as risk analyses, included. The instructor versions of the case models are distributed with the online *Instructor’s Manual* to the casebook.

Health Administration Press is keenly aware of the increasing financial burden that students face as course materials escalate in both quantity and price. The casebook is discounted 20 percent when purchased with this text. For more information, call Health Administration Press at (301) 362–6905 or e-mail hap@pmds.com.

## Acknowledgments

This book reflects the efforts of many people. First, I would like to welcome George Pink as a collaborator. His work on the text and ancillaries has been invaluable. Furthermore, my thanks go to the following individuals, who reviewed previous editions of the textbook and provided many valuable comments and suggestions for improving it:

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Tom Getzen of Temple University

Mike McCue of Virginia Commonwealth University

Dean Smith of the University of Michigan

Jack Wheeler of the University of Michigan

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Colleagues, students, and staff at the University of Florida provided inspirational support, as well as more tangible support, during the development and class testing of each edition of the textbook. And last, but certainly not least, I would like to thank the Health Administration Press staff, who were instrumental in ensuring the quality and usefulness of the textbook.

## Errors in the Textbook

In spite of the significant effort that has been expended on this edition, it is safe to say that some errors exist. In an attempt to create the most error-free and useful textbook possible, we strongly encourage both instructors and students to write me at the address below with comments and suggestions for improving the textbook. We welcome and value your input!

## Conclusion

Good financial management is vital to the economic well-being of the health services industry. Because of its importance, financial management theory and concepts should be thoroughly understood, but this is easier said than done. We hope that *Understanding Healthcare Financial Management* will help you better appreciate the financial management problems faced by the health services industry today and that it will provide guidance on how best to solve them.

Louis C. Gapenski, Ph.D.

Submit comments to:

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# The Healthcare Environment

Two factors make the provision of health services different from other services. First, many providers are organized as not-for-profit corporations as opposed to investor owned. Second, payment for services typically is made by third parties rather than by patients, who receive the services. By focusing on these differences, Part I of the text provides students with unique background information that creates the framework for financial decision making within healthcare organizations.

Chapter 1 discusses the institutional setting for the delivery of health-care services. Topics covered include the role of financial management, alternative forms of organization and ownership, organizational goals, and tax laws. In essence, this chapter creates the organizational background for the provision of health services.

Chapter 2 focuses on insurance concepts and the third-party-payer system. It is essential that healthcare managers understand who the payers are and the payment methods used because these external factors have a profound influence on financial decision making.



# INTRODUCTION TO HEALTHCARE FINANCIAL MANAGEMENT

## Learning Objectives

After studying this chapter, readers should be able to:

- Explain the difference between accounting and financial management.
- Discuss the role of financial management in health services organizations.
- Describe the basic forms of business organization along with their advantages and disadvantages.
- Discuss the two basic types of ownership and explain why ownership type is so important when making financial management decisions.
- Explain how the goals of investor-owned and not-for-profit businesses differ.
- Describe, in general terms, the tax laws that apply both to individuals and to healthcare businesses.

## Introduction

The study of healthcare financial management is both fascinating and rewarding. It is fascinating because so many of the concepts involved have implications for both professional and personal behavior. It is rewarding because, rightly or wrongly, the healthcare environment today, and into the foreseeable future, is forcing managers to place an increasing emphasis on financial implications when making operating decisions.

First and foremost, financial management is a *decision science*. Whereas accounting provides decision makers with a rational means by which to budget for and measure a business's financial performance, financial management provides the theory, concepts, and tools necessary to make better decisions. Thus, the primary purpose of this textbook is to help healthcare managers and students become better decision makers. The text is designed primarily for nonfinancial managers, although financial specialists—especially those with accounting rather than finance backgrounds or those who are moving into the health services industry from other industries—will also find the text useful.



The major difference between this text and corporate finance texts is that this text focuses on factors that are unique to the health services industry. For example, the provision of health services is dominated by *not-for-profit* organizations (both private and governmental), which are inherently different from *investor-owned* businesses.<sup>1</sup> Also, the majority of payments for services made to healthcare providers are not made by patients—the consumers of the service—but rather by some *third-party payer* (for example, a commercial insurance company or a government program). Indeed, even the purchase of health insurance is dominated by employers rather than by the individuals who will receive the services. Throughout this text, we emphasize ways in which the unique features of the health services industry affect financial management decisions.

Although this text contains some theory, and a great number of financial management concepts, its primary emphasis is on how managers can apply the theory and concepts; thus, it does not contain the traditional end-of-chapter questions and problems. (Note, however, that end-of-chapter problems in spreadsheet format are available as ancillary materials.) Rather, the text is designed to be used with the casebook *Cases in Healthcare Finance*, which contains cases that are based on real-life decisions faced by practicing healthcare managers. The cases are designed to enable students to apply the skills learned in this text's chapters in a realistic context, where judgment is just as critical to good decision making as numerical analysis. Furthermore, the cases are semidirected, which means that although students receive some guidance, they must formulate their own approach to the analyses, just as real-world decision makers must do.<sup>2</sup>

Also, personal computers are changing the way managers think about structuring and performing financial analyses. Managers, and students, must recognize that computers are capable of providing answers to questions that were not even asked a few years ago. Thus, both this text and the casebook are oriented toward using spreadsheets to help make better decisions. This text has accompanying spreadsheet models that illustrate the key concepts presented in many of the chapters. The casebook has spreadsheet models that make the quantitative portion of the case analyses both easier to do and more complete.


Note, however, that it is impossible to create a text that includes everything that a manager needs to know about healthcare financial management. Indeed, it would be foolish even to try because the industry is so vast and is changing so rapidly that many of the details needed to become completely knowledgeable in the field can only be learned through contemporary experience. Thus, we do not expect readers to fully understand every nuance of every financial management theory and concept that pertains to the industry, nor do we expect readers to become experts in quantitative analysis. Nevertheless, this text will provide the core competencies required to enable readers to (1) judge the validity of analyses performed by others, usually financial staff

specialists or consultants, and (2) incorporate sound financial management theory and concepts in their own managerial and personal decision making.

## How to Use This Book

The overriding goal in creating this text is to provide an easy-to-read, content-filled text on healthcare financial management. The text contains several features designed to assist in learning the material.

First, pay particular attention to the LEARNING OBJECTIVES listed at the beginning of each chapter. These objectives provide a feel for the most important topics in each chapter and what readers should set as learning goals for that chapter. After each major section, except the Introduction, one or more SELF-TEST QUESTIONS are listed. As you finish reading each major section, try to provide reasonable answers to these questions. Your responses do not have to be perfect, but if you are not satisfied with your answer, it would be best to reread that section before proceeding. Answers to the self-test questions are not provided, so a review of the section is indicated if you are in doubt about the adequacy and correctness of your answer.

Within the book, italics and boldface are used to indicate special terms. *Italics* are used whenever a key term is introduced; thus, italics alert readers that a new and important concept is being presented. **Boldface** is solely used for emphasis; thus, the meaning of a boldface word or phrase has unusual significance to the point being discussed. As indicated in the Preface, the book has accompanying spreadsheet models that match, and sometimes expand on, selected calculations within text. The sections of the text that have accompanying models are indicated by a web icon: .

In addition to in-chapter learning aids, materials designed to help readers learn healthcare financial management are included at the end of each chapter. First, each chapter ends with a summary section titled KEY CONCEPTS that very briefly reviews the most important topics covered in the chapter. If the meaning of a key concept is not apparent, you may find it useful to review the applicable section. Immediately after the KEY CONCEPT section, a paragraph is included that indicates if spreadsheet models and problems sets are available for that chapter. (See the Preface for more information on these ancillaries.)

Finally, each chapter ends with SELECTED WEBSITES and REFERENCES. The websites are designed to just “scratch the surface” of relevant material available on the World Wide Web. The books and articles cited as references can provide a more in-depth understanding of the material covered in the chapter.

Taken together, the pedagogic structure of the book is designed to make the learning of healthcare financial management as easy and efficient as possible.

## Self-Test Question

1. Briefly describe the key features of the text designed to enhance the learning experience.

## The Role of Financial Management in the Health Services Industry

Until the 1960s, *financial management* in all industries was generally viewed as descriptive in nature, with its primary role being to secure the financing needed to meet a business's operating objectives. A business's marketing, or planning, department would project demand for the firm's goods or services; facilities managers would estimate the assets needed to meet the projected demand; and the finance department would raise the money needed to purchase the required plant, equipment, and supplies. The study of financial management concentrated on business securities and the markets in which they are sold and on how businesses could access the financial markets to raise capital. Consequently, financial management textbooks of that era were almost totally descriptive in nature.

Today, financial management plays a much larger role in the overall management of a business. Now, the primary role of financial management is to plan for, acquire, and utilize funds (capital) to maximize the efficiency and value of the enterprise. Because of this role, financial management is known also as *capital finance*. The specific goals of financial management depend on the nature of the business, so we must postpone that discussion until later. In larger organizations, financial management and accounting are separate functions, although the accounting function typically is carried out under the direction of the organization's *chief financial officer (CFO)* and hence falls under the overall category of "finance."

In general, the financial management function includes the following activities:

- **Evaluation and planning.** First and foremost, financial management involves evaluating the financial effectiveness of current operations and planning for the future.
- **Long-term investment decisions.** Although more important to senior management, managers at all levels must be concerned with the capital investment decision process. Such decisions, which focus on the acquisition of new facilities and equipment (fixed assets), are the primary means by which businesses implement strategic plans, and hence they play a key role in a business's financial future.
- **Financing decisions.** All organizations must raise funds to buy the assets necessary to support operations. Such decisions involve the choice between internal and external funds, the use of debt versus equity capital, and the use of long-term versus short-term debt. Although senior

managers typically make financing decisions, these decisions have ramifications for managers at all levels.

- **Working capital management.** An organization's current, or short-term, assets, such as cash, marketable securities, receivables, and inventories, must be properly managed both to ensure operational effectiveness and to reduce costs. Generally, managers at all levels are involved, to some extent, in short-term asset management, which is often called *working capital management*.
- **Contract management.** In today's healthcare environment, health services organizations must negotiate, sign, and monitor contracts with managed care organizations and third-party payers. The financial staff typically has primary responsibility for these tasks, but managers at all levels are involved in these activities and must be aware of their effect on operating decisions.
- **Financial risk management.** Many financial transactions that take place to support the operations of a business can, themselves, increase a business's risk. Thus, an important financial management activity is to control financial risk.

In times of high profitability and abundant financial resources, the finance function tends to decline in importance. Thus, when most healthcare providers were reimbursed on the basis of costs incurred, the role of finance was minimal. At that time, the most critical finance function was cost accounting because it was more important to account for costs than it was to control them. Today, however, healthcare providers are facing an increasingly hostile environment, and any business that ignores the finance function runs the risk of financial deterioration, which ultimately can lead to bankruptcy and closure.

In recent years, providers have been redesigning their finance functions to recognize the changes that have been occurring in the health services industry. Historically, the practice of finance had been driven by the Medicare program, which demanded that providers (primarily hospitals) churn out a multitude of reports both to comply with regulations and to maximize Medicare revenues. Third-party reimbursement complexities meant that a large amount of time had to be spent on cumbersome accounting, billing, and collection procedures. Thus, instead of focusing on value-adding activities, most finance work focused on bureaucratic functions. Today, to be of maximum value to the enterprise, the finance function must support cost-containment efforts, managed care and other payer contract negotiations, joint venture decisions, and integrated delivery system participation. In essence, finance must help lead organizations into the future, rather than merely record what has happened in the past.

In this text, the emphasis is on financial management, but there are no unimportant functions in health services organizations. Managers must understand a multitude of functions such as marketing, accounting, and human

resource management in addition to financial management. Still, all business decisions have financial implications, so all managers—whether in operations, marketing, personnel, or facilities—must know enough about financial management to incorporate financial implications in decisions made within their own specialized areas. Thus, all managers must understand the theory and principles of financial management because this knowledge will make them even more effective at their own specialized work.

## Self-Test Questions

1. What is the role of financial management in today's health services organizations?
2. How has this role changed over time?

## Current Challenges

In 2006, two articles were published that listed the current concerns of health-care managers.<sup>3</sup> The first article focused on issues of concern among hospital chief executive officers (CEOs) surveyed by the American College of Healthcare Executives (ACHE). The top concern was financial challenges, by almost a two-to-one margin over the next highest concern (personnel shortages). In fact, financial concerns have headed the list of challenges on every survey conducted since the survey began in 2002. Tom Dolan, ACHE's president and CEO, said: "This year's survey results are a continuation of previous concerns. First and foremost is finance." When asked to rank their specific financial concerns, CEOs put reimbursement at the forefront, with concerns over Medicaid, Medicare, and bad debt losses topping the list. (Reimbursement will be discussed in Chapter 2.) Clearly, the ability of government payers to adequately reimburse providers leads the list of concerns.

The second article focused on issues of concern to CFOs. The most pressing issue was balancing clinical and financial issues. In essence, how can financial performance be improved without having a negative impact on clinical performance? Other issues of concern include improving the revenue cycle (billing and collecting on a timely basis) and developing different ways to access (raise) capital.

Taken together, these articles confirm the fact that financial issues are of primary importance to today's healthcare managers. The remainder of this book is dedicated to helping you confront and solve these issues.

## Self-Test Question

1. What are some important issues facing healthcare managers today?

## Alternative Forms of Business Organization

Throughout the text, the focus is on business finance—that is, the practice of financial management within business organizations. There are three primary

forms of *business organization*: (1) proprietorship, (2) partnership, and (3) corporation. Because most healthcare managers work for corporations and because not-for-profit businesses are organized as corporations, this form of organization is emphasized. However, many individual physician practices are organized as proprietorships, and partnerships are common in group practices and joint ventures. Healthcare managers must, therefore, be familiar with all forms of business organization.

### **Proprietorship**

A *proprietorship*, sometimes called a *sole proprietorship*, is a business owned by one individual. Going into business as a proprietor is easy—the owner merely begins business operations. However, most cities require even the smallest businesses to be licensed, and state licensure is required for most healthcare professionals.

The proprietorship form of organization is easily and inexpensively formed, is subject to few governmental regulations, and pays no corporate income taxes. All earnings of the business, whether reinvested in the business or withdrawn by the owner, are taxed as personal income to the proprietor. In general, a sole proprietorship will pay lower total taxes than a comparable, taxable corporation because corporate profits are taxed twice—once at the corporate level and once by stockholders at the personal level when profits are distributed as dividends or when capital gains are realized.

### **Partnership**

A *partnership* is formed when two or more individuals associate to conduct a nonincorporated business. Partnerships may operate under different degrees of formality, ranging from informal, verbal understandings to formal agreements filed with the state in which the partnership does business. Like a proprietorship, the major advantage of the partnership form of organization is its low cost and ease of formation. In addition, the tax treatment of a partnership is similar to that of a proprietorship; the partnership's earnings are allocated to the partners and taxed as personal income regardless of whether the earnings are actually paid out to the partners or retained in the business.<sup>4</sup>

Proprietorships and partnerships have three important limitations:

1. It typically is difficult for owners to sell, or transfer, their interest in the business.
2. The owners have unlimited personal liability for the debts of the business, which can result in losses greater than the amount invested in the business. In a proprietorship, unlimited liability means that the owner is personally responsible for the debts of the business. In a partnership, it means that if any partner is unable to meet his or her pro rata obligation in the event of bankruptcy, the remaining partners are responsible for the unsatisfied claims and must draw on their personal assets if necessary.
3. The life of the business is limited to the life of the owners.

These three disadvantages—difficulty in transferring ownership, unlimited liability, and impermanence of the business—lead to the fourth and perhaps the most important disadvantage from a finance perspective: It is difficult for proprietors and partners to attract substantial amounts of capital (raise money for the business). This difficulty is not a particular problem for a slow-growing business or when the owners are very wealthy, but for most businesses, it becomes a real handicap if the business needs to expand rapidly to take advantage of market opportunities. For this reason, proprietorships and most partnerships are restricted primarily to small businesses.<sup>5</sup> However, almost all businesses start out as sole proprietorships or partnerships and then ultimately convert to the corporate form of organization.

### Corporation

A *corporation* is a legal entity that is separate and distinct from its owners and managers. Although corporations can be either investor owned or not for profit, this section focuses on investor-owned corporations. The unique features of not-for-profit corporations will be discussed in later sections. The creation of a separate business entity gives the corporation three main advantages:

1. A corporation has unlimited life and can continue in existence after its original owners and managers have died or left the firm.
2. It is easy to transfer ownership in a corporation because ownership is divided into shares of stock that can be easily sold.
3. Owners of a corporation have limited liability.

To illustrate limited liability, suppose that one person made an investment of \$10,000 in a partnership that subsequently went bankrupt and owed \$100,000. Because the partners are liable for the debts of the partnership, that partner can be assessed for a share of the partnership's debt in addition to the initial \$10,000 contribution. In fact, if the other partners were unable to pay their shares of the indebtedness, one partner would be held liable for the entire \$100,000. However, if the \$10,000 had been invested in a corporation that went bankrupt, the potential loss for the investor would be limited to the \$10,000 investment. (However, in the case of small, financially weak corporations, the limited liability feature of ownership is often fictitious because bankers and other lenders will require personal guarantees from the stockholders.) With these three factors—unlimited life, ease of ownership transfer, and limited liability—corporations can more easily raise money in the financial markets than sole proprietorships or partnerships can.<sup>6</sup>

The corporate form of organization has two primary disadvantages. First, corporate earnings of taxable entities are subject to double taxation—once at the corporate level and once at the personal level when dividends are paid to stockholders or capital gains are realized. Second, setting up a corpo-



ration, and then filing the required periodic state and federal reports, is more costly and time consuming than what is required to establish a proprietorship or partnership.

Although a proprietorship or partnership can begin operations without much legal paperwork, setting up a corporation requires that the founders, or their attorney, prepare a charter and a set of bylaws. Today, attorneys have standard forms for charters and bylaws on their computers, so they can set up a “no-frills” corporation with much less work than what would have been required in the past. However, setting up a corporation remains relatively difficult when compared to a proprietorship or partnership, and it is still more difficult if the corporation has nonstandard features.

The *charter* includes the name of the corporation, its proposed activities, the amount of stock to be issued (if investor owned), and the number and names of the initial set of directors. The charter is filed with the appropriate official of the state in which the business will be incorporated, and, when approved, the corporation is officially in existence.<sup>7</sup> After the corporation has been officially formed, it must file quarterly and annual financial and tax reports with state and federal agencies.

The *bylaws* are a set of rules drawn up by the founders to provide guidance for the governing and internal management of the corporation. Bylaws include information about how directors are to be elected, whether the existing shareholders have the first right to buy any new shares that the firm issues, and the procedures for changing the charter or bylaws.

The value of any investor-owned business, other than a very small one, generally will be maximized if it is organized as a corporation for the following three reasons:

1. Limited liability reduces the risks borne by equity investors (the owners); with all else the same, the lower the risk, the higher the value of the investment.
2. A business’s value is dependent on growth opportunities, which in turn are dependent on the business’s ability to attract capital. Because corporations can obtain capital more easily than other forms of business can, they are better able to take advantage of growth opportunities.
3. The value of any investment depends on its *liquidity*, which means the ease at which the investment can be sold for a fair price. Because an equity investment in a corporation is much more liquid than a similar investment in a proprietorship or partnership, the corporate form of organization creates more value for its owners.

## Hybrid Forms of Organization

Although the three basic forms of organization—proprietorship, partnership, and corporation—dominate the overall business scene, several hybrid forms



of organization also are used by businesses. Some of these forms are found in the health services industry.

Several specialized types of partnerships have characteristics somewhat different than a standard form of partnership. First, limiting some of the partners' liabilities is possible by establishing a *limited partnership*, wherein certain partners are designated *general partners* and others *limited partners*. The limited partners, like the owners of a corporation, are liable only for the amount of their investment in the partnership, while the general partners have unlimited liability. However, the limited partners typically have no control, which rests solely with the general partners. Limited partnerships are quite common in real estate and mineral investments. They are not as common in the health services industry, however, because in this setting it is difficult to find one partner that is willing to accept all of the business's risk and a second partner that is willing to relinquish control.

The *limited liability partnership (LLP)* is a relatively new type of partnership that is available in many states. In an LLP, the partners have joint liability for all actions of the partnership, including personal injuries and indebtedness. However, all partners enjoy limited liability regarding professional malpractice because partners are only liable for their own individual malpractice actions, not those of the other partners. In spite of limited malpractice liability, the partners are jointly liable for the partnership's debts. Menomonee Falls Ambulatory Surgery Center in Wisconsin is an example of a LLP.

The *limited liability company (LLC)* is another new type of business organization. It has some characteristics of both a partnership and a corporation. The owners of an LLC are called *members*, and they are taxed as if they were partners in a partnership. However, a member's liability is like that of a stockholder of a corporation because liability is limited to the member's initial contribution in the business. Personal assets are only at risk if the member assumes specific liability, such as by signing a personal loan guarantee. Ardent Health Services, an organization with 28 facilities nationwide, is an example of an LLC. Both the LLP and LLC are new and complex forms of organizations, so setting them up can be time consuming and costly.

The *professional corporation (PC)*, which is called a *professional association (PA)* in some states, is a form of organization that is common among physicians and other individual and group practice healthcare professionals. All 50 states have statutes that prescribe the requirements for such corporations, which provide the usual benefits of incorporation but do not relieve the participants of professional liability. Indeed, the primary motivation behind the PC, which is a relatively old business form compared to the LLP and LLC, was to provide a way for professionals to incorporate yet still be held liable for professional malpractice.

PCs have tight restrictions, however. First, one or more owners must be licensed in the profession of the PC. Second, PCs are taxed as corporations; they cannot be designated as an S corporation for tax purposes (see the fol-

lowing paragraph). The Atlanta Cardiology Group, comprising 20 physicians who provide a full range of cardiac services at multiple sites, typifies a PC.

For tax purposes, standard for-profit corporations are called *C corporations*. If certain requirements are met, either one or a few individuals can incorporate but, for tax purposes only, elect to be treated as if the business were a proprietorship or partnership. Such corporations, which differ only in how the owners are taxed, are called *S corporations*. Although S corporations are similar to LLPs and LLCs regarding taxes, LLPs and LLCs provide more flexibility and benefits to owners. Many businesses, especially group practices, are, therefore, converting to the newer forms.

1. What are the three major forms of business organization, and how do they differ?
2. What are some different types of partnerships?
3. What are some different types of corporations?

## Self-Test Questions

### Alternative Forms of Ownership

Unlike other sectors in the economy, not-for-profit corporations play a major role in the healthcare sector, especially among providers. For example, only 20 percent of nongovernmental hospitals are investor owned; the remaining 80 percent are not for profit. Furthermore, not-for-profit ownership is common in the nursing home, home health care, and managed care industries.

#### Investor-Owned Corporations

As discussed in the previous section, for-profit businesses can be organized in a variety of ways. However, because of their size, corporations are by far the largest employers of healthcare professionals. When the average person thinks of a corporation, he or she probably thinks of an *investor-owned*, or *for-profit, corporation*. Virtually all large businesses (e.g., Ford, Microsoft, IBM, and General Electric) are investor-owned corporations.

Investors become owners of such businesses by buying shares of *common stock* in the firm. Investors may buy common stock when it is first sold by the firm. Such sales are called *primary market transactions*. In a primary market transaction, the funds raised from the sale generally go to the corporation.<sup>8</sup> After the shares have been initially sold by the corporation, they are traded in the *secondary market*. These sales may take place on *exchanges* such as the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX). They may also take place in the *over-the-counter (OTC) market*, which is composed of a large number of dealers/brokers connected by a sophisticated electronic trading system. When shares are bought and sold in the secondary market, the corporations whose stocks are traded receive no funds

from the trades; corporations receive funds only when shares are first sold to investors.

Investor-owned corporations may be either publicly held or privately held. The shares of *publicly held* firms are owned by a large number of investors and are widely traded. For example, HCA, which currently (in 2006) owns and operates about 180 hospitals and has over 400 million shares outstanding, is owned by some 50,000 individual and institutional stockholders. Another example is Manor Care, which owns and operates over 300 long-term care facilities and has about 80 million shares outstanding owned by some 8,000 stockholders. Drug manufacturers, such as Merck and Pfizer; medical equipment manufacturers, such as St. Jude Medical, which makes heart valves; and U.S. Surgical, which makes surgical stapling instruments, are all publicly held corporations.

Conversely, the shares of *privately held*, also called *closely held*, firms are owned by just a handful of investors and are not publicly traded. In general, the managers of privately held firms are major stockholders. In regards to ownership and control, therefore, privately held firms are more similar to partnerships than to publicly held firms. Often, the privately held corporation is a transitional form of organization that exists for a short time between a proprietorship or partnership and a publicly owned corporation in which the motivation to go public is driven by capital needs. Wellsprings Healthcare, a Texas firm that helps employers control healthcare costs, is an example of a closely held firm in the health services industry.

The *stockholders*, also called *shareholders*, are the owners of investor-owned firms. As owners, they have three basic rights:

1. **The right of control.** Common stockholders have the right to vote for the corporation's board of directors, which oversees the management of the firm. Each year, a firm's stockholders receive a *proxy* ballot, which they use to vote for directors and to vote on other issues that are proposed by management or stockholders. In this way, stockholders exercise control. In the voting process, stockholders cast one vote for each common share held.
2. **A claim on the residual earnings of the firm.** A corporation sells products or services and realizes revenues from the sales. To produce these revenues, the corporation must incur expenses for materials, labor, insurance, debt capital, and so on. Any excess of revenues over expenses—the residual earnings—belongs to the shareholders of the business. Often, a portion of these earnings are paid out in the form of *dividends*, which are merely cash payments to stockholders, or *stock repurchases*, in which the firm buys back shares held by stockholders. However, management typically elects to reinvest some, or all, of the residual earnings in the business, which presumably will produce even higher payouts to stockholders in the future.

- 3. A claim on liquidation proceeds.** In the event of bankruptcy and liquidation, shareholders are entitled to any proceeds that remain after all other claimants have been satisfied.

In summary, there are three key features of investor-owned corporations. First, the owners (the stockholders) of the business are well defined and exercise control of the firm by voting for directors. Second, the residual earnings of the business belong to the owners, so management is responsible only to the stockholders for the profitability of the firm. Finally, investor-owned corporations are subject to taxation at the local, state, and federal levels.

### **Not-for-Profit Corporations**

If an organization meets a set of stringent requirements, it can qualify for incorporation as a *tax-exempt*, or *not-for-profit, corporation*. Tax-exempt corporations are sometimes called *nonprofit corporations*. Because nonprofit **businesses** (as opposed to pure charities) need profits to sustain operations, and because it is hard to explain why nonprofit corporations should earn profits, the term “not-for-profit” is more descriptive of such health services corporations.

Tax-exempt status is granted to businesses that meet the tax definition of a charitable corporation, as defined by Internal Revenue Service (IRS) Tax Code Section 501(c)(3) or (4). Hence, such corporations are also known as *501(c)(3) or (4) corporations*. The tax code defines a charitable organization as, “any corporation, community chest, fund, or foundation that is organized and operated exclusively for religious, charitable, scientific, public safety, literary, or educational purposes.” Because the promotion of health is commonly considered a charitable activity, a corporation that provides healthcare services can qualify for tax-exempt status, provided that it meets other requirements.<sup>9</sup>

In addition to the charitable purpose, a not-for-profit corporation must be organized and operated so that it operates exclusively for the public, rather than private, interest. Thus, no profits can be used for private gain and no political activity can be conducted. Also, if the corporation is liquidated or sold to an investor-owned firm, the proceeds from the liquidation or sale must be used for a charitable purpose. Because individuals cannot benefit from the profits of not-for-profit corporations, such organizations cannot pay dividends. However, prohibition of private gain from profits does not prevent parties of not-for-profit corporations, such as managers and physicians, from benefiting through salaries, perquisites, contracts, and so on.

Not-for-profit corporations differ significantly from investor-owned corporations. Because not-for-profit firms have no shareholders, no single body of individuals has ownership rights to the firm’s residual earnings or exercises control of the firm. Rather, control is exercised by a *board of trustees*, which is not constrained by outside oversight. Also, not-for-profit corporations are generally exempt from taxation, including both property and income

taxes, and have the right to issue tax-exempt debt (municipal bonds). Finally, individual contributions to not-for-profit organizations can be deducted from taxable income by the donor, so not-for-profit firms have access to tax-subsidized contribution capital. (The tax benefits enjoyed by not-for-profit corporations are reviewed in a later section on tax laws.)

The financial problems facing most federal, state, and local governments have caused politicians to take a closer look at the tax subsidies provided to not-for-profit hospitals. For example, several bills that require hospitals to meet minimum levels of care to the indigent to retain tax-exempt status have been introduced in Congress. Such efforts by Congress prompted the American Hospital Association in 2006 to propose guidelines for charity care that include (1) giving discounts to uninsured patients of “limited means”; (2) establishing a common definition for “community benefits,” which encompass the full range of services provided to the population served; and (3) improving “transparency,” or the ability of outsiders to understand a business’s governance structure and policies, including executive compensation.

In addition to Congressional action, officials in 20 states have recently proposed legislation that mandates the amount of charity care provided by not-for-profit hospitals and the billing and collections procedures applied to the uninsured. For example, Texas has established minimum requirements for charity care, which in effect hold not-for-profit hospitals accountable to the public for the tax exemptions they receive. The Texas law specifies four tests, and each hospital must meet at least one of them. The test that most hospitals use to comply with the law requires that at least 4 percent of net patient service revenue be spent on charity care. Under a proposed Illinois law, not-for-profit hospitals would be required to devote at least 8 percent of their operating costs on charity care and to establish discounts to the uninsured on the basis of income level.

Finally, money-starved municipalities in several states have attacked the property tax exemption of not-for-profit hospitals that have “neglected” their charitable missions. For example, tax assessors are fighting to remove property tax exemptions from not-for-profit hospitals in several Pennsylvania cities after a recent appellate court ruling supported the Erie school district’s authority to tax a local hospital that had strayed too far from its charitable purpose. According to one estimate, if all not-for-profit hospitals had to pay taxes comparable to their investor-owned counterparts, local, state, and federal governments would garner an additional \$3.5 billion in tax revenues. This estimate explains why tax authorities in some jurisdictions are pursuing not-for-profit hospitals as a source of revenue.

The inherent differences between investor-owned and not-for-profit organizations have profound implications for many elements of healthcare financial management, including organizational goals, financing decisions (i.e., the choice between debt and equity financing and the specific types of securities issued), and capital investment decisions. How ownership affects the

application of healthcare financial management theory and concepts will be addressed throughout the text.

1. What are the major differences between investor-owned and not-for-profit corporations?
2. What pressures have been placed on not-for-profit hospitals to ensure that they meet their charitable mission?

## Self-Test Questions

## Organizational Structures

Whether investor owned or not for profit, the number of ways of organizing a health services organization is almost unlimited. At the most basic level, a healthcare provider can be a single entity with one operating unit. In this situation, all of the financial management decisions for the organization are made by a single set of managers. Alternatively, corporations can be set up with separate operating divisions or as holding companies with wholly or partially owned subsidiary corporations, in which different management layers have different financial management responsibilities.

### *Holding Companies*

Today, many organizations, both investor owned and not for profit, have adopted *holding company* structures to take advantage of economies of scale, or scope, in operations and financing or to gain favorable legal or tax treatment. Holding companies date from 1889, when New Jersey became the first state to pass a law permitting corporations to be formed for the sole purpose of owning the stocks of other firms. Many of the advantages and disadvantages of holding companies are identical to those inherent in a large firm with several divisions. Whether a firm is organized on a divisional basis or as a holding company with several subsidiary corporations does not affect the basic reasons for conducting large-scale, multiproduct or multiservice, multifacility operations. However, the holding company structure has some distinct advantages and disadvantages over the divisional structure.

There are several advantages to holding companies:

- **Control with fractional ownership.** A holding company may buy 5, 10, or 50 percent of the stock of another corporation. Such fractional ownership may be sufficient in giving the acquiring firm effective working control, or at least substantial influence, over the operations of the firm in which it has acquired stock ownership. Working control is often considered to entail more than 25 percent of the common stock, but it can be as low as 10 percent if the stock is widely held.
- **Isolation of risks.** Because the various operating firms in a holding company system are separate legal entities, the obligations of one unit are separate from those of the other units. Therefore, catastrophic losses

incurred by one unit of the system are not transferable into claims against the other units. This separation can be especially beneficial when the operating units carry the potential for large losses from malpractice or other liability lawsuits. Note, though, that the parent firm often voluntarily steps in to aid a subsidiary with large losses, either to protect the good name of the firm or to protect its investment in the subsidiary.

- **Separation of for-profit and not-for-profit subsidiaries.** Holding company organization facilitates expansion into both tax-exempt and taxable activities well beyond patient care. However, a tax-exempt holding company must ensure that all transactions with the taxable subsidiaries are conducted at arm's length, otherwise the tax-exempt status of the parent holding company can be challenged. Investor-owned multihospital systems are organized similarly, except that all of the entities are taxable, for-profit organizations.

Holding companies have the following disadvantages:

- **Partial multiple taxation.** Investor-owned holding companies that own at least 80 percent of a subsidiary's common stock can file a consolidated return for federal income tax purposes. In effect, the holding company and the subsidiary are treated as a single entity, with all of the revenues and costs aggregated. However, when less than 80 percent of the stock is owned, the only way that the subsidiary can transfer funds to the holding company is by paying dividends, and such dividends face partial multiple taxation. For example, holding companies that own more than 20 percent but less than 80 percent of the stock of another corporation must pay tax on 20 percent of the dividends received (80 percent are nontaxable), and companies that own less than 20 percent must pay tax on 30 percent of the dividends (70 percent are nontaxable). Because the subsidiary must pay taxes on the earnings prior to making the dividend payment, the funds transferred to the parent are taxed twice.
- **Ease of forced divestiture.** In the event of antitrust action, it is relatively easy for a holding company to relinquish ownership in a subsidiary by selling the stock to another party. This transfer is considered a disadvantage because it increases the likelihood that government agencies will demand divestiture if antitrust concerns arise.

### **Multihospital Systems**

*Multihospital systems*, including both tax-exempt and for-profit organizations, have grown much faster than freestanding hospitals over the past 30 years. Several advantages of multihospital systems have been hypothesized, including the following:

- better access to capital markets, which results in lower capital costs;



- elimination of duplicated services, which increases the volume of services at the remaining sites and results in lower unit costs and increased quality;
- economies of scale;
- access to specialized managerial skills within the system;
- ability to recruit and retain better personnel because of superior training programs, advancement opportunities, and transfer opportunities; and
- increased political power to deal with governmental issues such as property taxes, certificates of need, and government reimbursement systems.

In recent years, the largest systems have tended to shed some hospitals, although there continues to be some consolidation within local markets. It appears that hospital systems have more economies of scale within local markets than they do regionally or nationally.

### **Corporate Alliances**

*Corporate alliances* potentially can provide some of the benefits of multi-institutional systems without requiring common ownership. Perhaps the least binding alliances are industry trade groups, which tend to operate at both state and national levels. To illustrate the concept, note that the American Hospital Association and its state organizations—for example, the Florida Hospital Association—constitute one major hospital trade association. Also, the American Association of Equipment Lessors is the trade group for firms that lease equipment to the health services industry.

Other types of alliances can be more binding but provide more benefits to their members. For example, several hospital alliances exist primarily to provide purchasing clout for their members. One of the largest of such alliances is VHA (formerly Voluntary Hospitals of America), which is a for-profit firm whose shareholders are the member hospitals, all not-for-profit institutions, and their physicians. VHA's firms and subsidiaries provide members and affiliates with management services in such areas as procurement, data management, marketing, and even capital acquisition. VHA's members and affiliates retain local control and autonomy yet gain many of the advantages of a large system.

In addition to alliances among similar organizations, alliances are also being formed among dissimilar providers to offer a more complete range of services. Such vertical alliances are discussed in the next section.

### **Integrated Delivery Systems**

Perhaps the most dynamic recent changes in organizational structures in health services have centered on the *integrated delivery system*.<sup>10</sup> In the 1970s, horizontal integration, such as the combining of hospitals, was the dominant trend in organization evolution. In the 1980s and well into the 1990s, the dominant organizational movement was toward vertically integrated systems. In an integrated delivery system, a single organization, or a closely aligned



group of organizations, offers a broad range of patient care and support services operated in a unified manner. The range of services offered by an integrated delivery system may focus on a particular area, such as long-term care or mental health, or more commonly it may offer a full range of subacute, acute, and postacute services.

An integrated delivery system may have a single owner, or it may have multiple owners joined together by contracts and agreements. The driving force behind these systems is the motivation to offer a full line of coordinated services and hence to increase the overall effectiveness and lower the overall cost of the services provided. Cost reduction is obtained by providing only necessary services and ensuring that the services are provided at the most cost-effective clinical level. Integrated delivery systems may be formed by managed care plans or even directly by employers, but more often they are formed by providers to facilitate contracting with plans or employers.

Perhaps the key feature of integrated delivery systems is that, to be successful, the primary focus must be the clinical effectiveness and profitability of the system as a whole, as opposed to each individual element. This requires a much higher level of administrative and clinical integration than is seen in most organizations and, more importantly, it requires that managers of the individual elements of the system place their own interests second to that of the overall system. In addition, it requires a management information system that seamlessly passes both managerial and patient data among all of the components of the integrated system. Although it would appear that single-owner systems would have advantages over systems that are contractually created, such advantages, if they do exist, have proven to be difficult to realize in practice.

Although the advantages of integrated delivery systems are easy to hypothesize, the reality has been that these advantages have been very difficult to realize in practice. In fact, much of the enthusiasm generated for such systems in the 1990s has waned, and now the emphasis appears to be on creating smaller, more focused businesses that are easier to manage.

## Self-Test Questions

1. What are the advantages and disadvantages of the holding company form of organization?
2. What is the difference between horizontal and vertical integration?
3. What are integrated delivery systems, how are they created, and what is the driving force behind them? What are the challenges faced by integrated delivery systems?

## Organizational Goals

Financial decisions are not made in a vacuum but with an objective in mind. Financial management goals within an organization clearly must be consistent

with and in support of the overall goals of the business. Thus, by discussing organizational goals, a framework for financial decision making within health services organizations is provided.

In a proprietorship, partnership, or small privately owned corporation, the owners of the business generally are also its managers. In theory, the business can be operated for the exclusive benefit of the owners. If the owners want to work very hard to maximize wealth, they can. On the other hand, if every Wednesday is devoted to golf, no one is hurt by such actions. (Of course, the business still has to cater to its customers or else it will not survive.) It is in large publicly owned corporations, in which owners and managers are separate parties, that organizational goals become most important.

### **Large, Investor-Owned Corporations**

From a financial management perspective, the primary goal of investor-owned corporations is generally assumed to be *shareholder wealth maximization*, which translates to stock price maximization. Investor-owned corporations do, of course, have other goals. Managers, who make the actual decisions, are interested in their own personal welfare, in their employees' welfare, and in the good of the community and of society at large. Still, the goal of stock price maximization is a reasonable operating objective on which to build financial decision rules.

The primary obstacle to shareholder wealth maximization as the goal of investor-owned corporations is the *agency problem*. An agency problem exists when one or more individuals (the *principals*) hire another individual or group of individuals (the *agents*) to perform a service on their behalf and then delegate a decision-making authority to those agents. Within a healthcare financial management framework, the agency problem exists between stockholders and managers, and between debtholders and stockholders.

The agency problem between stockholders and managers occurs because the managers of large, investor-owned corporations hold only a very small proportion of the firm's stock, so they benefit very little from stock price increases. On the other hand, managers benefit substantially from actions often detrimental to shareholders' wealth, such as increasing the size of the firm to justify higher salaries and more fringe benefits; awarding themselves generous retirement plans; and spending too much on office space, personal staff, and travel. Clearly, many situations can arise in which managers are motivated to take actions that are in their best interests, rather than in the best interests of stockholders.

However, shareholders recognize the agency problem and counter it by creating incentives for managers to act in shareholders' interests. Additionally, other factors are at work to keep managers focused on shareholder wealth maximization.

Here are some of the factors that mitigate the agency problem:

- **The creation of managerial incentives.** More and more firms are creating *incentive compensation plans* that tie managers' compensation to the firm's performance. One tool often used is *stock options*, which allows managers to purchase stock at some time in the future at a given price. Because the options are valuable only if the stock price climbs above the *exercise price* (the price that the managers must pay to buy the stock), managers are motivated to take actions to increase stock price. However, because a firm's stock price is a function both of the actions taken by managers and the general state of the economy, a firm's managers could be doing a superlative job for shareholders and the options still prove to be worthless. To overcome the inherent shortcoming of stock options, many firms today now use *performance shares* as the managerial incentive. Performance shares are given to managers on the basis of the firm's performance as indicated by objective measures such as earnings per share, return on equity, and so on. In addition to getting more shares when targets are met, the value of the shares is enhanced if the firm's stock price rises. Finally, many businesses now are using the concept of *economic value added (EVA)* to structure managerial compensation. (EVA is discussed in Chapter 13.) All incentive compensation plans—stock options, performance shares, profit-based bonuses, and so forth—are designed with two purposes in mind. First, they offer managers incentives to act on those factors under their control in a way that will contribute to stock price maximization. Second, the existence of such plans helps firms attract and retain top-quality managers.<sup>11</sup>
- **The threat of firing.** Until the 1980s, the probability of a large firm's management being ousted by its stockholders was so remote that it posed little threat. This situation existed because ownership of most firms was so widely held, and management's control over the proxy (voting) mechanism was so strong, that it was almost impossible for dissident stockholders to fire a firm's managers. Today, however, about 50 percent of the stock of an average large corporation, such as pension funds and mutual funds, is held by large institutions rather than by individual investors. These institutional money managers have the clout, if they choose to use it, to exercise considerable influence over a firm's managers and, if necessary, to remove the current management team by voting them off the board.
- **The threat of takeover.** *Hostile takeovers*, in which a firm is bought against its management's wishes, are most likely to occur when a firm's stock is undervalued relative to its potential because of poor management. In a hostile takeover, a potential acquirer makes a direct appeal to the shareholders of the target firm to *tender*, or sell, their shares at some stated price. If 51 percent of the shareholders agree to tender their shares, the acquirer gains control. When a hostile takeover occurs, the managers of the acquired firm often lose their jobs, and any managers permitted to stay

on generally lose the autonomy they had prior to the acquisition. Thus, managers have a strong incentive to take actions to maximize stock price. In the words of the president of a major drug manufacturer, “If you want to keep control, don’t let your company’s stock sell at a bargain price.”

In summary, it is clear that managers of investor-owned firms can have motivations that are inconsistent with shareholder wealth maximization. Still, sufficient mechanisms are at work to force managers to view shareholder wealth maximization as an important, if not primary, goal. Thus, shareholder wealth maximization is a reasonable goal for financial management decision making within investor-owned firms.

### **Not-for-Profit Corporations**

Because not-for-profit corporations do not have shareholders, shareholder wealth maximization is not an appropriate goal for such organizations. Not-for-profit firms consist of a number of classes of *stakeholders* who are directly affected by the organization. Stakeholders include all parties that have an interest, usually of a financial nature, in the organization. For example, a not-for-profit hospital’s stakeholders include the board of trustees; managers; employees; physicians; creditors; suppliers; patients; and even potential patients, which may include the entire community. An investor-owned hospital has the same set of stakeholders, plus one additional class—stockholders. While managers of investor-owned firms have to please only one class of stakeholders—the shareholders—to keep their jobs, managers of not-for-profit firms face a different situation. They have to try to please all of the organization’s stakeholders because no single, well-defined group exercises control.

Many people argue that managers of not-for-profit firms do not have to please anyone at all because they tend to dominate the board of trustees who are supposed to exercise oversight. Others argue that managers of not-for-profit firms have to please all of the firm’s stakeholders to a greater or lesser extent because all are necessary to the successful performance of the business. Of course, even managers of investor-owned firms should not attempt to enhance shareholder wealth by treating any of their firm’s other stakeholders unfairly because such actions ultimately will be detrimental to shareholders.

Typically, the goal of not-for-profit firms is stated in terms of a mission. An example is the current mission statement of Bayside Memorial Hospital, a 450-bed, not-for-profit, acute care hospital:

Bayside Memorial Hospital, along with its medical staff, is a recognized, innovative healthcare leader dedicated to meeting the needs of the community. We strive to be the best comprehensive healthcare provider through our commitment to excellence.

Although this mission statement provides Bayside’s managers and employees with a framework for developing specific goals and objectives, it does

not provide much insight into the goal of the hospital's finance function. For Bayside to accomplish its mission, its managers have identified five financial goals:

1. The hospital must maintain its financial viability.
2. The hospital must generate sufficient profits to continue to provide the current range of healthcare services to the community. This goal means that current buildings and equipment must be replaced as they become obsolete.
3. The hospital must generate sufficient profits to invest in new medical technologies and services as they are developed and needed.
4. The hospital should not rely on its philanthropy program or government grants to fund its operations and growth, although it will aggressively seek such funding.
5. The hospital will strive to provide services to the community as inexpensively as possible, given the above financial requirements.

In effect, Bayside's managers are saying that to achieve the hospital's commitment to excellence as contained in its mission statement, the hospital must remain financially strong and profitable. Financially weak organizations cannot continue to accomplish their stated missions over the long run. What is interesting is that Bayside's five financial goals are probably not much different from the finance goals of Jefferson Regional Medical Center (JRMC), a for-profit competitor. Of course, JRMC has to worry about providing a return to its shareholders, and it receives only a very small amount of contributions and grants. However, to maximize shareholder wealth, JRMC also must retain its financial viability and have the financial resources necessary to offer new services and technologies. Furthermore, competition in the market for hospital services will not permit JRMC to charge appreciably more for services than its not-for-profit competitors.

### Self-Test Questions

1. What is the difference in goals between investor-owned and not-for-profit firms?
2. What is the agency problem, and how does it apply to investor-owned firms?
3. What factors tend to reduce the agency problem?

### Tax Laws

The value of any financial asset, such as a share of stock issued by HCA or a municipal bond issued by the Alachua County Healthcare Financing Authority on behalf of Shands HealthCare, as well as the value of many real assets such as a magnetic resonance imaging (MRI) machine, medical office

building, or hospital, depends on the stream of usable cash flows that the asset is expected to produce. Because taxes reduce the cash flows that are usable to the business, financial management analyses must include the impact of local, state, and federal taxes. Local and state tax laws vary widely, so we will not attempt to cover them in this text. Rather, we will focus on the federal income tax system because these taxes dominate the taxation of business income. Then, in our examples, we will typically increase the tax rate to approximate the effects of state and local taxes.

Tax laws can be changed by Congress, and major changes have occurred every three to four years, on average, since 1913, when the federal tax system was initiated. Furthermore, certain aspects of the Tax Code are tied to inflation, so changes automatically occur each year based on the previous year's inflation rate. Therefore, although this section will give you an understanding of the basic nature of our federal tax system, **it is not intended to be a guide for actual use.** Tax laws are so complicated that many law schools offer a master's degree in taxation, and many of the lawyers who hold this degree are also certified public accountants or CPAs. Managers and investors should and do, therefore, rely on tax experts rather than trust their own limited knowledge. Still, it is important to know the basic elements of the tax system as a starting point for discussions with tax specialists. In a field complicated enough to warrant such detailed study, we can cover only the highlights.

Current (2006) federal income tax rates on personal income go up to 35 percent, and when state and local income taxes are added, the marginal rate can approach 50 percent. Business income is also taxed heavily. The income from partnerships and proprietorships is reported by the individual owners as personal income and, consequently, is taxed at rates going up to 50 percent. Corporate income, in addition to state and local income taxes, is taxed by the federal government at marginal rates as high as 39 percent. Because of the magnitude of the tax bite, taxes play an important role in most financial management decisions made by individuals and by for-profit organizations.

### **Individual (Personal) Income Taxes**

Individuals pay personal taxes on wages and salaries; on investment income such as dividends, interest, and profits from the sale of securities; and on the profits of sole proprietorships, partnerships, and S corporations. For tax purposes, investors received two types of income: (1) ordinary and (2) dividends and capital gains. *Ordinary income* includes wages and salaries and interest income. *Dividend income*, which arises from stock ownership, and *capital gains*, which arise from the sale of assets (including stocks), generally are taxed at lower rates than ordinary income.

Federal income taxes on ordinary income are *progressive*—that is, the higher one's income, the larger the *marginal tax rate*, which is the rate applied to the last dollar of earnings. Marginal rates on ordinary income begin at 10 percent,

**Taxes on Wages  
and Salaries**

rise to 15, 25, 28, and 33 percent, and finally top out at 35 percent. Because the levels of income for each bracket are adjusted for inflation annually, and because the brackets are different for single individuals and married couples who file a joint return, we will not provide a complete discussion here. However, to help put things in perspective, it takes a taxable income of roughly \$336,550 to be in the highest (35 percent) bracket, so most people fall into the lower brackets.

### Taxes on Interest Income

Individuals can receive *interest income* on savings accounts, certificates of deposit, bonds, and the like. Such income from securities, like wages and salaries, is taxed as ordinary income and hence is taxed at federal rates that go up to 35 percent, in addition to applicable state and local income taxes. Note, however, that under federal tax laws, interest on most state and local government bonds, called *municipals* or “*munis*,” is not subject to federal income taxes. Such bonds include those issued by municipal healthcare authorities on behalf of not-for-profit healthcare providers. Thus, investors get to keep all of the interest received from municipal bonds but only a proportion of the interest received from bonds issued by the federal government or by corporations. This means that a lower interest rate muni bond can provide the same or higher after-tax return as a higher-yielding corporate or Treasury bond. For example, consider an individual in the 35 percent federal tax bracket who can buy a taxable corporate bond that pays a 10 percent interest rate. What rate would a similar-risk muni bond have to offer to make the investor indifferent between the muni and the corporate? Here is a way to think about this problem:

$$\begin{aligned}
 \text{After-tax rate on corporate bond} &= \text{Pretax rate} - \text{Yield lost to taxes} \\
 &= \text{Pretax rate} - (\text{Pretax rate} \times \text{Tax rate}) \\
 &= \text{Pretax rate} \times (1 - T) \\
 &= 10\% \times (1 - 0.35) = 10\% \times 0.65 = 6.5\%.
 \end{aligned}$$

Here,  $T$  is the investor’s marginal tax rate. Thus, the investor would be indifferent between a corporate bond with a 10 percent interest rate and a municipal bond with a 6.5 percent rate.

If the investor wants to know what yield on a taxable bond is equivalent to, say, a 7.0 percent interest rate on a muni bond, then he or she would follow this procedure:

$$\begin{aligned}
 \text{Equivalent rate on taxable bond} &= \frac{\text{Rate on municipal bond}}{1 - T} \\
 &= \frac{7.0\%}{1 - 0.35} = \frac{7.0\%}{0.65} = 10.77\%.
 \end{aligned}$$

The exemption of municipal bonds from federal taxes stems from the separation of power between the federal government and state and local governments, and its primary effect is to allow state and local governments,



and not-for-profit healthcare providers, to borrow at lower interest rates than otherwise would be possible.

In addition to interest income on securities, investors can receive dividend income from securities (stocks). Because investor-owned corporations pay dividends out of earnings that have already been taxed, there is double taxation on corporate income. To recognize that taxes have already been paid on these earnings, dividend income is taxed at the same rates as long-term capital gains income, which are less than those on ordinary and interest income. If an individual is in the 25 percent, or higher, tax bracket, dividends are taxed at 15 percent. If in the 10 or 15 percent tax bracket, dividends are taxed at only 5 percent. To illustrate the advantage, consider an individual in the 35 percent tax bracket who receives both \$100 in interest income and \$100 in dividend income. The taxes on the interest income would be  $0.35 \times \$100 = \$35$ , while the taxes on the dividend income would be only  $0.15 \times \$100 = \$15$ , a difference of \$20.<sup>12</sup>

### Dividend Income

Assets such as stocks, bonds, real estate, and plant and equipment (land, buildings, x-ray machines, and the like) are defined as *capital assets*. If an individual buys a capital asset and later sells it at a profit—that is, if the individual sells it for more than the purchase price—the profit is called a *capital gain*. If the individual sells it for less than the purchase price, the loss is called a *capital loss*. An asset sold within one year of the time it was purchased produces a *short-term capital gain or loss*, whereas an asset held for more than one year produces a *long-term capital gain or loss*. To illustrate the concept, consider that if you buy 100 shares of Manor Care, a long-term care business, for \$10 per share and sell the stock later for \$15 per share, you will make a capital gain of  $100 \times (\$15 - \$10) = 100 \times \$5 = \$500$ . However, if you sell the stock for \$5 per share, you will incur a capital loss of \$500. If you hold the stock for one year or less, the gain or loss is short term; otherwise, it is a long-term gain or loss. Note that if you sell the stock for \$10 a share, you will make neither a capital gain nor a loss; you will simply get your \$1,000 back and no taxes are due on the transaction.

### Capital Gains Income

Short-term capital gains are taxed as ordinary income at the same rates as wages and interest. However, long-term capital gains are taxed at the same rates as dividends, which are lower than ordinary income. To illustrate the effect of this tax benefit on long-term capital gains, consider an investor in the top 35 percent tax bracket who makes a \$500 long-term capital gain on the sale of Manor Care stock. If the \$500 were ordinary income, she would have to pay federal income taxes of  $0.35 \times \$500 = \$175$ . However, as a long-term capital gain, the tax would be only  $0.15 \times \$500 = \$75$ , for a savings of \$100 in taxes. There are many nuances to capital gains taxes, especially regarding how losses can affect taxes. However, our purpose here is merely to introduce the concept.



The purpose of the reduced tax rate on dividends and long-term capital gains is to encourage individuals to invest in those assets that contribute most to economic growth.

### Corporate Income Taxes

The corporate tax structure, shown in Table 1.1, has marginal rates as high as 39 percent, which brings the average rate up to 35 percent. To illustrate this concept, consider the following example. If Midwest Home Health Services, an investor-owned home health care business headquartered in Chicago, had \$80,000 of taxable income, its federal income tax bill would be \$15,450:

$$\begin{aligned}\text{Corporate taxes} &= \$13,750 + [0.34 \times (\$80,000 - \$75,000)] \\ &= \$13,750 + (0.34 \times \$5,000) \\ &= \$13,750 + \$1,700 = \$15,450.\end{aligned}$$

Midwest's marginal tax rate would be 34 percent, but its average tax rate would be  $\$15,450/\$80,000 = 19.3\%$ . Note that the average federal corporate income tax rate is progressive to \$18,333,333 of income, but it is constant thereafter.

### Unrelated Business Income

Even though tax-exempt holding companies can be created with both tax-exempt and taxable subsidiaries, it is also possible for tax-exempt corporations to have taxable income, which is usually referred to as *unrelated business income (UBI)*. UBI is created when a tax-exempt corporation has income from a trade or business that (1) is not substantially related to the charitable goal of the organization and (2) is carried on with the frequency and regularity of comparable for-profit commercial businesses.

As an example of UBI, consider Bayside Memorial Hospital's pharmacy sales. In addition to its services to the hospital's patients, the not-for-profit hospital's pharmacy has a second location, adjacent to the parking garage, which sells drugs and supplies to the general public. In general, the IRS views the charitable purpose of a hospital as providing healthcare services to its patients, so the income from Bayside's sale of drugs and supplies to nonpatients, which is done on a regular basis, is taxable. The fact that the profits from the sales are used for charitable purposes is immaterial. Note, however, that if the trade or business engaged in by a not-for-profit entity (1) is run by volunteers, (2) is run for the convenience of employees, or (3) involves the sale of merchandise contributed to the organization, then the income generated remains tax exempt. Thus, the profits on Bayside's sale of drugs and supplies to its employees, as well as the profits on the sale of items in its gift shop run by volunteer "pink ladies," is exempt from taxation.

UBI tax returns must be filed annually with the IRS by not-for-profit organizations if the gross income from unrelated business activity exceeds

**TABLE 1.1**  
Corporate Tax  
Rates for 2006

<i>Taxable Income</i>	<i>Tax</i>	<i>Average Tax Rate at Top of Bracket</i>
Up to \$50,000	15% of taxable income	15.0%
\$50,000–\$75,000	\$7,500 + 25% of excess over \$50,000	18.3
\$75,000–\$100,000	\$13,750 + 34% of excess over \$75,000	22.3
\$100,000–\$335,000	\$22,250 + 39% of excess over \$100,000	34.0
\$335,000–\$10,000,000	\$113,900 + 34% of excess over \$335,000	34.0
\$10,000,000–\$15,000,000	\$3,400,000 + 35% of excess over \$10,000,000	34.3
\$15,000,000–\$18,333,333	\$5,150,000 + 38% of excess over \$15,000,000	35.0
Over \$18,333,333	\$6,416,667 + 35% of excess over \$18,333,333	35.0

\$1,000. In determining taxable income, expenses related to UBI income production are deducted from gross income. Then, taxes are calculated as if the income were earned by a taxable corporation.

Interest income received by a taxable corporation is taxed as ordinary income at the regular tax rates contained in Table 1.1. However, a portion of the dividends received by one corporation from another is excluded from taxable income. As we mentioned earlier in our discussion of holding companies, the size of the dividend exclusion actually depends on the degree of ownership. In general, we will assume that corporations that receive dividends have only nominal ownership in the dividend-paying corporations, so 30 percent of the dividends received are taxable. The purpose of the dividend exclusion is to lessen the impact of triple taxation. Triple taxation occurs when the earnings of Firm A are taxed; then dividends are paid to Firm B, which must pay partial taxes on the income; and then Firm B pays out dividends to Individual C, who must pay personal taxes on the income.

To illustrate the effect of the dividend exclusion, consider the following example. A corporation that earns \$500,000 and pays a 34 percent marginal tax rate would have an *effective tax rate* of only  $0.30 \times 0.34 = 0.102 = 10.2\%$  on its dividend income. If this firm had \$10,000 in pretax dividend income, its after-tax dividend income would be \$8,980:

**Interest and  
Dividend  
Income  
Received by an  
Investor-Owned  
Corporation**

$$\begin{aligned}
 \text{After-tax income} &= \text{Pretax income} - \text{Taxes} \\
 &= \text{Pretax income} - (\text{Pretax income} \times \text{Effective tax rate}) \\
 &= \text{Pretax income} \times (1 - \text{Effective tax rate}) \\
 &= \$10,000 \times [1 - (0.30 \times 0.34)] \\
 &= \$10,000 \times (1 - 0.102) = \$10,000 \times 0.898 = \$8,980.
 \end{aligned}$$

If a taxable corporation has surplus funds that can be temporarily invested in securities, the tax laws favor investment in stocks, which pay dividends, rather than in bonds, which pay interest. For example, suppose Midwest Home Health Services has \$100,000 to invest temporarily, and it can buy either bonds that paid interest of \$8,000 per year or preferred stock that paid dividends of \$7,000 per year. Because Midwest is in the 34 percent tax bracket, its tax on the interest if it bought the bonds would be  $0.34 \times \$8,000 = \$2,720$ , and its after-tax income would be  $\$8,000 - \$2,720 = \$5,280$ . If it bought the preferred stock, its tax would be  $0.34 \times (0.30 \times \$7,000) = \$714$ , and its after-tax income would be \$6,286. Other factors might lead Midwest to invest in the bonds, or in other securities, but the tax laws certainly favor stock investments when the investor is a corporation.

### Interest and Dividend Income Received by a Not-for-Profit Corporation

Interest and dividend income received from securities purchased by not-for-profit corporations with **temporary surplus cash** is not taxable. However, note that not-for-profit firms are prohibited from issuing tax-exempt bonds for the sole purpose of reinvesting the proceeds in other securities, although such firms can temporarily invest the proceeds from a tax-exempt issue in taxable securities while waiting for the planned expenditures to occur. If not-for-profit firms could engage in such *tax arbitrage* operations, they could, in theory, generate an unlimited amount of income by issuing tax-exempt bonds for the sole purpose of investing in higher-yielding securities that are taxable to most investors. For example, a not-for-profit firm might sell tax-exempt bonds with an interest rate of 5 percent and use the proceeds to invest in U.S. Treasury bonds that yield 6 percent.

### Interest and Dividends Paid by an Investor-Owned Corporation

A firm's assets can be financed either with debt or equity capital. If it uses debt financing, it must pay interest on that debt, whereas if an investor-owned firm uses equity financing, normally it will pay dividends to its stockholders. The interest paid by a taxable corporation is deducted from the corporation's operating income to obtain its taxable income, but dividends are not deductible. Put another way, dividends are paid from after-tax income. Therefore, Midwest Home Health Services, which is in the 34 percent tax bracket, needs only \$1 of pretax earnings to pay \$1 of interest expense, but it needs \$1.52 of pretax earnings to pay \$1 in dividends:

$$\begin{aligned}\text{Dollars of pretax income required} &= \frac{\$1}{1 - \text{Tax rate}} \\ &= \frac{\$1}{0.66} = \$1.52.\end{aligned}$$

The fact that interest is a tax-deductible expense, while dividends are not, has a profound impact on the way taxable businesses are financed. The U.S. tax system favors debt financing over equity financing. This point will be discussed in detail in Chapter 10.

At one time, corporate long-term capital gains were taxed at lower rates than ordinary income. However, under current law, corporate capital gains are taxed at the same rate as operating income.

### *Corporate Capital Gains*

Corporate operating losses that occur in any year can be used to offset taxable income in other years. Such losses can be carried back to each of the preceding three years and forward for the next 15 years. For example, an operating loss by Midwest Home Health Services in 2006 would be applied first to 2003. If Midwest had taxable income in 2003, and hence paid taxes, the loss would be used to reduce 2003's taxable income, so the firm would receive a refund on taxes paid for that year. If the 2006 loss exceeded the taxable income for 2003, the remainder would be applied to reduce taxable income for 2004, then 2005. If Midwest had losses in the previous three years, the cumulative losses, including the loss for 2006, would be carried forward to 2007, then 2008, and so on—up to year 2021. Note that losses that are carried back provide immediate tax benefits, but the tax benefits of losses that are carried forward are delayed until some time in the future. The tax benefits of losses that cannot be used to offset taxable income in 15 years or less are lost to the firm. The purpose of this provision in the tax laws is to avoid penalizing corporations whose incomes fluctuate substantially from year to year.

### *Corporate Loss Carry-Back and Carry-Forward*

As we mentioned earlier, if a corporation owns 80 percent or more of another corporation's stock, it can aggregate income and expenses and file a single consolidated tax return. Thus, the losses of one firm can be used to offset the profits of another. No business wants to incur losses (it can go broke losing \$1 to save 34 cents in taxes), but tax offsets do make it more feasible for large multicompany businesses to undertake risky new ventures that might suffer start-up losses.

### *Consolidated Tax Returns*

1. Briefly, explain the individual (personal) and corporate income tax systems.
2. What is the difference in individual tax treatment between interest and dividend income?

### *Self-Test Questions*

3. What are capital gains and losses, and how are they differentiated from ordinary income?
4. What is unrelated business income?
5. How do federal income taxes treat dividends received by corporations compared to dividends received by individuals?
6. With regards to investor-owned businesses, do tax laws favor financing by debt or by equity? Explain your answer.

## Depreciation

Suppose Northside Family Practice buys an x-ray machine for \$100,000 and uses it for ten years, after which time the machine becomes obsolete. The cost of the services provided by the machine must include a charge for the cost of the machine; this charge is called *depreciation*. Because depreciation reduces profit (net income) as calculated by accountants, the higher a business's depreciation charge, the lower its reported profit. However, depreciation is a noncash charge—it is an allocation of previous cash expenditures—so higher depreciation expense does not actually reduce cash flow. In fact, for taxable businesses, higher depreciation increases cash flow because the greater a business's depreciation expense in any year, the lower its tax bill.

To see more clearly how depreciation expense affects cash flow, consider Table 1.2. Here, we examine the impact of depreciation on two investor-owned hospitals that are alike in all regards except for the amount of depreciation expense each hospital has. Hospital A, with \$100,000 of depreciation expense, has \$200,000 of taxable income, pays \$80,000 in taxes, and has \$120,000 of after-tax income. Hospital B, with \$200,000 of depreciation expense, has only \$100,000 of taxable income, pays \$40,000 in taxes, and has an after-tax income of \$60,000.

However, depreciation is a noncash expense, whereas we assume that all other entries in Table 1.2 represent actual cash flows. To determine each

**TABLE 1.2**

The Effect of  
Depreciation on  
Cash Flow

	<i>Hospital A</i>	<i>Hospital B</i>
Revenue	\$1,000,000	\$1,000,000
Costs except depreciation	700,000	700,000
Depreciation	100,000	200,000
Taxable income	\$ 200,000	\$ 100,000
Federal plus state taxes (assumed to be 40%)	80,000	40,000
After-tax income	<u>\$ 120,000</u>	<u>\$ 60,000</u>
Add back depreciation	100,000	200,000
Net cash flow	<u>\$ 220,000</u>	<u>\$ 260,000</u>

hospital's cash flow, depreciation must be added back to after-tax income. When this is done, Hospital B, with the larger depreciation expense, has the larger cash flow. In fact, Hospital B's cash flow is larger by  $\$260,000 - \$220,000 = \$40,000$ , which represents the tax savings, or *tax shield*, on its additional  $\$100,000$  in depreciation expense:

$$\begin{aligned}\text{Tax shield} &= \text{Tax rate} \times \text{Depreciation expense} \\ &= 0.40 \times \$100,000 = \$40,000.\end{aligned}$$

Because a business's financial condition depends on the actual amount of cash that it earns, as opposed to some arbitrarily determined accounting profit, owners and managers should be more concerned with cash flow than reported profit. Note that if the hospitals in Table 1.2 were **not-for-profit hospitals**, taxes would be zero for both hospitals, and both hospitals would have  $\$300,000$  in net cash flow. However, Hospital A would report  $\$200,000$  in earnings, while Hospital B would report only  $\$100,000$  in earnings.

For-profit businesses generally calculate depreciation one way for tax returns and another way when reporting income on their financial statements. For *tax depreciation*, businesses must follow the depreciation guidelines laid down by tax laws, but for other purposes, businesses usually use *accounting*, or *book*, *depreciation* guidelines.

To determine **book depreciation**, the most common method is the *straight-line* method. To apply the straight-line method, (1) start with the *capitalized cost* of the asset (generally, price plus shipping plus installation); then (2) subtract the asset's *salvage value*, which, for book purposes, is the estimated value of the asset at the end of its useful life; and finally (3) divide the net amount by the asset's useful life. For example, consider Northside's x-ray machine that costs  $\$100,000$  and has a ten-year useful life. Furthermore, assume that it costs  $\$10,000$  to deliver and install the machine and that its estimated salvage value after ten years of use is  $\$5,000$ . In this case, the capitalized cost, or *basis*, of the machine is  $\$100,000 + \$10,000 = \$110,000$ , and the annual depreciation expense is  $(\$110,000 - \$5,000)/10 = \$10,500$ . Thus, the depreciation expense reported on Northside's income statement would include a  $\$10,500$  charge for "wear and tear" on the x-ray machine. The name "straight line" comes from the fact that the annual depreciation under this method is constant. The *book value* of the asset, which is the cost minus the accumulated depreciation to date, declines evenly (follows a straight line) over time.

For **tax purposes**, depreciation is calculated according to the *Modified Accelerated Cost Recovery System (MACRS)*. MACRS actually spells out two procedures for calculating tax depreciation: (1) the *standard (accelerated) method*, which is faster than the straight-line method because it allows businesses to depreciate assets on an accelerated basis, and (2) an *alternative straight-line method*, which is optional for some assets but mandatory for

others. Because taxable businesses want to gain the tax shields from depreciation as quickly as possible, they will normally use the standard (accelerated) MACRS method when it is allowed.

The calculation of MACRS depreciation uses three components: (1) the depreciable basis of the asset, which is the total amount to be depreciated; (2) a recovery period that defines the length of time over which the asset is depreciated; and (3) a set of allowance percentages for each recovery period that when multiplied by the basis gives each year's depreciation expense.

### Depreciable Basis

The *depreciable basis* is a critical element of the depreciation calculation because each year's recovery allowance depends jointly on the asset's depreciable basis and its recovery period. The depreciable basis under MACRS generally is equal to the purchase price of the asset plus any transportation and installation costs. Unlike the calculation of book depreciation, the basis for MACRS depreciation is **not** adjusted for salvage value regardless of whether the standard accelerated or alternate straight-line method is used.

### MACRS Recovery Periods

Table 1.3 describes the general types of property that fit into each *recovery period*. Property in the 27.5- and 39-year classes (real estate) must be depreciated using the alternate straight-line method, but 3-, 5-, 7-, and 10-year property (personal property) can be depreciated either by the accelerated method or by the alternate straight-line method.

### MACRS Recovery Allowances

Once the property is placed in the correct recovery period, the yearly recovery allowance, or depreciation expense, is determined by multiplying the asset's depreciable basis by the appropriate recovery percentage shown in Table 1.4. The specific calculation is discussed in the following sections.

**TABLE 1.3**  
MACRS  
Recovery  
Periods

<i>Period</i>	<i>Type of Property</i>
3-year	Tractor units and certain equipment used in research
5-year	Automobiles, trucks, computers, and certain special manufacturing tools
7-year	Most equipment, office furniture, and fixtures
10-year	Certain longer-lived types of equipment
27.5-year	Residential rental property such as apartment buildings
39-year	All nonresidential property such as commercial and industrial buildings

*Note:* Land cannot be depreciated.

**TABLE 1.4**  
MACRS  
Recovery  
Allowances

Ownership Year	Recovery Period			
	3-Year	5-Year	7-Year	10-Year
1	33%	20%	14%	10%
2	45	32	25	18
3	15	19	17	14
4	7	12	13	12
5		11	9	9
6		6	9	7
7			9	7
8			4	7
9				7
10				6
11				3
	100%	100%	100%	100%

*Note:* The tax tables carry the recovery allowances out to two decimal places, but for ease of illustration, we will use the rounded allowances shown in this table throughout this text.

Under MACRS, the assumption is generally made that an asset is placed in service in the middle of the first year. Thus, for three-year recovery period property, depreciation begins in the middle of the year the asset is placed in service and ends three years later. The effect of the *half-year convention* is to extend the recovery period out one more year, so three-year property is depreciated over four calendar years, five-year property is depreciated over six calendar years, and so on. This convention is incorporated in the values listed in Table 1.4.

### MACRS Depreciation Illustration

Assume that the \$100,000 x-ray machine is purchased by Northside Family Practice and placed in service in 2006. Furthermore, assume that Northside paid another \$10,000 to ship and install the machine, and that the machine falls into the MACRS five-year class. Because salvage value does not play a part in tax depreciation, and because delivery and installation charges are included (are capitalized) in the basis rather than expensed in the year incurred, the machine's depreciable basis is \$110,000.

Each year's recovery allowance (tax depreciation expense) is determined by multiplying the depreciable basis by the applicable recovery percentage. Thus, the depreciation expense for 2006 is  $0.20 \times \$110,000 = \$22,000$ , and for 2007 it is  $0.32 \times \$110,000 = \$35,200$ . Similarly, the depreciation expense is \$20,900 for 2008, \$13,200 for 2009, \$12,100 for 2010, and \$6,600 for 2011. The total depreciation expense over the six-year recovery period is \$110,000, which equals the depreciable basis of the x-ray machine. Note that the depreciation expense reported for tax purposes each year is different



from the book depreciation reported on Northside's income statement that we calculated earlier.

The *book value* of a depreciable asset at any point in time is its depreciable basis minus the depreciation accumulated to date. Thus, at the end of 2006, the x-ray machine's tax book value is  $\$110,000 - \$22,000 = \$88,000$ ; at the end of 2007, the machine's tax book value is  $\$110,000 - \$22,000 - \$35,200 = \$52,800$  (or  $\$88,000 - \$35,200 = \$52,800$ ); and so on. Again, note that the book value for accounting purposes is different from the book value for tax purposes.

According to the IRS, the value of a depreciable asset at any point in time is its tax book value. If a business sells an asset for more than its tax book value, the implication is that the firm took too much depreciation, and the IRS will want to recover the excess tax benefit. Similarly, if an asset is sold for less than its book value, the implication is that the firm did not take sufficient depreciation, and it can take additional depreciation on the sale of the asset. For example, suppose Northside sells the x-ray machine in early 2008 for \$60,000. Because the machine's tax book value is \$52,800 at the time,  $\$60,000 - \$52,800 = \$7,200$  is added to the Northside's operating income and taxed. Conversely, if Northside received only \$40,000 for the machine, it would be able to deduct  $\$52,800 - \$40,000 = \$12,800$  from taxable income and hence reduce its taxes in 2008.

## Self-Test Questions

1. Briefly, describe the MACRS tax depreciation system.
2. What is the effect of the sale of a depreciable asset on the firm's taxes?

## Key Concepts

This chapter presented some background information on business organization, ownership, goals, and taxes. Here are its key concepts:

- Financial management is a *decision science*, so the primary objective of this text is to provide students and practicing healthcare managers with the theory, concepts, and tools necessary to make effective decisions. The text is structured to support this goal.
- The *primary role of financial management* is to plan for, acquire, and utilize funds to maximize the efficiency and value of the enterprise.
- Specific financial management functions include (1) *evaluation and planning*, (2) *long-term investment decisions*, (3) *financing decisions*, (4) *working capital management*, (5) *contract management*, and (6) *financial risk management*.
- The three main forms of business organization are the *sole proprietorship*, the *partnership*, and the *corporation*.
- Although each form of organization has its own unique advantages and

disadvantages, most large organizations and all not-for-profit entities are organized as *corporations*.

- *Investor-owned corporations* have *shareholders* who are the owners of the firm. Shareholders exercise control through the *proxy* process, in which they elect the firm's board of directors and vote on matters of major consequence to the firm. As owners, the shareholders have a claim on the residual earnings of the firm. Investor-owned firms are fully taxable.
- Organizations that serve a charitable purpose and meet certain criteria can be organized as *not-for-profit corporations*. Rather than have a well-defined set of owners, such organizations have a large number of *stakeholders* who have an interest in the organization. Not-for-profit firms do not pay taxes, they can accept tax-deductible contributions, and they can issue tax-exempt (municipal) debt.
- From a financial management perspective, the goal of investor-owned firms is *shareholder wealth maximization*, which translates to stock price maximization. For not-for-profit firms, a reasonable goal for financial management is to *ensure the organization can fulfill its mission*, which translates to *maintaining the organization's financial viability*.
- An *agency problem* is a potential conflict of interests that can arise between principals and agents. One type of agency problem that can arise in financial management is the conflict between the owners and managers of a for-profit corporation.
- The value of any income stream depends on the amount of *usable, or after-tax, income*. Thus, tax laws play an important role in financial management decisions.
- Separate tax laws apply to *personal* income and *corporate* income.
- Fixed assets are *depreciated* over time to reflect the decline in their values. Depreciation is a deductible, but noncash, expense. Thus, for a taxable entity, the higher its depreciation, the lower its taxes and hence the higher its cash flow, with other things held constant.
- Current laws specify that the *Modified Accelerated Cost Recovery System (MACRS)* be used to depreciate assets for tax purposes.

Although this chapter provides a great deal of background information relevant to healthcare financial management, it is necessary to have a more thorough understanding of the reimbursement system. This important topic is covered in Chapter 2.

## Chapter Models and Problems

This chapter does not have an accompanying spreadsheet model. However, the chapter has two problems in spreadsheet format that focus on tax issues.

The problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

There are a multitude of websites that pertain to this chapter:

- For more information on taxes, see the Tax Guide for Investors at [www.fairmark.com](http://www.fairmark.com).

- To get some feel for the services offered by a corporate alliance, see the VHA site at [www.vha.com](http://www.vha.com).
- Two of the largest integrated health systems in the United States are Kaiser Permanente and the Henry Ford Health System. To gain a better idea of what constitutes such systems, see [www.kaiserpermanente.org](http://www.kaiserpermanente.org) or [www.henryfordhealth.org](http://www.henryfordhealth.org).

## Notes

1. Not-for-profit organizations are also called *nonprofit*, but the former designation is becoming dominant within the health services industry. Also, investor-owned businesses are sometimes called *proprietary*, or *for profit*. We will discuss the differences in these forms of ownership in detail later in the chapter.
2. There is a set of questions for each case in the online Instructor's Manual to the casebook. Instructors who want to provide more guidance to students than given in the case itself can distribute these questions to their students.
3. See Melanie Evans, "What Really Matters Most," *Modern Healthcare*, January 9, 2006, and Margaret S. Veach, "What's On Your Plate? Ten Top Issues for 2006," *Healthcare Financial Management*, January 2006
4. Note that a tax-exempt corporation, which is discussed later in this chapter, can be one partner of a partnership. In this situation, profits allocated to the tax-exempt partner are not taxed, but those allocated to taxable partners are subject to taxation.
5. Although most partnerships are small, there are some very large firms that are organized as partnerships or as hybrid organizations, which will be discussed in a later section. Examples include the major public accounting firms and many large law firms.
6. *Financial markets* bring together individuals and businesses that need money with other individuals and businesses that have excess funds to invest. In a developed economy, such as in the United States, there are a great many financial markets. Some markets deal with debt capital, while some deal with equity capital; some deal with short-term capital and others deal with long-term capital, and so on. How financial markets operate and their benefits to healthcare businesses will be discussed throughout the text.
7. Over 60 percent of corporations in the United States are chartered in Delaware, which over the years has provided a favorable governmental and legal environment for business activities. A firm does not have to be headquartered or even conduct business in its state of incorporation.
8. In rare situations, shares can be sold to the public for the first time by the corporation's original owners or by a foundation established by the owners, rather than directly by the firm. In such situations, the proceeds from the sale go to the original owners or foundation and not to the firm. Stock sales are discussed in more detail in Chapter 6.
9. An entire chapter can easily be filled with the details of obtaining and maintaining tax-exempt status, but our focus is on the impact of such status on financial management decision making.

10. For a more thorough discussion of integrated delivery systems, see Douglas A. Conrad and William L. Dowling, “Vertical Integration in Health Services: Theory and Managerial Implications,” *Health Care Management Review*, Fall 1990.
11. Incentive compensation plans are also used by not-for-profit organizations. For more information, see the Winter 1989 issue of *Topics in Health Care Financing*, “Incentive Compensation”; and William O. Cleverley and Roger K. Harvey, “Economic Value Added—A Framework for Health Care Executive Compensation,” *Hospital & Health Services Administration*, Summer 1993.
12. Note that current legislation calls for some tax rates to be further reduced over time, while other reductions already in effect, including the reduced rates on dividend income, will be phased out if not made permanent by future legislation. As you can see, tax rates are constantly changing, so it is very important to ensure that the tax rates used for real-world financial decision making are current.

## THE THIRD-PARTY-PAYER SYSTEM

### Learning Objectives

After studying this chapter, readers should be able to:

- Describe the key features of insurance.
- Discuss, in general terms, the reimbursement methods used by third-party payers and the incentives and risks that they create for providers.
- Describe the major types of third-party payers.
- Discuss the specific reimbursement methods used by Medicare.

### Introduction

In general, businesses in the healthcare sector that do not provide products or services directly to patients have the same operating environment as businesses in any other industry. For example, Cincinnati Milicron, a machine tool manufacturer, and GE Medical Systems sell their products in roughly the same way. Cincinnati sells its machines directly to manufacturers that use the machines to produce other goods, and GE Medical sells its diagnostic equipment directly to hospitals, medical practices, and other organizations that use the equipment for diagnostic testing. The prices that the two firms charge for their products are set in the competitive marketplace, and it is relatively easy for buyers to distinguish among competing products. In general, the more expensive the product, the better the performance, where performance can be judged on the basis of a set of more or less objective measures. Thus, in some industries in the healthcare sector, and in most other sectors of the economy, the consumer of the product or service (1) has a choice among many suppliers, (2) can distinguish the quality of competing goods or services, (3) makes a (presumably) rational decision regarding the purchase on the basis of quality and price, and (4) pays for the full cost of the purchase.

However, for the most part, the provision of healthcare services takes place in a unique way. First, often there are few providers of a particular service close at hand. Next, it is very difficult, if not impossible, to judge the quality of competing services. Then, the decision about which services to purchase is usually not made by the consumer of those services but rather by a physician or some other clinician. Also, payment to the provider is not normally made by

the user of the services but by a *third-party payer*. Finally, for most individuals, the purchase of health insurance from third-party payers is totally paid for or heavily subsidized by employers or government agencies, so patients are mostly insulated from the costs of healthcare.

This highly unusual marketplace for healthcare services has a profound effect on the supply of, and demand for, such services. We will leave most of the discussion concerning the market for healthcare services to economics courses, but to get a better understanding of the unique payment mechanisms involved, we must examine the third-party-payment system in more detail. Thus, in this chapter, we discuss those elements of the payer system that directly affect financial management decisions in health services organizations.

## Insurance Concepts

To begin our discussion, note that the third-party-payer system is really an insurance system with a wide variety of insurers that come in all types and sizes. Some are investor owned, while others are not for profit or government sponsored. Furthermore, some insurers require their policyholders, who may or may not be the beneficiaries of the insurance, to make the policy payments, while other insurers collect partially or totally from society at large. Because insurance is the cornerstone of the third-party-payer system, an appreciation of the nature of insurance will help you better understand the marketplace for healthcare services.<sup>1</sup>

### A Simple Illustration

To better understand insurance concepts, consider a simple example. Assume that no health insurance exists and that you face only two medical outcomes in the coming year:

<u>Outcome</u>	<u>Probability</u>	<u>Cost</u>
Stay healthy	0.99	\$ 0
Get sick	0.01	20,000
	<u>1.00</u>	

Furthermore, assume that every other individual faces the same medical outcomes and hence “sees” the same odds and costs associated with healthcare. Then, what is your expected healthcare cost,  $E(\text{Cost})$ , for the coming year? To find the answer, we must multiply the cost of each outcome by its probability of occurrence, and then sum the products:

$$\begin{aligned}
 E(\text{Cost}) &= (\text{Probability of outcome 1} \times \text{Cost of outcome 1}) \\
 &\quad + (\text{Probability of outcome 2} \times \text{Cost of outcome 2}) \\
 &= (0.99 \times \$0) + (0.01 \times \$20,000) \\
 &= \$0 + \$200 = \$200.
 \end{aligned}$$

Now, assume that you, and everyone else, make \$20,000 a year. With this salary, you can easily afford the \$200 “expected” healthcare cost. The problem is, however, that no one’s actual bill will be \$200. If you stay healthy, your bill will be zero. But if you are unlucky and get sick, your bill will be \$20,000, and this cost will force you, and most people who get sick, into personal bankruptcy, which is a ruinous event.

Now, suppose an insurance policy that pays all of your healthcare costs for the coming year is available for \$250. Would you take the policy, even though it costs \$50 more than your “expected” healthcare costs? Most people would. Because individuals are risk averse, they would be willing to pay a \$50 premium over their expected benefit to eliminate the risk of financial ruin. In effect, policyholders are passing the costs associated with the risk of getting sick to the insurer.

Would an insurer be willing to offer the policy for \$250? If the insurer can sell enough policies, it can take advantage of the *law of large numbers*. We know that it is impossible to predict the healthcare costs for the coming year for any one individual with any certainty because the cost will either be \$0 or \$20,000, and we will not know for sure until the year is over. For any individual, the expected cost of healthcare is \$200, but the standard deviation is a whopping \$1,990, so there is significant uncertainty about each individual’s required expenditure.

However, if an insurance company sells a million policies, its expected total policy payout is one million times the expected payout for each policy, or  $1,000,000 \times \$200 = \$200$  million. Furthermore, the law of large numbers tells us that the standard deviation of costs to an insurer with a large number of policyholders is  $\sigma/\sqrt{n}$ , where  $\sigma$  is the standard deviation for one individual and  $n$  is the number of individuals insured. Thus, payout uncertainty for the insurer, as measured by standard deviation, is only  $\$1,990 / \sqrt{1,000,000} = \$1.99$  per subscriber, or \$1.99 million in total. Given these data, we see that if there were no uncertainty in the \$20,000 estimated medical cost per claim, the insurer could forecast its total claims quite precisely. It would collect  $1,000,000 \times \$250 = \$250$  million in health insurance premiums, pay out roughly \$200 million in claims, and hence have about \$50 million to cover administrative costs, provide a reserve in case realized claims are greater than predicted by its actuaries, and make a profit. Clearly, with a standard deviation of claims of about \$2 million, the \$50 million “cushion” should be sufficient to carry out a successful business. The problem for real-world insurers is their inability to forecast the cost of each claim.

### Basic Characteristics of Insurance

The simple example of health insurance described above illustrates why individuals would seek health insurance, and why insurance companies would be formed to provide such insurance. Needless to say, the concept of insur-



ance becomes much more complicated in the real world. Insurance is typically defined as having four distinct characteristics:

1. **Pooling of losses.** The *pooling*, or *sharing*, of *losses* is the heart of insurance. *Pooling* means that losses are spread over a large group of individuals so that each individual realizes the average loss of the pool (plus administrative expenses) rather than the actual loss incurred. In addition, pooling involves the grouping of a large number of homogeneous *exposure units* (people or things having the same risk characteristics) so that the law of large numbers can apply. Thus, pooling implies (1) the sharing of losses by the entire group and (2) the prediction of future losses with some accuracy based on the law of large numbers.
2. **Payment only for random losses.** A *random loss* is one that is unforeseen and unexpected and occurs as a result of chance. Insurance is based on the premise that payments are made only for losses that are random. We will discuss the moral hazard problem, in which losses are not random, in a later section.
3. **Risk transfer.** An insurance plan almost always involves *risk transfer*. The sole exception to the element of risk transfer is *self-insurance*, which occurs when a business (or individual) assumes a risk itself rather than insures the risk through an insurance company. (Self-insurance is discussed in a later section.) Risk transfer means that the risk is transferred from the insured to the insurer, which typically is in a better financial position to pay the loss than the insured because of the premiums collected.
4. **Indemnification.** The final characteristic of insurance is *indemnification* for losses—that is, the reimbursement of the insured if a loss occurs. Within the context of health insurance, indemnification occurs when the insurer pays the insured, or the provider, in whole or in part for the expenses related to an insured illness or injury.

### Adverse Selection

One of the major problems facing insurers is *adverse selection*. Adverse selection occurs because those individuals and businesses that are more likely to have claims are more inclined to purchase insurance than those that are less likely to have claims. For example, an otherwise healthy individual without insurance who needs a costly surgical procedure will likely seek health insurance if he or she can afford it, whereas an identical individual without the threat of surgery is much less likely to purchase insurance. Similarly, consider the likelihood of a 20-year-old to seek health insurance versus the likelihood of a 60-year-old. All else the same, the older individual, with much greater health risk due to age, is more likely to seek insurance.

If this tendency toward adverse selection goes unchecked, a disproportionate number of sick people, or those most likely to become sick, will seek health insurance, and the insurer will experience higher-than-expected

claims. This increase in claims will trigger a premium increase, which only worsens the problem, because the healthier members of the plan will seek insurance from other firms at a lower cost or may totally forgo insurance. The adverse-selection problem exists because of *asymmetric information*, which occurs when individual buyers of health insurance know more about their health status than do insurers.

Insurance companies attempt to control the adverse selection problem by underwriting provisions. *Underwriting* refers to the selection and classification of candidates for insurance. From a health insurance perspective, there are two extreme positions that can be taken by insurers regarding underwriting. First, assuming that insurers offer insurance in all 50 states, but not elsewhere, insurers can base premiums on national average statistics without regard to individual characteristics. Thus, each individual (or employer) would pay the same health insurance premium regardless of age, gender, geographic location, line of work, smoking habits, genetic disposition, and so on. The premium charged for each individual would be sufficient in the aggregate to cover all expected outlays, plus administrative expenses, and earn a profit for the insurer. In this situation, *cross-subsidies* clearly exist because young, healthy nonsmokers in relatively safe jobs would pay the same premiums as older, sickly smokers in relatively hazardous jobs. Thus, after taking administrative costs out of the insurance premium, healthy individuals would pay premiums that exceed their expected healthcare costs, while the sicker individuals would pay premiums that are less than their expected costs.

At the other extreme, if no information asymmetries existed and perfect information were available, insurers can charge a premium to each subscriber on the basis of that subscriber's expected healthcare costs, as was done in the illustration presented previously. Individuals who are expected to have higher costs would be charged higher premiums, and those with lower expected costs would be charged lower premiums. Of course, neither individuals nor insurers have perfect foresight, so the extreme of charging an insured individual on the basis of his or her expected healthcare costs is not actually attainable. However, insurers can take into account all factors that are proven to affect health status (and hence costs)—such as smoking habits, weight, cholesterol level, and hereditary factors—when fixing insurance rates.

What approach do health insurers take in practice? When health insurance first became popular following World War II, most insurers used *community ratings*. Here, a single set of premiums, or rates, is offered to all members of a community without regard to age, gender, health status, and so on. Thus, rates reflected geographical differences and potentially even ethnic and cultural differences if the community was dominated by a single ethnic or cultural group. However, within the community, rates represented an average of high- and low-risk individuals. However, over time some insurers (particularly commercial insurers) started to offer *experience ratings*, whereby rates are set based on the claims experience of the specific group being insured.

For example, the Boeing Company might contract with a health insurer to insure all of Boeing's employees in the Seattle area. If Boeing's employees—who as a group tends to be younger and more educated—have lower health-care costs than the community in general, then insurers competing for the contract that use experience ratings can offer Boeing lower rates than can competitors that use community ratings. As more and more employers with low-risk employees seek health insurance based on experience ratings, the least costly groups are skimmed from the insurance pool, and those that remain have higher-than-average costs. Because the healthcare costs for those remaining are above the average for the community, insurers serving that population have no choice but to apply experience ratings, so higher premiums can be charged to the remaining groups. The trend, then, has been toward experience ratings and away from community ratings, although community ratings are still used.

Another way that health insurers protect themselves against adverse selection is by including *preexisting conditions* clauses in contracts. A preexisting condition is a physical or mental condition of the insured individual that existed prior to the issuance of the policy. A typical clause states that preexisting conditions are not covered until the policy has been in force for some period of time—say, one or two years. Preexisting conditions present a true problem for the health insurance industry. As we discussed previously, one of the key elements of insurance is randomness—that is, payouts on a policy should be in response to random events. If an individual has a preexisting condition, this key feature of insurance is violated. In regards to the preexisting condition, the insurer no longer bears random risk but rather assumes the role of payer for the treatment of a known condition.

Because of the tendency of insurers to shy away from large predictable claims, Congress passed the *Health Insurance Portability and Accountability Act (HIPAA)* in 1996. Among other things, the HIPAA sets national standards, which can be modified within limits by the states, regarding what provisions can be included in health insurance policies. For example, under a group health policy, coverage to individuals cannot be denied or limited, nor can individuals be required to pay more, because of health status. Although preexisting condition clauses are not banned, there are limits to what counts as a preexisting condition and how long it takes for coverage to begin. Also, time credit for preexisting conditions under one plan can be credited toward the exclusion period in a second plan, provided there is no break in coverage. Furthermore, health insurance cannot be canceled because the policyholder becomes sick, and individuals have the right to purchase individual insurance from the insurer that provided group insurance when they leave a firm. All in all, the provisions of the HIPAA give consumers of health insurance protection against arbitrary actions by insurers when health status changes for the worse.

### Moral Hazard

The fact that insurance is based on the premise that payments are made only for random losses creates the problem of *moral hazard*. The most common illustration of moral hazard in a casualty insurance setting is the owner who deliberately sets a failing business on fire to collect the insurance. Moral hazard is also present in health insurance, but its form typically is not so dramatic—not too many people are willing to voluntarily sustain injury or illness for the purpose of collecting health insurance. However, undoubtedly there are people who purposely use healthcare services that are not medically required. For example, some people might visit a physician or a walk-in clinic for the social value of human companionship rather than to address a medical necessity. Also, some hospital discharges might be delayed for the convenience of the patient rather than for medical purposes. Finally, when the full cost, or most of the cost, is covered by insurance, individuals often are quick to agree to a \$1,000 MRI scan or other high-cost procedure that may not be necessary. If the same test required total out-of-pocket payment, individuals would think twice before agreeing to such an expensive procedure unless the medical necessity was clearly understood. All in all, the fact that “somebody else” is paying the costs leads to a greater consumption of healthcare services than would occur if patients bore the costs.

Even more insidious is the impact of insurance on individual behavior. Individuals are less likely to take preventive actions when the costs of not taking those actions will be borne by insurers. Why worry about getting a flu shot if the monetary costs associated with the treatment are borne by the insurer, or why stop smoking if others will pay for the likely adverse health consequences? Clearly, the very fact that insurance exists causes individuals to forgo preventive actions and embrace unhealthy behaviors, both of which might be approached differently in the absence of insurance.

Insurers generally attempt to protect themselves from moral hazard claims by paying less than the full amount of healthcare costs borne by the insured. By making insured individuals bear some of the cost, there will be less of a tendency to consume unneeded services or engage in unhealthy behaviors. One way of doing this is to require a *deductible*. Medical policies usually contain some dollar amount that must be satisfied before benefits are paid. Although deductibles have some positive effect on the moral hazard problem, their primary purpose is to eliminate the payment of small claims, wherein the administrative cost of processing the claim may be larger than the claim itself. Although there are several types of deductibles, the most common form is the *calendar-year deductible*. Here, the first \$250 (or \$500 or more) of medical expenses incurred each year is paid by the individual insured. Once the deductible is met, the insurer will pay all eligible medical expenses (less any copayments) for the remainder of the year.

The primary weapon that insurers have against the moral hazard problem is the *copayment*, which requires insured individuals to pay a certain percentage of eligible medical expenses—say, 20 percent—in excess of the deductible amount. For example, assume that George Maynard, who has employer-provided medical insurance that pays 80 percent of eligible expenses after the \$100 deductible is satisfied, incurs \$10,000 in medical expenses during the year. The insurer will pay  $0.80 \times (\$10,000 - \$100) = 0.80 \times \$9,900 = \$7,920$ , so George's responsibility is  $\$10,000 - \$7,920 = \$2,080$ .

The purposes of copayments are to reduce premiums and to prevent overutilization of healthcare services. Because insured individuals pay part of the cost, premiums can be reduced. Additionally, by being forced to pay some of the costs, insured individuals will presumably seek fewer and more cost-effective treatments and embrace a healthier lifestyle.

Some health insurance policies contain *stop-loss limits*, also called *out-of-pocket maximums*, whereby the insurer pays all covered costs, including the copayment, after the insured individual pays a certain amount of copayment costs—say, \$2,000. Thus, if George had \$50,000 of covered expenses above the deductible amount, his coinsurance share would be \$10,000 if there were no stop-loss provision. If his policy contained a stop-loss amount of \$2,000, George would only have to pay \$2,000 and his insurer would pay the remaining \$48,000 of costs. Of course, health insurance policies with stop-loss provisions are more costly than those without such features.

Finally, most insurance policies have *policy limits*—for example, \$1 million in total lifetime coverage, or \$1,500 per year for mental health benefits, or \$100 per year for eyeglasses. These limits are designed to control excessive use of certain services and to protect the insurer against catastrophic losses. Of course, a lifetime coverage limit means that subscribers must bear the risk of catastrophic losses.

*Health savings accounts (HSAs)*, which were authorized by Congress in 2003, constitute a new approach to paying for health services. HSAs are accounts that individuals establish with a trustee (custodian) that can only be used to pay for healthcare expenses. Such accounts must be used in conjunction with qualified *high-deductible health plans (HDHPs)*, which in 2006 required a minimum deductible of \$1,050 for individuals and \$2,100 for families. The details of HDHPs, and their costs, vary widely by specific plan. To illustrate, one insurer offers two different HDHP alternatives for individual coverage: Plan A, with a \$1,050 deductible, a 20 percent copay, and a \$5,000 out-of-pocket maximum; and Plan B with a \$2,500 deductible, no copays, and a \$3,300 maximum. Premiums for HDHPs, as well as funding for HSAs, may be paid for by the employer, employee, or both. However, most employers pay some (or all) of the premium but require the employee to fund the HSA.

In 2006, contributions to HSAs, which are deductible for federal income taxes, were limited to \$2,700 for individual coverage and \$5,450 for family coverage. HSAs are sponsored by financial institutions and health in-

urers who pay interest on the accounts. Money in HSAs can be used to pay for any “qualified medical expense,” including those for dental and vision care and over-the-counter drugs. Both interest paid on these accounts and all amounts used to pay for healthcare services are tax free. In addition, the account can be “rolled over” from year to year with no tax consequences until the account is closed, at which time withdrawals are taxable.

HSAs are part of a new trend toward *consumer-driven healthcare*. The idea is that if patients take more responsibility for paying for healthcare services, they will be more responsible consumers, and hence overall costs will be reduced in the long run. Many pundits see this as the wave of the future, and both financial services companies and health insurers have launched HSAs to “help employers reduce health benefit costs while empowering employees to better control healthcare costs today and save for future expenses in retirement.”

1. Briefly, explain the following characteristics of insurance:
  - a. Pooling of losses
  - b. Payment only for random losses
  - c. Risk transfer
  - d. Indemnification
2. What is adverse selection, and how do insurers deal with the problem?
3. What is the moral hazard problem?
4. Explain both the mechanics and rationale of a health savings account (HSA).

## Self-Test Questions

## Generic Reimbursement Methods

Regardless of the payer for a particular healthcare service, only a limited number of payment methods are used to reimburse providers. Payment methods fall into two broad classifications: (1) fee-for-service and (2) capitation. In *fee-for-service* payment methods, of which many variations exist, the greater the amount of services provided, the higher the amount of reimbursement. Under *capitation*, a fixed payment is made to providers for each covered life, regardless of the amount of services provided. In this section, the mechanics of alternative payment methods are first considered. The incentives created for providers under the alternative methods are then discussed. Finally, the risk implications of the alternative reimbursement methods are analyzed.

### Fee-for-Service Methods

The three primary fee-for-service methods are (1) cost based, (2) charge based, and (3) prospective payment.

Under *cost-based reimbursement*, the payer agrees to reimburse the provider for the costs incurred in providing services to the insured population. Reim-

### Cost-Based Reimbursement

bursement is limited to *allowable costs*, usually defined as those costs directly related to the provision of healthcare services. Nevertheless, for all practical purposes, cost-based reimbursement guarantees that a provider's total costs will be covered by payments from payers. Typically, the payer makes *periodic interim payments (PIPs)* to the provider, and a final reconciliation is made after the contract period expires and all costs have been processed through the provider's accounting system. During the early years (1966–1983), Medicare reimbursed providers on the basis of costs incurred.

### Charge-Based Reimbursement

When payers pay *billed charges*, they pay according to the schedule of charge rates established by the provider in its charge description master file, or *charge-master*, which contains the service code and “list price” for all services provided. To a certain extent, this reimbursement system places payers at the mercy of providers in regards to the cost of healthcare services, especially in markets where competition is limited. In the very early days of health insurance, all payers reimbursed providers on the basis of billed charges. Some insurers still reimburse providers according to billed charges, but the trend for payers is toward other, less generous reimbursement methods. As this trend continues, the only payers that will be expected to pay billed charges are self-pay, or private-pay, patients.

Many payers that historically have reimbursed providers on the basis of billed charges now pay by *negotiated*, or *discounted*, charges. This payment method is frequently used by insurers that have established managed care plans such as health maintenance organizations (HMOs) and preferred provider organizations (PPOs). Because HMOs and PPOs, as well as some conventional insurers, have bargaining power because of the large number of patients that they bring to a provider, they can negotiate discounts from billed charges. Such discounts generally range from 20 to 40 percent, or more, of billed charges. Sometimes, *sliding-scale discounts* are used, whereby the amount of discount is tied to the amount of volume generated by the payer—the greater the volume, the higher the discount.

### Prospective Payment

In a *prospective payment system*, the rates paid by payers are determined before the services are provided. Furthermore, payments are not directly related to either reimbursable costs or billed charges. Four common units of payment are included in the category of prospective payment:

1. **Per procedure.** Under *per procedure* reimbursement, a separate payment is made for each procedure performed on a patient. Because of the high administrative costs associated with this method when applied to complex diagnoses, per procedure reimbursement is more commonly used in outpatient than in inpatient settings.
2. **Per diagnosis.** In the *per diagnosis* reimbursement method, the provider is paid a rate that depends on the patient's diagnosis. Diagnoses that require higher resource utilization, and hence are more costly to treat,



have higher reimbursement rates. Medicare pioneered this basis of payment in its *diagnosis-related group (DRG)* system, which it first used for hospital reimbursement in 1983. (Reimbursement on the basis of DRG is discussed in detail in the section on Medicare.)

3. **Per diem (per day).** If reimbursement is based on a *per diem* rate, the provider is paid a fixed amount for each day that service is provided, regardless of the nature of the services. This type of reimbursement is applicable only to inpatient settings. Note that per diem rates can be *stratified*. For example, a hospital may be paid one rate for a medical/surgical day, a higher rate for a critical care unit day, and yet a different rate for an obstetric day. Stratified per diems recognize that providers incur widely different daily costs for providing different types of care.
4. **Global pricing.** Under *global pricing*, payers pay a single prospective payment that covers all services delivered in a single episode, whether the services are rendered by a single or by multiple providers. For example, a global fee may be set for all obstetric services associated with a pregnancy, including all prenatal and postnatal visits as well as the delivery, provided by a single physician. For another example, a global price may be paid for all physician and hospital services associated with a cardiac bypass operation.

### Capitation

Up to this point, all the reimbursement methods presented have been fee-for-service methods—that is, providers are reimbursed on the basis of the amount of services provided. The service may be defined as a visit, a diagnosis, a hospital day, or in some other manner, but the key feature is that the more services that are performed, the greater the reimbursement amount. *Capitation*, although a form of prospective payment, is an entirely different approach to reimbursement and hence deserves to be treated as a separate category. Under capitated reimbursement, the provider is paid a fixed amount per covered life per period (usually a month) regardless of the amount of services provided.

Because the payment is tied only indirectly to the amount of services provided, capitation dramatically changes the financial landscape of healthcare providers and hence has profound implications for financial decision making. In fact, we devote a full chapter (Chapter 17) to capitation and its implications.

### Nonpayment

Before we close this section, we think it worthwhile to address briefly the issue of nonpayment. If a user of healthcare services does not have insurance, then the responsibility for payment of total billed charges falls on the patient or the patient's family. Because people without health insurance tend to be poor, many of them find it difficult, if not impossible, to pay for healthcare



services that can quickly amount to tens of thousands of dollars. Nonpaying patients fall into two categories. First, those who have the capacity, but are unwilling, to pay. The lost revenues attributable to this class of nonpayer are called *bad debt losses*. The second group is made up of patients who are not able to pay. The lost revenues attributable to the second class of nonpayer are called *charity, or indigent, care losses*.

These classifications are important for two reasons. First, the two types of nonpayment are handled differently on the income statement. Second, it is important that not-for-profit providers be able to document their contributions to society, and one of the most important contributions is willingness to treat indigent patients.

### **Provider Incentives**

Providers, like individuals and other businesses, react to the incentives created by the financial environment. For example, individuals can deduct mortgage interest from income for tax purposes, but they cannot deduct interest payments on personal loans. Loan companies have responded by offering home equity loans that are a type of second mortgage. The tax laws assumed that these loans would be used to make home ownership more accessible, but in reality they are generally used for other purposes, including financing vacations, cars, and appliances. In this situation, tax laws created incentives for consumers to have mortgage debt rather than personal debt, and the mortgage loan industry responded accordingly.

In the same vein, it is interesting to briefly examine the incentives that alternative reimbursement methods have on provider behavior. Under cost-based reimbursement, providers are given a “blank check” to be used in acquiring assets and incurring operating costs. If payers reimburse providers for all costs, the incentive is to incur costs. Facilities will be lavish and conveniently located, and staff will be available to ensure that patients are given “deluxe” treatment. Furthermore, as in billed-charges reimbursement, services that may not truly be required will be provided because more services lead to higher costs, which translate to higher revenues.

Under charge-based reimbursement, providers have the incentive to set high chargemaster rates, which leads to high revenues. However, in competitive markets, there will be a constraint on how high providers can go, and insurers with negotiating power will demand discounts. Because billed charges is a fee-for-service type of reimbursement, in which more services result in higher revenue, a strong incentive exists to provide the highest possible amount of services. In essence, providers can increase volume, and hence revenues, by *churning*—creating more visits, ordering more tests, extending inpatient stays, and so on. Although charge-based reimbursement does encourage providers to contain costs, the incentive is weak because typically charges can be more easily increased than costs can be reduced. Note, however, that discounted charge reimbursement places additional pressure

on profitability and hence creates increased incentive for providers to lower costs.

Under prospective payment reimbursement, provider incentives are altered. First, under per procedure reimbursement, the profitability of individual procedures will vary depending on the relationship between the actual costs incurred and the payment for that procedure. Providers, usually physicians, have the incentive to perform procedures that have the highest profit potential. Furthermore, the more procedures the better because each procedure typically generates additional profit. The incentives under per diagnosis reimbursement are similar. Providers, usually hospitals, will seek patients with diagnoses that have the greatest profit potential and discourage (even discontinue) services that have the least profit potential. Furthermore, to the extent that providers have some flexibility in assigning diagnoses to patients, an incentive exists to *upcode* diagnoses from the actual one to another that provides greater reimbursement.

In all prospective payment methods, providers have the incentive to reduce costs because the amount of reimbursement is fixed and independent of the costs actually incurred. When per diem reimbursement is used, particularly with hospitals, providers have an incentive to increase length of stay. Because the early days of a hospitalization are typically more costly to the provider than the later days, the later days are more profitable. However, as mentioned previously, hospitals have the incentive to reduce costs during each day of a patient's stay.

Under global pricing, providers do not have the opportunity to be reimbursed for a series of separate services, which is called *unbundling*. For example, a physician's treatment of a fracture can be bundled, and hence billed as one episode, or it can be unbundled with separate bills submitted for diagnosis, x-rays, setting the fracture, removing the cast, and so on. The rationale for unbundling is usually to provide more detailed records of treatments rendered, but often the result is higher total charges for the parts than would be charged for the entire "package" of services. Also, global pricing, when applied to multiple providers for a single episode of care, forces involved providers (e.g., physicians and a hospital) to jointly offer the most cost-effective treatment. Such a joint view of cost containment may be more effective than each provider separately attempting to minimize its treatment costs because lowering costs in one phase of treatment can increase costs in another.

Finally, capitation reimbursement totally changes the playing field by completely reversing the actions that providers must take to ensure financial success. Under all prospective payment methods, the key to provider success is to work harder, increase utilization, and hence increase profits. Under capitation, the key to profitability is to work smarter and decrease utilization. As with prospective payment, capitated providers have the incentive to reduce costs, but now they also have the incentive to reduce utilization. Thus, only those procedures that are truly medically necessary should be performed,

and treatment should take place in the lowest cost setting that can provide the appropriate quality of care. Furthermore, providers have the incentive to promote health, rather than just treat illness and injury, because a healthier population consumes fewer healthcare services.

### *Financial Risks to Providers*

A key issue facing providers is the impact of various reimbursement methods on financial risk, which is a concept that is explained in detail in Chapters 4, 12, and 17. For now, think of financial risk in terms of the effect that the reimbursement methods have on profit uncertainty—the greater the chances of losing money, the higher the risk. Cost- and charge-based reimbursements are the least risky for providers because payers more or less ensure that costs will be covered and hence profits will be earned. In cost-based systems, costs are automatically covered. In charge-based systems, providers typically can set charges high enough to ensure that costs are covered, although discounts introduce uncertainty into the reimbursement process.

Regardless of the reimbursement method (except cost based), providers bear the cost-of-service risk in that costs can exceed revenues. However, a primary difference among the reimbursement types is the ability of the provider to influence the revenue/cost ratio. If providers set charge rates for each type of service provided, they can most easily ensure that revenues exceed costs. Furthermore, if providers have the power to set rates above those that would exist in a truly competitive market, charge-based reimbursement can result in higher profits than cost-based reimbursement.

Prospective payment adds a second dimension of risk to reimbursement contracts because the bundle of services needed to treat a particular patient may be more extensive than that assumed in the payment amount. However, when the prospective payment is made on a per procedure basis, risk is minimal because each procedure will produce its own revenue. When prospective payment is made on a per diagnosis basis, provider risk is increased. If, on average, patients require more intensive treatments, and for inpatients a longer length of stay (LOS) than assumed in the prospective payment amount, the provider must bear the added costs.

When prospective payment is made on a per diem basis, even when stratified, one daily rate usually covers a large number of diagnoses. Because the nature of the services provided can vary widely, both because of varying diagnoses as well as intensity differences within a single diagnosis, the provider bears the risk that costs associated with the services provided on any day exceed the per diem rate. However, patients with complex diagnoses and greater intensity tend to remain hospitalized longer, and per diem reimbursement does differentiate among different LOSs. Still, the additional days of stay may be insufficient to make up for the increased resources consumed. In addition, providers bear the risk that the payer, through its utilization review process, will constrain LOS and hence increase intensity during the days that a patient

is hospitalized. Thus, under per diem, compression of services and shortened LOS can put significant pressure on providers' profitability.

Under global pricing, a more inclusive set of procedures, or providers, are included in one fixed payment. Clearly, the more services that must be rendered for a single payment or the more providers that have to share a single payment, the more providers are at risk for intensity of services.

Finally, under capitation, providers assume all utilization and actuarial risks along with the risks assumed under the other reimbursement methods. The assumption of utilization risk has traditionally been an insurance function rather than a provider function. In the traditional fee-for-service system, the financial risk of providing healthcare is shared between purchasers and insurers. Hospitals, physicians, and other providers bear negligible risk because they are paid on the basis of the amount of services provided. Insurers bear short-term risk in that payments to providers in any year can exceed the amount of premiums collected. However, poor profitability by insurers in one year usually can be offset by premium increases to purchasers the next year, so the long-term risk of financing the healthcare system is borne by purchasers. Capitation, however, places the burden of short-term utilization risk on providers.

When provider risk under different reimbursement methods is discussed in this descriptive fashion, an easy conclusion to make is that capitation is by far the riskiest to providers, while cost- and charge-based reimbursements are by far the least risky. Although this conclusion is not a bad starting point for analysis, financial risk is a complex subject and its surface has just been scratched. One of the key issues throughout the remainder of this text is financial risk, so readers will see this topic over and over. For now, keep in mind that different payers use different reimbursement methods. Thus, providers can face conflicting incentives and differing risk, depending on the predominant method of reimbursement.

In closing, note that all prospective payment methods involve a transfer of risk from insurers to providers, which increases as the payment unit moves from per procedure to capitation. The added risk does not mean that providers should avoid such reimbursement methods; indeed, refusing to accept contracts with prospective payment provisions would be tantamount to organizational suicide for most providers. However, providers must understand the risks involved in prospective payment arrangements, especially the effect on profitability, and make every effort to negotiate a level of payment that is consistent with the risks incurred.

1. Briefly, describe the following payment methods:
  - a. Cost based
  - b. Charge based and discounted charges
  - c. Per procedure

## Self-Test Questions

- d. Per diagnosis
  - e. Per diem
  - f. Global
  - g. Capitation
2. What is the major difference between fee-for-service reimbursement and capitation?
  3. What provider incentives are created under each of the payment methods previously listed?
  4. Which of these payment methods carry the least risk for providers? The most risk? Explain your answer.

## Major Health Insurers (Third-Party Payers)

Up to this point, we have discussed the basic concept of insurance, some key elements of health insurance, and the general types of reimbursement methodologies. Now, we will provide a brief background of the major health insurers (third-party payers) and, more importantly, we will discuss some of the specific reimbursement methods that they use to pay healthcare providers.

Health insurance originated in Europe in the early 1800s, when mutual benefit societies were formed to reduce the financial burden associated with illness or injury. Today, health insurers fall into two broad categories: (1) private insurers and (2) public programs.

### Self-Test Question

1. What are the two major classifications of health insurers?

### Private Insurers

In the United States, the concept of public, or government, health insurance is relatively new, while private health insurance has been in existence since the turn of the century. In this section, we discuss the major private insurers—Blue Cross and Blue Shield, commercial insurers, and self-insurers.

### Blue Cross and Blue Shield

Blue Cross and Blue Shield organizations trace their roots to the Great Depression, when both hospitals and physicians were concerned about their patients' abilities to pay healthcare bills.

*Blue Cross* originated as a group of separate insurance programs offered by individual hospitals. At the time, many patients were unable to pay their hospital bills, but most individuals, except the poorest, could afford to purchase some type of hospitalization insurance. Thus, the programs initially were designed to benefit hospitals as well as patients. The programs were all similar in structure. Hospitals agreed to provide a certain amount of services to program members who made periodic payments of fixed amounts to the hospitals whether services were used or not. In a short time, these programs

were expanded from single hospital programs to communitywide multihospital plans called *hospital service plans*. The American Hospital Association (AHA) recognized the benefits of such plans to hospitals, so a close relationship was formed between the AHA and the organizations that offered hospital service plans.

In the early years, several states ruled that the sale of hospital services by prepayment did not constitute insurance, so the plans were exempt from regulations that govern the insurance industry. However, it was clear that the legal status of hospital service plans would be subject to future scrutiny unless their status was formalized. So the states, one by one, passed enabling legislation that provided for the founding of not-for-profit hospital service corporations that were exempt both from taxes and from the capital requirements mandated for other insurers. However, state insurance departments had, and continue to have, oversight over most aspects of the plans' operations. The Blue Cross name was officially adopted by most of these plans in 1939.

*Blue Shield* plans developed in a manner similar to that of the Blue Cross plans, except that the providers were physicians, instead of hospitals, and the professional organization was the American Medical Association (AMA), instead of the AHA. As of 2006, there were 38 Blue Cross and Blue Shield member organizations; some offer only one of the two plans, but most offer both plans. Member organizations are independent corporations that operate locally or statewide under license from a single national association that sets standards that must be met to use the Blue Cross and Blue Shield name. Collectively, the "Blues" provide healthcare coverage for over 94 million people in all 50 states, the District of Columbia, and Puerto Rico.

Historically, the individual state and local organizations have been not-for-profit corporations that enjoyed the full benefits accorded to that status, including freedom from taxes. But in 1986, Congress eliminated the Blues' tax exemption on the grounds that they operated "commercial-type" insurance activities. However, the plans were given some special deductions, which resulted in taxes that are generally less than those paid by commercial insurance companies. In spite of the change in tax status, the national association continued to require all Blues to operate entirely as not-for-profit corporations, although they could establish for-profit subsidiaries. In 1994, however, the national association lifted its traditional ban on member plans becoming investor-owned companies.

Since 1994, four Blues' companies have converted to for-profit status, including WellPoint Health Networks, which runs Blue Cross of California. Although the number of for-profit companies is small, they enroll about one-quarter of all Blue Cross patients. Because state laws require the assets of not-for-profit corporations to be used for charitable purposes **in perpetuity**, the conversion of ownership is a relatively complex endeavor. (We discuss the issues involved in conversion in Chapter 16.) To meet this requirement, plans that convert typically set up a charitable foundation to which they contribute

a sum that is, in theory, equal to the value of the assets being converted. However, critics of conversions claim that the amounts contributed fall far short of the actual value of the tax exemptions that the not for profits received during their existence.

In spite of the conversions thus far, it is unlikely that many more Blues will convert to for-profit status because of the legal problems inherent in conversion and because they already have the ability to create for-profit subsidiaries. The main rationale for converting or creating for-profit subsidiaries is having access to investor-supplied equity capital, which many believe is necessary for insurers to be competitive in today's healthcare market.

Because the Blue Cross and Blue Shield corporations operate independently, no one reimbursement method is universal to all of them. However, over the past few years the tendency has been to move away from cost-based and charge-based methods and toward prospective payment systems. For example, some of the Blues use hospital reimbursement methods that are similar to Medicare's prospective payment system based on DRGs, while other Blues use a two-tier system in which a per diem rate is paid for routine hospitalizations and negotiated charge-based rates are paid for nonroutine services.

Virtually all of the Blues now offer managed care plans along with more traditional indemnity insurance, and many plans are contracting exclusively with integrated delivery systems in certain service areas. In these situations, capitation often is the method of payment to providers.

### **Commercial Insurers**

*Commercial health insurance* is issued by life insurance companies, by casualty insurance companies, and by businesses formed exclusively to write health insurance. Commercial insurance companies can be organized either as stock or mutual businesses. *Stock* businesses are shareholder owned and can raise equity capital just like any other for-profit business. Furthermore, the stockholders assume the risks and responsibilities of ownership and management. A *mutual* business has no shareholders; its management is controlled by a board of directors elected by the firm's policyholders. Regardless of the form of ownership, commercial insurance businesses are taxable entities.

Commercial insurers moved strongly into health insurance following World War II. At that time, the United Auto Workers negotiated the first contract with employers, where fringe benefits for employees were a major part of the contract. Like the Blues, the majority of individuals with commercial health insurance are covered under *group policies* with employee groups, professional and other associations, and labor unions. Group health coverage has the following advantages over individual coverage:

- Group coverage has low administrative costs because many individuals are insured under a single contract. This type of coverage lowers the costs associated with sales and administration of the contract. The group



contract holder—say, the employer or labor union—usually pays a part of or the entire premium. Note, though, that employers that have costly employee health programs are usually forced by competitive pressures to offset higher healthcare costs with lower wages or reductions in other fringe benefits. Also, the competitive labor market forces employers to offer competitive aggregate benefits, although the benefit mix may differ.

- Generally, eligibility for a group plan does not depend on the insured individual's health status. The insurer bases its premiums on the overall health status of the group. Note, however, that the premiums paid by groups having a small number of members can be adversely affected by the poor health of one individual.
- In general, an individual's coverage cannot be canceled unless the individual leaves the group or the plan itself is terminated.

Commercial insurers have traditionally reimbursed healthcare providers on the basis of billed charges. However, with the dramatic increase in healthcare costs that has occurred over the past 20 years, the traditional providers of health insurance—employers and unions—have seen their healthcare premiums grow to almost unbelievable amounts. Clearly, this trend cannot continue, so the major purchasers of group health insurance have put pressure on the insurance companies to trim costs. This pressure, in turn, has forced commercial insurers to move toward other reimbursement methods and delivery systems, including managed care plans, that presumably have a better chance at controlling costs than does reimbursement on the basis of billed charges.

The third major form of private insurance is *self-insurance*. One can argue that all individuals who do not have any other form of health insurance are self-insurers, but this is not technically correct. Self-insurers make a conscious decision to bear the risks associated with healthcare costs, and then set aside (or have available) funds to pay future costs as they occur. Individuals, except for the very wealthy, are not good candidates for self-insurance because they face too much uncertainty concerning future healthcare expenses. On the other hand, large groups, especially employers, are good candidates for self-insurance. Indeed, most large groups are self-insured today. For example, employees of the State of Florida are covered by health insurance that is administered by Blue Cross and Blue Shield of Florida, but the actual benefits to plan members are paid by the state. Blue Cross and Blue Shield is paid for administering the plan, but the state bears all risks associated with utilization and cost uncertainty.

### Self-Insurers

Many firms today are even going one step further in their self-insurance programs by totally bypassing third-party payers. For example, Digital Equipment Corporation (now owned by Compaq), a major computer maker, negotiates discounts directly with hospitals and physicians. Others, such as Deere



& Company, a farm implements manufacturer, have set up health services subsidiaries to provide healthcare services to their employees. For the most part, these firms use the same techniques as managed care organizations, but they try to do things better and cheaper themselves by applying the kind of management attention to healthcare that they do to their core businesses.

## Self-Test Questions

1. Briefly, describe some different types of private insurers.
2. What reimbursement methods do private insurers commonly use?

### Public Insurers

The government is a major insurer and direct provider of healthcare services. For example, the government provides healthcare services directly to qualifying individuals through the Department of Veterans Affairs (VA), Department of Defense (DOD), and Public Health Service (PHS) medical facilities. In addition, the government either provides or mandates a variety of insurance programs, such as workers compensation and TRICARE, formerly called CHAMPUS (Civilian Health and Medical Program of the Uniformed Services). However, in this section, we focus on the two major government insurance programs: Medicare and Medicaid.

**Medicare** *Medicare* was established by the federal government in 1966 to provide medical benefits to individuals aged 65 and older. Medicare consists of three separate coverages: (1) *Part A*, which provides hospital and some skilled nursing home coverage; (2) *Part B*, which covers physician services, ambulatory surgical services, outpatient services, and certain other miscellaneous services; and (3) *Part D*, which covers prescription drugs. Part A coverage is free to all individuals eligible for Social Security benefits. Individuals who are not eligible for Social Security benefits can obtain Part A medical benefits by paying premiums of \$393 per month (for 2006). Part B is optional to all individuals who have Part A coverage, and it requires a monthly premium of \$88.50 (for 2006). About 97 percent of Part A participants purchase Part B coverage. Part D, which began on January 1, 2006, offers prescription drug coverage through plans offered by over 70 private companies. Each plan may offer somewhat different coverage, so the cost of Part D coverage varies widely. Medicare expenditures are expected to total over 400 billion in 2006, including the new prescription drug benefit.

**Administration of Medicare** The Medicare program falls under the *Department of Health and Human Services (DHHS)*, which creates the specific rules of the program on the basis of enabling legislation. Medicare is administered by an agency under DHHS called the *Centers for Medicare and Medicaid Services (CMS)*. CMS has eight regional offices that oversee the Medicare program and ensure that regulations are followed.

Medicare payments to healthcare providers are not made directly by CMS, but rather by contractors at the state or local level called *intermediaries* for Part A payments and *carriers* for Part B payments. Intermediaries and carriers are typically either Blue Cross associations or commercial insurers. For example, Blue Cross and Blue Shield of Florida is the CMS intermediary for Florida, while Nationwide Mutual Insurance Company is the carrier for Ohio.

From its inception in 1966 to 1983, hospital payments were based on a retrospective system that reimbursed hospitals for all reasonable costs. In general, reasonable costs were defined as (1) operating costs for labor and materials; (2) capital costs for depreciation, interest expense, lease payments, and return on equity for investor-owned hospitals; and (3) costs associated with medical education programs. In effect, Medicare provided hospitals with blank checks that they could use to provide “gold-plated” services to Medicare beneficiaries.

For many providers, Medicare became the “goose that laid the golden egg.” Per beneficiary Medicare spending rose from \$648 in 1967 to over \$6,000 (estimated) in 2006. Unfortunately, in its early years, Medicare provided no incentives whatever for providers to offer cost-effective services. If anything, Medicare encouraged overbuilding, “gold plating,” excessive services, and overly long hospital stays. However, Medicare did lead to many positive results, although at a high price. First, Medicare fueled a hospital boom, which put a hospital nearby for most of the population. In addition, Medicare provided most elderly with access to healthcare services that only a small proportion had had before. Increased access is at least a partial reason why life expectancy has increased dramatically for the elderly—in 1966, a 65-year old could expect to live to about 70; today, he or she can expect to live to about 83. Finally, Medicare was a major factor in the racial desegregation of hospitals because all providers had to desegregate to qualify for federal dollars.

On October 1, 1983, Congress established a new reimbursement system for Medicare Part A providers, called the *inpatient prospective payment system* (*inpatient PPS* or *IPPS*), in an attempt to curb spending. The intent of the IPPS was (1) to reduce the growth in Medicare outlays, (2) to provide cost-containment incentives to providers, and yet (3) to maintain the quality of care achieved under the old cost-based system. The basic concept of the IPPS is to reimburse hospitals with a fixed sum for each admission based on the patient’s diagnosis. If the hospital is able to provide the services for less than the fixed reimbursement amount, it can keep the difference. Conversely, if a Medicare patient costs the hospital more than the reimbursement amount, the hospital must bear the loss. Note that all hospitals are not paid under the IPPS system; for example, some specialty hospitals are still reimbursed on a

**A Short History  
of Part A  
Reimbursement**

**Foundations of  
the Inpatient  
Prospective  
Payment System**

retrospective cost basis. However, the vast majority of hospitals are paid under the system, so that will be the focus of our Medicare Part A reimbursement discussion.

The IPPS was phased in over several years, and the initial fixed reimbursement rates were based on hospital costs at that time. Thus, upon implementation of IPPS, hospitals were able to embark on cost-cutting measures that allowed them to deliver services to Medicare beneficiaries for less than the fixed payments, and many hospitals were able to generate large profits. For example, operating margins on Medicare patients during the first two years of IPPS averaged nearly 14 percent.<sup>2</sup>

Unfortunately for hospitals, since the system's inception, IPPS payments, on average, have not kept pace with hospital costs. In addition, once the most obvious cost cutting took place, it was difficult for hospitals to generate additional efficiency gains. Furthermore, the Balanced Budget Act of 1997 (BBA) placed significant restrictions on the growth in Medicare spending during the 1998–2002 period. Hospitals, through aggressive lobbying efforts, have been able to somewhat dilute the impact of the BBA. For example, the Balanced Budget Relief Act of 1999 (BBRA) restored some of the reductions in spending growth imposed by the BBA, but recent hospital payment growth rates still have been less than the growth in operating costs. The net result has been that the average hospital's operating margin on Medicare patients has fallen to the point that some hospitals are now losing money on Medicare inpatients.

The IPPS has had a direct influence on hospital's lengths of stay. Prior to IPPS, according to the AHA, the average hospital LOS for Medicare patients was 10.3 days; now it is about 6.5 days. However, no evidence has been found to support the contention that Medicare patients are being discharged "quicker and sicker." Quicker yes, but probably not, at least on average, sicker. While the relationship between length of stay and quality is uncertain, shorter stays do often mean that Medicare patients or their families will have to worry sooner about finding posthospital services when they are needed.

The IPPS also has had a profound impact on the provision of outpatient care. Because outpatient care is paid by Medicare Part B, it continued to be reimbursed on a cost basis after IPPS was instituted for inpatient care. This reimbursement provided an incentive for hospitals to shift healthcare services from inpatient to outpatient. For example, while the inpatient activity at general acute care hospitals has fallen over the past decade, the number of outpatient visits has about doubled. Furthermore, Medicare spending for outpatient services has been growing three times as fast as spending for inpatient services. In effect, some of the cost savings expected from the IPPS were lost because hospitals shifted inpatient services to outpatient services. As we describe in a later section, Medicare has implemented a prospective payment system for outpatient services to create a similar reimbursement system for both inpatient and outpatient care.

Under the IPPS, a single payment for each patient covers the cost of routine inpatient care, special care, and ancillary services. The amount of the prospective payment is based on the patient’s DRG as assigned at discharge. (Originally, the attending physician had to attest, in writing, to the principal diagnosis, secondary diagnosis, and procedures performed. However, the requirement for physician certification was dropped in 1996.) The Medicare DRG payment generally covers all costs except medical education costs and bad debt costs, which we will discuss later along with capital costs.

*Payments Under the Inpatient Prospective Payment System<sup>3</sup>*

The starting point in determining the amount of reimbursement is the DRG itself. Potential patient diagnoses have been divided into 25 *major diagnostic categories (MDCs)*, which roughly correspond to the major organ systems. Within the 25 MDCs, there are 579 DRGs.<sup>4</sup> To illustrate the nature of DRGs, consider Table 2.1, which contains illustrative data for ten of the most frequently used DRGs.

The individual DRG *relative weights* represent the average resources consumed in treating that particular diagnosis relative to resources consumed in treating the average diagnosis. Thus, the resources, and hence costs, associated with DRG 209—hip and femur procedure (joint replacement)—are over 1.9 times as much as the resources associated with the average diagnosis, while the resources associated with DRG 140—angina pectoris—are only 75 percent of the average diagnosis. To account for changes in resource consumption, treatment patterns, and technology, the DRG weights are *recalibrated*, or updated, annually.

The Medicare *case mix index* is a useful tool for judging the types of diagnoses that are being treated at a particular hospital. The index represents

<i>DRG Name</i>	<i>DRG Number</i>	<i>MDC Number</i>	<i>Relative Weight</i>	<i>Average Length of Stay</i>
Intracranial hemorrhage	14	1	1.2456	4.5 days
Simple pneumonia, age > 17	89	4	1.0320	4.7
Bronchitis and asthma with complications, age > 17	96	4	0.7303	3.6
Heart failure and shock	127	5	1.0345	4.1
Cardiac arrhythmia with complications	138	5	0.8287	3.0
Angina pectoris	140	5	0.7521	2.7
Esophagitis, age > 17	182	1	0.8413	3.4
Hip and femur procedure	209	8	1.9059	6.1
Nutritional and metabolic disorders with complications, age > 17	296	10	0.8187	3.7
Psychoses	430	19	0.6483	5.8

**TABLE 2.1**  
Illustrative Data for Ten Frequently Used DRGs

Source: CMS, 2006.

the average DRG weight for all Medicare patients treated in a specific period. Of course, the average DRG weight for an average hospital is 1.0. To illustrate the concept, consider that the recent case-mix index for South Forest Medical Center in Fort Lauderdale was 1.775, while that of Ponce De Leon Memorial Hospital in Arcadia, Florida, was 0.840. South Forest is treating much more complex cases that require greater services and longer LOS than is Ponce De Leon.

CMS classifies hospitals into one of two categories based on its area wage-rate index. Each year, CMS publishes standardized national *labor-* and *nonlabor-related* costs per discharge for the two wage-rate categories as illustrated in Table 2.2.

The IPPS rate computation is relatively simple given the standardized labor and nonlabor amounts, the local area wage index, and the DRG relative weight. To illustrate, consider Table 2.3, which displays the Medicare reimbursement computation for DRG 127—heart failure and shock—for a hospital located in Miami, Florida, which has an area wage rate greater than 1.000. The appropriate national standard labor amount, \$3,298, is first adjusted by the local *area wage index*, which is published periodically by CMS and reflects relative labor costs across the United States. This product, \$3,275, which is the labor amount adjusted for area wage rates, is then added to the national nonlabor amount, \$1,434. The result is the adjusted hospital rate, \$4,809, which is the base rate applied to all diagnoses. Finally, the adjusted hospital rate is multiplied by the DRG relative weight to obtain the reimbursement amount. In our illustration, the DRG relative weight is 1.0345, which produces a DRG payment of \$4,975 for a patient discharged from a Miami hospital with a diagnosis of heart failure and shock.

The IPPS payment is based on the costs associated with an average patient for each diagnosis. Of course, for any given DRG in any given hospital, some patients will incur costs that are greater than average, while some will be less costly than average. If the patients select hospitals randomly—that is, if all of the sicker patients in a given DRG do not go to a particular hospital—and if a large number of patients are treated by the hospital in each DRG, then the high-cost and low-cost patients will offset one another and the hospital will experience average costs for each DRG. Of course, this does not always happen.

Reimbursement on an arithmetic mean, or average, cost basis, works well if the distribution of patient costs within each DRG is symmetrical, but the distribution is actually skewed to the right—patients with a “mild” case of heart failure and shock may incur a cost of half of the average amount, but patients with a “severe” case may incur a cost of five times the average amount.

Most hospitals paid under IPPS are reimbursed using the national rates as described above; however, some hospitals are subject to additional

Area Wage Rate	Labor Related	Nonlabor Related
Greater than 1.000	\$3,298	\$1,434
1.000 or less	2,934	1,798

Source: CMS, 2006.

**TABLE 2.2**  
Illustrative  
National  
Average  
Standardized  
Amounts

Area wage rate	Greater than 1.000
Area wage index for Miami	1.0233
DRG description	127 (Heart failure and shock)
DRG relative weight	1.0345 (From Table 2.1)
Labor amount	\$3,298 (From Table 2.2)
Multiplied by area wage index	× <u>1.0233</u>
Adjusted labor amount	\$3,375
Plus nonlabor amount	+ <u>1,434</u> (From Table 2.2)
Adjusted hospital rate	\$4,809
Multiplied by DRG relative weight	× <u>1.0345</u>
Hospital reimbursement for DRG 127	<u>\$4,975</u>

**TABLE 2.3**  
Sample Medicare  
DRG Payment

adjustments that effectively increase the reimbursement rates above those shown in Table 2.2. For example, to provide some cushion for the high costs associated with severely ill patients within each diagnosis, the IPPS includes a provision for *outlier payments*. Outliers are classified into two categories: (1) *LOS outliers* and (2) *cost outliers*. Medicare will make additional payments when a patient’s LOS or cost exceeds the established LOS or cost cutoff points.

Also, there are additional payments for hospitals that have a medical education role as well as payments for Medicare bad-debt losses that occur when patients do not make their copayments. There are several other types of Medicare payments, such as payments for hospitals that have a disproportionate share of poor Medicare patients who are typically in ill health and hence cost more to treat than average Medicare patients. However, we will leave additional details on IPPS reimbursement to other readings.

Finally, note that CMS plans to change the IPPS to a new system that would better reflect patient acuity, and hence hospitals’ true costs of providing care. One possible approach would be to use *all-patient refined*, or *APR*, DRGs, which are designed to more fully capture the differences in severity of illness. To illustrate, the APR DRG system designed by one vendor

uses 1,256 APR DRGs. Clearly, such a system would improve the correlation between DRGs and actual costs, but it would also increase the complexity of the IPSS.

**An Overview of  
the Hospital  
Outpatient  
Prospective  
Payment System  
(OPPS)**

As we discussed earlier, the transition to a fixed payment system for inpatient care, while continuing to reimburse outpatient services on the basis of costs, created an incentive to increase the amount of outpatient services offered. Although this trend in general is not a bad one, outpatient services offered by hospitals often have higher costs than the same services offered in stand-alone settings. Thus, Medicare's long-run intent was to create a prospective payment system for hospital outpatient services similar to that for inpatient services. The intent was realized on August 1, 2000.

Instead of using DRGs as the basis for payment, hospital outpatient service reimbursement is based on ambulatory payment classifications (APCs). The system consists of about 350 APCs that specify surgical and nonsurgical procedures, visits to clinics and emergency departments, and ancillary services. The payment calculation is very similar to that for DRGs. In essence, each APC has a standard national payment rate (dollar amount) and national Medicare program percentage, which defines the amount paid by Medicare. The difference between the national payment rate and the amount paid by Medicare is the copayment amount. In the payment calculation, the payment is further divided into a labor-related component, which is 60 percent of the national payment rate, and a nonlabor component, which is the remaining 40 percent. The labor component is then adjusted by the specific hospital's IPSS inpatient wage index. The end result is a total payment for the APC broken down into the amount paid by Medicare and the amount paid by the patient.

The actual calculation is not complex, but there are considerable complications within the OPSS that must account for many complexities, such as multiple procedures conducted on a single patient, which is a common occurrence in outpatient settings. The system will undoubtedly be modified as problems are encountered during implementation. Still, the Medicare prospective payment system for hospital outpatient services is here to stay.

**Medicare  
Reimbursement  
for Nursing  
Homes and Home  
Health Care**

The BBA mandated that both skilled nursing facility (SNF) care and home health care provided to Medicare patients be reimbursed on a prospective payment basis. While the prospective payment methods were being developed, Medicare payments to these providers were made under an interim system, which resulted in reimbursement amounts that were significantly less than under the old systems. Because, as we discuss later, state Medicaid plans often use the same methodologies as Medicare, the new systems have had a very detrimental effect on the profitability of both long-term care facilities and home health businesses. Many for-profit providers in these industries lost huge amounts of market capitalization when their stock prices plummeted.



Even worse, many providers, both for profit and not for profit, were forced into bankruptcy and closure. Of course, the industry trade organizations are lobbying hard for increased reimbursement rates, but there is no doubt that a lot of damage has been done.

Through 1991, Part B reimbursement to physicians and medical equipment suppliers was based on the concept of *reasonable charges*. In essence, Medicare defined a reasonable charge as the lowest of (1) the actual charge for the service performed, (2) the physician's customary charge, or (3) the prevailing charge for that service in the community. Medicare then paid providers 80 percent of the reasonable charge after the Medicare patient had satisfied his or her deductible amount. The patient was responsible for the 20 percent copayment.

### Part B Reimbursement

However, Medicare changed its physician payment system beginning in 1992 to a *resource-based relative value system (RBRVS)*. Under RBRVS, reimbursement is based on three resource components: (1) physician work, (2) practice expenses, and (3) malpractice insurance. Each of about 7,500 healthcare common procedure codes have assigned relative value units for the three resource components, which are summed to get the total number of units per code. The total units for each code are multiplied by a conversion factor that equals the dollar value of one unit, then adjusted by cost indexes that reflect geographical differences in costs, to get the dollar reimbursement amount.

When the RBRVS payment system was first put into place, it appeared to have had two primary goals: (1) to control Medicare costs for physician services and (2) to close the spread between specialist and primary care compensation by cutting Medicare payments for surgical and diagnostic procedures and increasing payments for office visits. The results, since 1992, indicate that the switch to the RBRVS has been more successful in controlling overall costs than in increasing the relative incomes of primary care physicians. Still, the gap has closed somewhat, and it appears that the increased financial incentive for primary care physicians is causing an increasing proportion of medical school graduates to choose primary care as a career.

An integral part of the Medicare reimbursement system is the *Quality Review Organization (QRO)*. QROs are independent organizations contracted by CMS at the state level to monitor the quality of care, and the resulting reimbursement, provided by hospitals and other providers that treat Medicare patients. For example, the QRO for New York, IPRO, is a not-for-profit corporation that does Medicare review for CMS as well as for New York and several other states.

### Quality Review Organizations

Over time, the role of QROs has evolved, with increasing emphasis on quality improvement and less emphasis on reimbursement. In addition, many



QROs provide contract services to providers other than hospitals and in areas other than Medicare.

**Medicare  
Payment  
Advisory  
Commission**

The *Medicare Payment Advisory Commission (MedPAC)* is an independent organization that advises Congress on issues that affect Medicare. MedPAC was established by federal law in 1997 by the merger of two formerly separate commissions—the Prospective Payment Assessment Commission (ProPAC) and the Physician Payment Review Commission (PPRC). MedPAC has 17 members with a wide range of expertise in the financing and delivery of health services. The primary work of the Commission is to prepare two reports annually—(1) one that focuses on payment policies, including specific reimbursement amounts, and (2) one that addresses other issues. Because MedPAC is the principal “independent” advisor to Congress on Medicare payment issues, its influence over the program is significant.

**Medicaid**

*Medicaid* was begun in 1966 as a modest program to be jointly funded and run by the states and the federal government to provide a medical safety net for low-income mothers and children and for elderly, blind, and disabled individuals who receive benefits from the Supplemental Security Income program. Congress mandated that Medicaid cover hospital and physician care, but states were encouraged to expand on the basic package of benefits by either increasing the range of benefits or extending the program to the near poor through optional eligibility. A mandatory nursing home benefit was added in 1972.

States with large tax bases were quick to expand coverage to many of the optional groups, while states with limited abilities to raise funds for Medicaid were forced to construct limited programs. In 2006, total Medicaid spending, including both federal and state expenditures, was expected to total \$320 billion. Of these total expenditures, the federal government picks up about 58 percent of the tab and the states pay for the remainder.

Because Medicaid is administered by the states, each state establishes its own reimbursement system for providers. Although historically Medicaid has reimbursed providers on a cost basis, more and more states are moving to per diem and fixed-fee prospective rates similar to those instituted by Medicare. As Medicaid expenditures continue to rise at alarming rates, policymakers are struggling to find cost-effective ways to improve the program’s access, quality, and reimbursement systems.

Hospitals recently have been very vocal in their claims that Medicaid reimbursement does not cover the costs of service, and some have even sued their state governments for increased payments on the grounds that Medicaid laws call for “fair market” rate reimbursement. Physicians historically have also fared badly under Medicaid because states have tried to cut Medicaid costs by freezing physicians’ fees. Citing excess paperwork, high risks, and low fees, many physicians, particularly obstetricians and pediatricians, have either quit taking Medicaid patients or are limiting the numbers served.

1. Briefly, describe the origins and purpose of Medicare.
2. What is the inpatient prospective payment system (IPPS), and how does it work?
3. What is the outpatient prospective payment system (OPPS), and how does it work?
4. How are physicians reimbursed for providing services to Medicare patients?
5. What are Quality Review Organizations (QROs)?
6. What does MedPAC stand for, and what is its purpose?
7. What is Medicaid, and how is it administered?

## Self-Test Questions

### *Managed Care Plan Reimbursement Methods*

Managed care plans use all of the reimbursement techniques used by third-party payers described in this chapter plus capitation. In addition, managed care plans often create financial incentives in their reimbursement systems that encourage minimizing the amount of services provided. Because of the complexities of such reimbursement, and the fact that it completely changes provider incentives, we devote an entire chapter to the topic (see Chapter 17).

1. What reimbursement methodology is unique to managed care plans?

## Self-Test Question

### Other Issues

Two other issues that relate to reimbursement and the third-party-payer system merit discussion: (1) cost shifting and (2) case mix management.

### *Cost Shifting*

Providers of most services, from auto repair shops to fast-food restaurants to window repair businesses, charge all customers the same rate for similar services. Furthermore, the rates charged are set by supply-and-demand conditions in a competitive marketplace. However, in the provision of healthcare services, there is typically a wide range of reimbursement amounts for a single treatment protocol. For example, assume a hospital treats six different patients for heart failure and shock (DRG 127) in a single week. Table 2.4 contains a hypothetical reimbursement pattern for those six patients.

Reimbursement for this single DRG ranges from a high of \$6,575 for private-pay, or self-pay, patients to a low of \$0 for indigent patients. Assuming one patient from each payer (an even payer mix), the hospital is reimbursed \$4,331, on average, which is only 3.1 percent above the \$4,200 average cost of treatment. Thus, a hospital with this payer mix is barely breaking even on this DRG. Now, assume that this hospital's payer mix changes so that it now

**TABLE 2.4**

Typical  
Reimbursement  
Pattern

<i>Payer</i>	<i>Reimbursement Method</i>	<i>Reimbursement Amount</i>
Private pay	Billed charges	\$ 6,575
Commercial insurance	Billed charges less 10%	5,920
HMO/PPO	Billed charges less 20%	5,260
Medicare	Prospective payment	4,451
Medicaid	Cost less 10%	3,780 <sup>a</sup>
Indigent patient	No payment	0
Total reimbursement		<u>\$25,986</u>
Average reimbursement		<u>\$ 4,331</u>

<sup>a</sup>Assumes \$4,200 cost of treatment.

has one more Medicare patient, and it loses its commercial insurance patient: its average reimbursement for this DRG now is only \$4,086, which is \$114 below costs.

Clearly, the hospital cannot allow this situation to persist, so it engages in *cost shifting*—that is, it increases its billed charges applicable to this DRG so that private-pay, commercially insured, and HMO/PPO patients pay even more than is indicated in Table 2.4. Thus, costs associated with patients whose reimbursement does not cover those costs are shifted to other payers who, at least temporarily, are willing to absorb, or pass on, the higher billings.

Cost shifting has been the remedy that many healthcare providers have used to maintain profitability in the face of higher indigent care loads and less-generous government reimbursement amounts. However, as the burden of cost shifting falls more and more heavily on just a few classes of payers, it has become more and more difficult to continue the practice. As private-pay rates increase and insurance rates increase for group health insurance, especially for medium and small businesses, these parties are finding it very difficult, if not impossible, to carry the burden of payers that are paying less than costs. Indeed, cost shifting has contributed to the movement to managed care plans, which in turn have adopted reimbursement methodologies, such as discounted fee-for-service and capitation, that make further cost shifting difficult if not impossible.

### **Case Mix Management**

In addition to cost shifting, which is not sustainable in the long run, providers have been using *case mix management* to try to control costs and enhance profitability. Case mix management can be exercised at two levels. First, at the lowest level, it is used to lower the costs associated with a particular diagnosis by changing the mix of procedures applied to the diagnosis.<sup>5</sup> The provider—say, a hospital—examines the costs associated with treating a large number of

patients with the same diagnosis. Typically, these costs will vary substantially on the basis of severity of illness and the particular treatments prescribed by attending physicians.

Although a complicated and challenging job, it is possible in many situations to identify lower-cost treatment protocols that result in outcomes that are just as good as those from higher-cost protocols. When these are identified, hospital managers and physicians can work together to adopt the lower-cost treatment patterns. Although this might lower revenues from third-party payers that continue to reimburse on a cost basis, more and more payers are moving to prospective payment or capitation, so lower costs translate directly into higher profits.

The second type of case mix management involves changing the provider's overall patient mix by lowering the number of patients with diagnoses that typically result in losses and increasing the number with diagnoses that are highly profitable. For example, many services associated with heart disease have been, and continue to be, highly profitable. Thus, many hospitals have been very aggressive in their advertising campaigns to promote themselves as “your cardiac care center” or “leaders in the fight against heart disease.” Conversely, hospitals are not promoting, and even attempt to discontinue, those services that are money losers. By doing so, hospitals are attempting to increase the percentage of high-profit treatments and decrease the percentage of treatments that result in losses.

1. What is cost shifting?
2. Will providers be able to continue to cost shift in the future?
3. What is case mix management?

## Self-Test Questions

### Key Concepts

This chapter presented information on the insurance function, the third-party-payer system, and the reimbursement methodologies used by payers. Here are its key concepts:

- Health insurance is widely used in the United States because individuals are *risk averse* and insurance firms can take advantage of the *law of large numbers*.
- Insurance is based on four key characteristics: (1) *pooling of losses*, (2) *payment for random losses*, (3) *risk transfer*, and (4) *indemnification*.
- *Adverse selection* occurs when those individuals most likely to have claims purchase insurance, while those least likely to have claims do not.
- *Moral hazard* occurs when an insured individual purposely sustains a loss, as opposed to a random loss. In a health insurance setting, moral

hazard is more subtle, producing such behaviors as seeking more services than needed and engaging in unhealthful behavior because the costs of the potential consequences are borne by the insurer.

- When payers pay *billed charges*, they pay according to the schedule of charge rates established by the provider.
- *Negotiated charges*, which are *discounted* from billed charges, are often used by insurers in conjunction with managed care plans such as HMOs and PPOs.
- Under a *retrospective cost* system, the payer agrees to pay the provider certain allowable costs that are incurred in providing services to the payer's enrollees.
- In a *prospective payment system*, the rates paid by payers are determined in advance and are not tied directly to either reimbursable costs or billed charges. Typically, prospective payments are made on the basis of the following service definitions: (1) *per procedure*, (2) *per diagnosis*, (3) *per diem* (per day), or (4) *global pricing*.
- The major private insurers are *Blue Cross and Blue Shield*, *commercial insurers*, and *self-insurers*.
- The government is a major insurer and direct provider of healthcare services. The two major forms of government health insurance are *Medicare* and *Medicaid*.
- In 1983, the federal government adopted the *inpatient prospective payment system (IPPS)* for Medicare hospital inpatient reimbursement. Under IPPS, the amount of the payment is fixed by the patient's *diagnosis-related group (DRG)*.
- To provide some cushion for the high costs associated with severely ill patients within each diagnosis, the IPPS includes a provision for *outlier payments*.
- In addition, hospitals receive payments for other costs, such as those related to medical education and bad-debt losses.
- In 2000, Medicare reimbursement for hospital-based outpatient care was changed from a cost-based system to the *outpatient prospective payment system (OPPS)*. The payment calculation is similar in nature to that for inpatients. Also, Medicare recently created prospective payment systems for both nursing home and home health care services that are much less generous than the previous cost-based systems.
- Physicians are reimbursed by Medicare using the *resource-based relative value system (RBRVS)*. Under RBRVS, reimbursement is based on three resource components: (1) *physician work*, (2) *practice expenses*, and (3) *malpractice insurance*. Each of these components is given a weighting for each of some 7,500 procedures. The weightings are summed and multiplied by a dollar conversion factor to determine the payment amount.

- *Quality Review Organizations (QROs)* are independent organizations contracted by CMS at the state level to monitor the quality of care, and the resulting reimbursement, provided by hospitals and other healthcare providers that treat Medicare patients.
- The *Medicare Payment Advisory Commission (MedPAC)* is an independent body that advises Congress on Medicare matters, including specific reimbursement amounts.
- *Cost shifting* results when a provider increases its billed charges to one set of payers to compensate for insufficient reimbursement from another set of payers.
- Providers employ *case mix management* to try to control costs and enhance profitability. First, case mix management is used to lower the costs associated with a particular diagnosis by changing the mix of procedures applied to the diagnosis. Second, case mix management involves changing the diagnosis mix by lowering the number of patients with diagnoses that typically result in losses and increasing the number with diagnoses that are highly profitable.

The information in this chapter plays a vital role in financial decision making within health services organizations. Thus, it will be used over and over in future chapters.

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## Selected Websites

There are a multitude of websites that pertain to this chapter:

- For an extensive source of information on the Medicare program, including information for both patients and providers, see the Centers for Medicare and Medicaid Services (CMS) website at [www.cms.gov](http://www.cms.gov).
- The Blue Cross and Blue Shield national organization website contains a great deal of information on their organization and the licensed health plans; see [www.bluecares.com](http://www.bluecares.com).
- The health insurance industry provides generic information on health insurance on its website; see [www.ahip.org](http://www.ahip.org).
- For more information on Quality Review Organizations (QROs), see the website for the New York IPRO at [www.ipro.org](http://www.ipro.org).
- To learn more about the Medicare Payment Advisory Commission (MedPAC) as well as see some of the reports that they have prepared for Congress, see [www.medpac.gov](http://www.medpac.gov).

## Notes

1. For more information on the basics of insurance, see one of the many excellent insurance textbooks. For example, George E. Rejda, *Principles of Risk Management and Insurance* (Glenview, IL: Addison-Wesley, 2003), or Emmett J. Vaughan and Therese M. Vaughan, *Fundamentals of Risk and Insurance* (New York: Wiley, 2003).
2. An operating margin of 14 percent means that for each dollar of Medicare revenue, operating costs amounted to 86 cents, so the hospital made a 14-cent operating profit. In most industries, operating margins run less than 10 percent, so most managers would be quite happy with a 14 percent margin.
3. Our purpose here is not to make you an expert in Medicare's IPPS. Indeed, most hospitals, other than the smallest, have one or more specialists on the financial staff whose sole responsibility is to keep track of changes in Medicare reimbursement practices. However, some type of DRG-based prospective payment system is being used by many payers with many different types of providers, so some knowledge of the system is necessary for all healthcare managers.
4. The number of DRGs in Medicare's IPPS changes frequently as diagnoses are refined. Originally, there were only 383 DRGs.
5. For a more detailed discussion of case mix management at the treatment level, see Dalton A. Tong and Patricia L. Jones, "Physicians, Financial Managers Join Forces to Control Costs," *Healthcare Financial Management*, January 1990, 21–30.







# Basic Financial Management Concepts

Before we discuss the details of the financial management of healthcare organizations, it is essential that you gain some fundamental knowledge of two very important basic topics.

Chapter 3 focuses on *time value analysis*. Most financial management decisions involve future dollar amounts. For example, when a physician group practice uses debt financing, it is obligated to make a series of future (principal and interest) payments to the lender. Or, when a hospital builds an outpatient surgery center, it expects the investment to provide a series of future cash flows when it is “up and running.” To estimate the financial impact of these transactions, future dollar amounts must be valued. The process of doing this is called time value analysis, and Chapter 3 provides the concepts necessary to perform this analysis.

Chapter 4 discusses *financial risk* and *required return*. Virtually all financial decisions involve risk. To illustrate, there is the risk that the physician group practice that obtained debt financing will not be able to make the required payments. Or, there is the risk that the cash flows expected from the hospital’s new outpatient surgery center will be less than those forecasted when the center was built. Situations like this involve financial risk, and to make good financial decisions, managers must be able to define and measure such risk. Furthermore, risk must be translated into required rates of return. For example, to be financially attractive, the new outpatient surgery center must provide an expected rate of return that is sufficient to compensate the hospital for the riskiness of its investment. Chapter 4 provides the tools required to understand financial risk and how it is translated into required return.



## TIME VALUE ANALYSIS

### Learning Objectives

After studying this chapter, readers should be able to:

- Explain why time value analysis is so important to healthcare financial management.
- Find the present and future values for lump sums, annuities, and uneven cash flow streams.
- Explain and apply the opportunity cost principle.
- Measure the return on an investment.
- Create an amortization table.
- Describe and apply stated, periodic, and effective annual interest rates.

### Introduction

The financial value of any asset, whether a *financial asset*, such as a stock or a bond, or a *real asset*, such as a piece of diagnostic equipment or an ambulatory surgery center, is based on future cash flows. However, a dollar to be received in the future is worth less than a current dollar because a dollar in hand today can be invested, can earn interest, and hence can be worth more than one dollar in the future. Even if no investment opportunities existed, a dollar in hand would still be worth more than a dollar to be received in the future because a dollar today can be used for immediate consumption, whereas a future dollar cannot. Because current dollars are worth more than future dollars, valuation analyses must account for cash flow timing differences.

The process of assigning appropriate values to cash flows that occur at different points in time is called *time value analysis*. However, the application of time value analysis to valuation situations is often called *discounted cash flow analysis* because, as you will see later in this chapter, finding present values is called *discounting*. Time value analysis is an important part of many healthcare financial management decisions because many financial analyses involve the valuation of future cash flows. In fact, of all the financial analysis techniques discussed in this text, none is more important than time value analysis. The concepts presented in this chapter are the cornerstones of financial analysis, so a thorough understanding of these concepts is essential to good financial decision making.

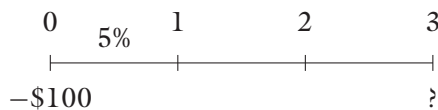
## Time Lines

One important tool used in time value analysis is the *time line*. Time lines make it easier to visualize when the cash flows in a particular analysis occur. To illustrate the time-line concept, consider the following five-period time line:



Time 0 is any starting point; Time 1 is one period from the starting point, or the end of Period 1; Time 2 is two periods from the starting point, or the end of Period 2; and so on. Thus, the numbers on top of the tick marks represent ends of periods. Often, the periods are years, but other time intervals—such as quarters, months, or days—are also used when needed to fit the timing of the cash flows being evaluated. If the time periods are years, the interval from 0 to 1 would be Year 1, and the tick mark labeled 1 would represent both the end of Year 1 and the beginning of Year 2. In many time value analyses, Time 0 (the starting point) is considered to be today, although the term “today” usually does not literally mean today’s date.

Cash flows are shown on a time line directly below the tick marks, at the point in time when they are expected to occur. The interest rate that is relevant to the analysis is sometimes shown directly above the time line in the first period. (In rare cases, it may be appropriate to apply more than one interest rate in a time value analysis. In this situation, interest rates may be shown in multiple periods.) Additionally, unknown cash flows—the ones to be determined in the analysis—are sometimes indicated by question marks. To illustrate a completed time line, consider the following example:



Here, the interest rate for each of the three periods is 5 percent, a *lump sum* (single amount) investment of \$100 is made at Time 0, and the Time 3 value is to be determined. The \$100 is an *outflow* because it is shown as a negative cash flow. (Outflows are often designated by parentheses rather than by minus signs.) In simple analyses, it is not really necessary to designate cash flows as inflows and outflows because the analyst is well aware of the economics of the situation. However, more complicated analyses require the correct cash flow designation, and many financial calculators require that signs be attached to cash flows in all analyses, even simple ones. Thus, to ensure that students are familiar with sign conventions, we will use them on most of our illustrations.

Time lines are essential when learning time value concepts, but even experienced analysts use time lines when dealing with complex problems. The time line may be an actual line, as used in this chapter, or it may be a series

of columns, or rows, on a spreadsheet. Time lines will be used extensively in the remainder of this text, so get into the habit of creating time lines when conducting time value analyses.

1. Draw a three-year time line that illustrates the following situation: An investment of \$10,000 at Time 0; inflows of \$5,000 at the end of Years 1, 2, and 3; and an interest rate of 10 percent during the entire three years.

## Self-Test Question

### Future Value of a Lump Sum (Compounding)



The process of going from today's values, or *present values (PVs)*, to future values is called *compounding*. Although compounding is not used extensively in healthcare financial management, it is the best starting point for learning time value concepts. To illustrate *lump sum* compounding, which deals with a single starting dollar amount, suppose that the manager of Meridian Clinic deposits \$100 of the clinic's excess cash in a bank account that pays 5 percent interest per year. How much would be in the account at the end of one year? To begin, here are some terms used in the solution:

- $PV = \$100$  = present value, or beginning amount, of the account.
- $I = 5\%$  = interest rate the bank pays on the account per year. The interest amount, which is paid at the end of each year, is based on the balance at the beginning of the year. Expressed as a decimal,  $I = 0.05$ .
- $INT$  = dollars of interest earned during each year, which equals the beginning amount multiplied by the interest rate. Thus, for Year 1,  $INT = PV \times I$ .
- $FV_N$  = future value, or ending amount, of the account at the end of  $N$  years. Whereas  $PV$  is the value now,  $FV_N$  is the value  $N$  years into the *future*, after the interest earned has been added to the account.
- $N$  = number of years (or periods) involved in the analysis.

To start,  $N = 1$ , so  $FV_N$  is calculated as follows:

$$\begin{aligned} FV_N &= FV_1 = PV + INT \\ &= PV + (PV \times I) \\ &= PV \times (1 + I). \end{aligned}$$

The future value at the end of one year,  $FV_1$ , equals the present value multiplied by (1.0 plus the interest rate). This future value relationship can be used to find how much \$100 will be worth at the end of one year if it is invested in an account that pays 5 percent interest:

$$FV_1 = PV \times (1 + I) = \$100 \times (1 + 0.05) = \$100 \times 1.05 = \$105.$$

Now, what would be the value after five years? Here is a time line that shows the amount at the end of each year:

	0	1	2	3	4	5
	----- ----- ----- ----- ----- -----					
		5%				
Beginning amount	-\$100					
Interest earned		\$ 5	\$ 5.25	\$ 5.51	\$ 5.79	\$ 6.08
End of year amount		105	110.25	115.76	121.55	127.63

Note the following points:

- The account is opened with a deposit of \$100. This is shown as an outflow at Year 0.
- Meridian earns  $\$100 \times 0.05 = \$5$  of interest during the first year, so the amount in the account at the end of Year 1 is  $\$100 + \$5 = \$105$ .
- At the start of the second year, the account balance is \$105. Interest of  $\$105 \times 0.05 = \$5.25$  is earned on the now larger amount, and the account balance at the end of the second year is  $\$105 + \$5.25 = \$110.25$ . The Year 2 interest, \$5.25, is higher than the first year's interest, \$5, because  $\$5 \times 0.05 = \$0.25$  in interest was earned on the first year's interest.
- This process continues, and because the beginning balance is higher in each succeeding year, the interest earned increases in each year.
- The total interest earned, \$27.63, is reflected in the final balance at the end of Year 5, \$127.63.

To better understand the mathematics of compounding, note that the Year 2 value, \$110.25, is equal to:

$$\begin{aligned}
 FV_2 &= FV_1 \times (1 + I) \\
 &= PV \times (1 + I) \times (1 + I) \\
 &= PV \times (1 + I)^2 \\
 &= \$100 \times (1.05)^2 = \$110.25.
 \end{aligned}$$

Furthermore, the balance at the end of Year 3 is:

$$\begin{aligned}
 FV_3 &= FV_2 \times (1 + I) \\
 &= PV \times (1 + I)^3 \\
 &= \$100 \times (1.05)^3 = \$115.76.
 \end{aligned}$$

Continuing the calculation out to the end of Year 5 gives:

$$FV_5 = \$100 \times (1.05)^5 = \$127.63.$$

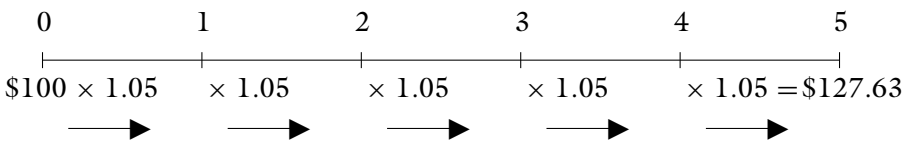
It is clear that a definite pattern exists in these future value calculations. In general, the future value of a lump sum at the end of  $N$  years can be found by applying this equation:

$$FV_N = PV \times (1 + I)^N.$$

Future values, as well as most other time value calculations, can be solved three ways: (1) by using a regular calculator, (2) by using a financial calculator, and (3) by using a spreadsheet.<sup>1</sup> Almost all students who use this textbook will be using spreadsheets to handle time value analyses, so our focus will be on this solution technique. However, we will also illustrate the use of regular calculators to help students understand the set up of the problem and the underlying time value calculation. (If you are using a financial calculator for time value analyses, visit this book's companion website at [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5). The site has a financial calculator tutorial that covers most of the calculations in this chapter.)

*Regular calculator solution:*

A regular (nonfinancial) calculator can be used, either by multiplying the PV by  $(1 + I)$  for  $N$  times or by using the exponential function to raise  $(1 + I)$  to the  $N$ th power and then multiplying the result by the PV. The easiest way to find the future value of \$100 after five years when compounded at 5 percent is to enter \$100, then multiply this amount by 1.05 five times. If the calculator is set to display two decimal places, the answer would be \$127.63:



As denoted by the arrows, compounding involves moving to the **right** along the time line. The word “compounding” means to add to or increase, so values increase when moving to the right along a time line.

*Spreadsheet solution:*

	A	B	C	D
1				
2	5	Nper	Number of periods	
3	\$ 100.00	Pv	Present value	
4	5.0%	Rate	Interest rate	
5				
6	\$ 127.63	=100*(1.05)^5 (entered into Cell A6)		
7				
8	\$ 127.63	=A3*(1+A4)^A2 (entered into Cell A8)		
9				
10	\$ 127.63	=FV(A4,A2,-A3) (entered into Cell A10)		



Spreadsheet programs, such as Excel, are ideally suited for time value analyses. For simple time value calculations, it is easy to enter the appropriate formula directly into the spreadsheet. For example, you could enter the spreadsheet version of the future value equation into Cell A6:  $=100*(1.05)^5$ . Here,  $=$  tells the spreadsheet that a formula is being entered into the cell;  $*$  is the spreadsheet multiplication sign; and  $^$  is the spreadsheet exponential, or power, sign. When this formula is entered into Cell A6, the value \$127.63 appears in the cell (when formatted with a dollar sign to two decimal places). Note that different spreadsheet programs use slightly different syntax in their time value analyses. The examples presented in this text use Excel syntax.

In most situations, it is more useful to enter a formula that can accommodate changing input values than to embed these values directly into the formula, so it would be better to solve this future value problem with this formula:  $=A3*(1+A4)^A2$ , as done in Cell A8. Here, the present value (\$100) is contained in Cell A3, the interest rate (0.05, which is displayed as 5.0%) in Cell A4, and the number of periods (5) in Cell A2. With this formula, future values easily can be calculated with different starting amounts, interest rates, or number of years by changing the values in the input cells.

In addition to entering the appropriate time value formulas, most time value solutions are preprogrammed in the spreadsheet software. The preprogrammed time value formulas are called *functions*. Like any formula, a time value function consists of a number of arithmetic calculations combined into one statement. By using functions, spreadsheet users can save the time and tedium of building formulas from scratch.

Each function begins with a unique name that identifies the calculation to be performed, along with one or more *arguments* (the input values for the calculation) enclosed in parentheses. The best way to access the time value functions is to use the spreadsheet's function wizard (also called the paste function). For this future value problem, first move the cursor to Cell A10 (the cell where you want the answer to appear). Then, click on the function wizard, select Financial for the function category and FV (future value) for the function name, and enter A4 for Rate, A2 for Nper (number of periods), and  $-A3$  for Pv. (Note that the Pmt and Type entries are left blank for this problem. Also, note that the cell address entered for Pv has a minus sign. This is necessary for the answer to be displayed as a positive number.) Finally, press OK and the result, \$127.63, appears in Cell A10.

Note that most of the spreadsheet solutions shown in this book follow a similar format. The input values and the output are contained in Column A. If a spreadsheet function is used in the solution, the input value (argument) names are shown in Column B to the right of the input values. In addition, the formula or function used to calculate the output is shown in Column B to the right of the output value. Finally, Column C contains the descriptive input names.

The most efficient way to solve most problems involving time value is to use a spreadsheet.<sup>1</sup> However, the basic mathematics behind the calculations must be understood to set up complex problems before solving them. In addition, the underlying logic must be understood to comprehend stock and bond valuation, lease analysis, capital budgeting analysis, and other important healthcare financial management topics.

To help you better understand time value solution techniques, we will use a more or less constant format in the illustrations presented in this chapter:

- We lay out the situation on a time line and show the equation that must be solved.
- We then present the regular calculator solution, if applicable.
- Finally, we present the spreadsheet formula or function (or both) in a spreadsheet format.

### Graphic View of the Compounding (Growth) Process



Figure 3.1 shows how \$1, or any other lump sum, grows over time at various rates of interest. The data used to plot the curves can be obtained by using any of the solution techniques described in the previous section. Note that the greater the rate of interest, the faster the growth rate. Thus, \$100 on deposit for ten years at a 5 percent interest rate will grow to \$162.89, but the same amount invested at 10 percent interest will grow to \$259.37. The interest rate is, in fact, a growth rate: If a lump sum is deposited and earns 5 percent interest, the funds on deposit will grow at a rate of 5 percent per period. Note also that future value concepts are not restricted to bank deposits; they can be applied to any growing, or declining, numerical value such as number of clinic visits or earnings per share.

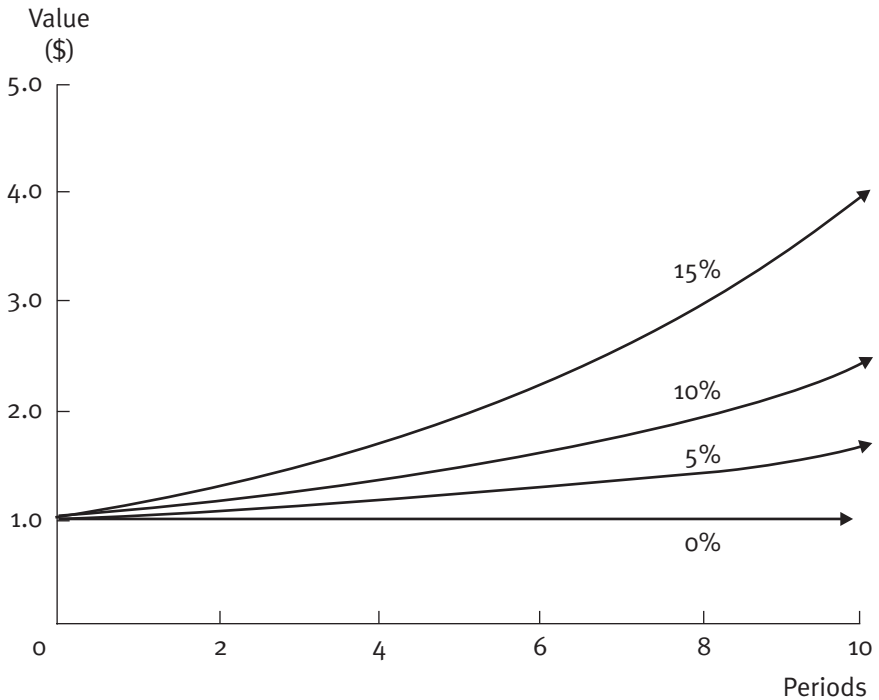
### The Power of Compounding

It is very important to understand what is commonly called “the power of compounding.” In essence, this means that a relatively small starting value can grow to a large amount over a long period of time, even when the rate of growth (interest rate) is modest. For example, assume that a new parent places \$1,000 in a mutual fund to help pay the child’s college expenses, which are expected to begin in 18 years. The mutual fund—a common stock fund holding a large number of securities—is assumed to earn a return of 10 percent per year, which is a reasonable estimate by historical standards. After 18 years, the value of the mutual fund account would be \$5,560, which is not an inconsequential sum.

Now, assume that the money was meant to help fund the child’s retirement, which is assumed to occur 65 years into the future. The value of the mutual fund account at that time would be \$490,371, or nearly a **half-million dollars**. Imagine that, \$1,000 grows to nearly half a million all because of the power of compounding. The moral of this story is clear: When saving for retirement, or for any other purpose, start early.

**FIGURE 3.1**

Relationships Among Future Value, Interest Rates, and Time

*Interest Rate Plot Points*

Period	Interest Rate Plot Points		
	5%	10%	15%
1	1.0500	1.1000	1.1500
2	1.1025	1.2100	1.3225
3	1.1576	1.3310	1.5209
4	1.2155	1.4641	1.7490
5	1.2763	1.6105	2.0114
6	1.3401	1.7716	2.3131
7	1.4071	1.9487	2.6600
8	1.4775	2.1436	3.0590
9	1.5513	2.3579	3.5179
10	1.6289	2.5937	4.0456

### Self-Test Questions

1. What is compounding? What is interest on interest?
2. What is the basic equation for calculating the future value of a lump sum?
3. What are three solution techniques for solving lump sum compounding problems? Which technique is the most efficient?
4. What is meant by the power of compounding?

## Present Value of a Lump Sum (Discounting)

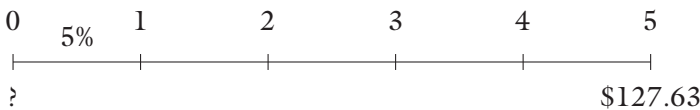


Suppose that GroupWest Health Plans, which has premium income reserves to invest, has the opportunity to purchase a low-risk security that will pay \$127.63 at the end of five years. A local bank is currently offering 5 percent interest on a five-year certificate of deposit (CD), and GroupWest's managers regard the security being offered as being as safe as the bank CD. The 5 percent interest rate available on the bank CD is GroupWest's *opportunity cost rate*. (Opportunity costs are discussed in detail in the next section.) How much would GroupWest be willing to pay for this security?

In the previous section, we learned that an initial amount of \$100 invested at 5 percent per year would be worth \$127.63 at the end of five years. Thus, GroupWest should be indifferent to the choice between \$100 today and \$127.63 to be received after five years. Today's \$100 is defined as the present value, or PV, of \$127.63 due in five years when the opportunity cost rate is 5 percent. If the price of the security being offered is anything less than \$100, GroupWest should buy it. If the price is greater than \$100, GroupWest should turn the offer down. If the price is exactly \$100, GroupWest can buy it or turn it down because that is the security's "fair value." In general, the present value of a cash flow due  $N$  years in the future is the amount that, if it were on hand today, would grow to equal the future amount when compounded at the opportunity cost rate.

Finding present values is called *discounting*, and it is simply the reverse of compounding: If the PV is known, compound to find the FV; if the FV is known, discount to find the PV. Here are the solution techniques for this discounting problem.

*Time line:*



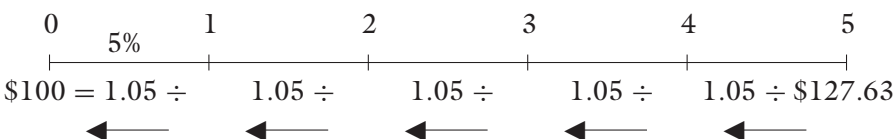
To develop the discounting equation, solve the compounding equation for PV:

$$\text{Compounding: } FV_N = PV \times (1 + I)^N.$$

$$\text{Discounting: } PV = \frac{FV_N}{(1 + I)^N}.$$

*Regular calculator solution:*

Enter \$127.63 and divide it five times by 1.05:



As shown by the arrows, discounting is moving to the left along a time line. The word “discount” means to reduce or to lessen, so values decrease when moving to the left along a time line.

*Spreadsheet solution:*

	A	B	C	D
1				
2	5	Nper	Number of periods	
3	\$ 127.63	Fv	Future value	
4	5.0%	Rate	Interest rate	
5				
6	\$ 100.00	=A3/(1+A4)^A2 (entered into Cell A6)		
7				
8	\$ 100.00	=PV(A4,A2,-A3) (entered into Cell A8)		
9				
10				

One solution would be to enter the applicable formula, as shown to the right of Cell A6:  $=A3/(1+A4)^A2$ . Here, the future value (\$127.63) is contained in Cell A3, the interest rate (0.05, which is displayed as 5.0%) in Cell A4, and the number of periods (5) in Cell A2. With this formula, present values easily can be calculated with different starting future amounts, interest rates, or number of years.

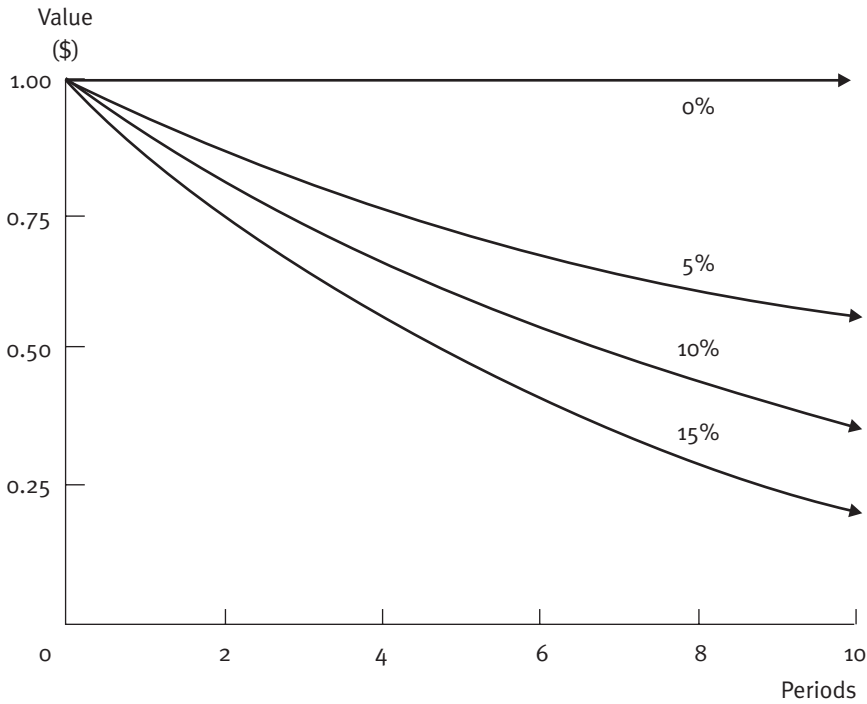
The function approach is illustrated in Cell A8. First, move the cursor to that cell (the cell where you want the answer to appear). Then, click on the function wizard, select Financial for the function category and PV (present value) for the function name, and enter A4 for Rate, A2 for Nper (number of periods), and -A3 for Fv. (Note that the Pmt and Type entries are left blank for this problem. Also, note that the cell address entered for Fv has a minus sign. This is necessary for the answer to be displayed as a positive number.) Finally, press OK and the result, \$100.00, appears in Cell A8.

### Graphic View of the Discounting Process

Figure 3.2 shows how the present value of \$1, or any other sum, to be received in the future diminishes as the years to receipt increase. Again, the data used to plot the curves can be developed by using any of the solution techniques. The graphs show (1) that the present value decreases and approaches zero as the payment date is extended further into the future and (2) that the rate of decrease is greater the higher the interest (discount) rate.

### Discounting at Work

At relatively high interest rates, funds due in the future are worth very little today, and even at moderate discount rates, the present value of a sum due in the distant future is small. To illustrate discounting at work, consider 100-year bonds. A bond is a type of debt security in which an investor loans



**FIGURE 3.2**  
Relationships  
Among Present  
Value, Interest  
Rates, and  
Time

Period	Interest Rate Plot Points		
	5%	10%	15%
1	.9524	.9091	.8696
2	.9070	.8254	.7561
3	.8638	.7513	.6575
4	.8227	.6830	.5718
5	.7835	.6209	.4972
6	.7462	.5634	.4323
7	.7107	.5132	.3759
8	.6768	.4665	.3269
9	.6446	.4241	.2843
10	.6139	.3855	.2472

some amount of principal—say, \$1,000—to a borrower who promises to pay interest over the life of the bond and to return the principal amount at maturity. Typically, the longest maturities for bonds are 30 to 40 years, but in the early 1990s, several firms, including Columbia/HCA Healthcare (now HCA), issued 100-year bonds.

At first blush, it might appear that anyone who would buy a 100-year bond must be irrational because there is little assurance that the firm will even

be around in 100 years to repay the amount borrowed. However, consider the present value of \$1,000 to be received in 100 years. If the discount rate is 7.5 percent, which is roughly the interest rate that was set on the bond, the present value is a mere \$0.72. Thus, the time value of money erodes the value of the principal repayment to the point that it is worth less than \$1 when the bond is purchased. This tells us that the value of the bond stems mostly from the interest stream received in the early years of ownership and that the payments expected during the later years of the bond contribute little to the bond's initial \$1,000 value.

### Self-Test Questions

1. What is discounting? How is it related to compounding?
2. What are the three techniques for solving lump sum discounting problems?
3. What is the basic equation for calculating the present value of a lump sum?
4. How does the present value of an amount to be received in the future change as the time is extended and as the interest rate increases?

### Opportunity Costs

In the last section, the *opportunity cost* concept was used to set the discount rate on GroupWest's investment. This concept plays a very important role in time value analysis. To illustrate the concept, suppose an individual found the winning ticket for the Florida lottery and now has \$1 million to invest. Should the individual assign a "cost" to these funds? At first blush, it might appear that this money has zero cost because its acquisition was purely a matter of luck. However, as soon as the lucky individual thinks about what to do with the \$1 million, he or she has to think in terms of the opportunity costs involved. By using the funds to invest in one alternative—for example, in the stock of HMA—the individual forgoes the opportunity to make some other investment, for example, buying U.S. Treasury bonds. Thus, there is an opportunity cost associated with any investment planned for the \$1 million even though the lottery winnings were "free."

Because one investment decision automatically negates all other possible investments with the same funds, the cash flows expected to be earned from any investment must be discounted at a rate that reflects the return that can be earned on forgone investment opportunities. The problem is that the number of forgone investment opportunities is virtually infinite, so which one should be chosen to establish the opportunity cost rate? The opportunity cost rate to be applied in time value analysis is the rate that can be earned on alternative investments of **similar risk**. It would not be logical to assign a very low opportunity cost rate to a series of very risky cash flows, or vice versa. This concept is one of the cornerstones of financial management, so it is worth

repeating. **The opportunity cost rate (i.e., the discount rate) applied to investment cash flows is the rate that can be earned on alternative investments of similar risk.**

Note that the opportunity cost rate does not depend on the source of the funds to be invested. Rather, the primary determinant of this rate is the riskiness of the cash flows being discounted. Thus, the same opportunity cost rate would be applied to a potential investment in HCA stock whether the funds were won in a lottery, taken out of petty cash, or obtained by selling off some land.

Generally, opportunity cost rates are obtained by looking at rates that can be earned, or more precisely rates that are expected to be earned, on securities such as stocks or bonds. Securities are usually chosen to set opportunity cost rates because their expected returns are more easily estimated than rates of return on real assets such as HMOs, group practices, hospital beds, MRI machines, and the like. Furthermore, as discussed in Chapter 7, securities generally provide the minimum return appropriate for the amount of risk assumed, so securities returns provide a good benchmark for other investments.

To illustrate the opportunity cost concept, assume that Oakdale Community Hospital is considering building a nursing home. The first step in the financial analysis is to forecast the cash flows that the nursing home is expected to produce. These cash flows, then, must be discounted at some opportunity cost rate to determine their present value. Would the hospital's opportunity cost rate be (1) the expected rate of return on Treasury bonds; (2) the expected rate of return on the stock of Manor Care, which operates about 350 nursing homes and assisted living centers; or (3) the expected rate of return on pork belly futures? (Pork belly futures are investments that involve commodity contracts for delivery at some future time.) The answer is the expected rate of return on Manor Care's stock because that is the rate of return available to the hospital on alternative investments of similar risk. Treasury securities are low-risk investments, so they would understate the opportunity cost rate in owning a nursing home. Conversely, pork belly futures are very high-risk investments, so that rate of return is probably too high to apply to Oakdale's nursing home investment.<sup>2</sup>

The source of the funds used for the nursing home investment is **not relevant** to the time value analysis. Oakdale may obtain the needed funds by issuing tax-exempt debt, or by soliciting contributions, or it may have excess cash accumulated from profit retention. The discount rate applied to the nursing home cash flows depends only on the riskiness of those cash flows and the returns available on alternative investments of similar risk, not on the source of the investment funds.

At this point, you may question the ability of real-world analysts to assess the riskiness of a cash flow stream or to choose an opportunity cost rate with any confidence. Fortunately, the process is not as difficult as it may



appear here because businesses have benchmarks that can be used as starting points. (Chapter 9 contains a discussion of how baseline opportunity cost rates are established for capital investments, while Chapter 12 presents a detailed discussion on how the riskiness of a cash flow stream can be assessed.)

## Self-Test Questions

1. Why does an investment have an opportunity cost rate even when the funds employed have no explicit cost?
2. How are opportunity cost rates established?
3. Does the opportunity cost rate depend on the source of the investment funds?

## Solving for Interest Rate and Time

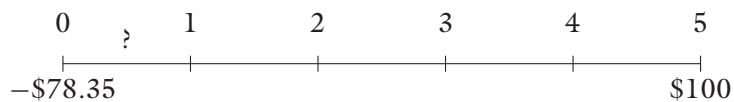
In our examples thus far, four time value analysis variables have been used: PV, FV, I, and N. Specifically, the interest rate, I, and the number of years, N, plus either PV or FV have been initially given. However, if the values of any three of the variables are known, the value of the fourth can be found.

### Solving for Interest Rate (I)



Suppose that Family Practice Associates (FPA), a primary care physicians' group practice, can buy a bank certificate of deposit (CD) for \$78.35 that will return \$100 after five years. In this case PV, FV, and N are known, but I, the interest rate that the bank is paying, is not known. Such problems are solved in this way:

*Time line:*



$$FV_N = PV \times (1 + I)^N$$

$$\$100 = \$78.35 \times (1 + I)^5$$

*Spreadsheet solution:*

	A	B	C	D
1				
2	5	Nper	Number of periods	
3	\$ (78.35)	Pv	Present value	
4	\$ 100.00	Fv	Future value	
5				
6				
7				
8	5.00%	=RATE(A2,,A3,A4) (entered into Cell A8)		
9				
10				

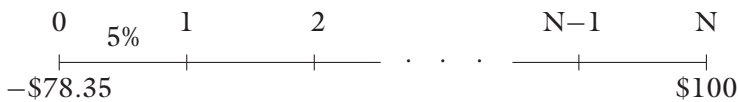
Here, the spreadsheet function named RATE is used to solve for I, as illustrated to the right of Cell A8. First, click on the function wizard; select Financial for the function category and RATE for the function name; and enter A2 for Nper (number of periods), A3 for Pv, and A4 for Fv. (Note that the Pmt and Type entries are left blank for this problem. Also, note that the PV was entered as a negative number, as shown on the time line.) Finally, press OK and the result, 5.00%, appears in Cell A8. (Note that some spreadsheet programs display the answer in decimal form unless the cell is formatted to display in percent.)

**Solving for Time (N)**



Suppose that the bank told FPA that a CD pays 5 percent interest each year, that it costs \$78.35, and that at maturity the group would receive \$100. How long must the funds be invested in the CD? In this case, PV, FV, and I are known, but N, the number of periods, is not known.

*Time line:*



$$FV_N = PV \times (1 + I)^N$$

$$\$100 = \$78.35 \times (1.05)^N$$

*Spreadsheet solution:*

	A	B	C	D
1				
2	5.00%	Rate	Interest rate	
3	\$ (78.35)	Pv	Present value	
4	\$ 100.00	Fv	Future value	
5				
6				
7				
8	5.00	=NPER(A2,,A3,A4) (entered into Cell A8)		
9				
10				

To solve for time, the spreadsheet function named NPER (number of periods) is used. To begin, place the cursor in Cell A8 and click on the function wizard. Then, select Financial for the function category and NPER for the function name, and enter A2 for Rate, A3 for Pv, and A4 for Fv. (Note that the Pmt and Type entries are left blank for this problem. Also, note that the PV was entered as a negative number, as shown on the time line.) Finally, press OK and the result, 5.00, appears in Cell A8. (Note that interest rates usually are entered as decimals in function arguments.)

### The Rule of 72

The *Rule of 72* is a simple and quick method for judging the approximate effect of different interest rates on the growth of a lump sum deposit. It tells us that to find the number of years required to double the value of a lump sum, merely divide the number 72 by the interest rate paid. For example, if the interest rate is 10 percent, it would take  $72/10 = 7.2$  years for the money in an account to double in value. The spreadsheet solution is 7.27 years, so the Rule of 72 is relatively accurate, at least when reasonable interest rates are applied.

In a similar manner, the Rule of 72 can be used to determine the interest rate required to double the money in an account in a given number of years. To illustrate the concept, we find that an interest rate of  $72/5 = 14.4\%$  is required to double the value of an account in five years. The spreadsheet solution here is 14.9 percent, so the Rule of 72 again gives a reasonable approximation of the correct answer.

### Self-Test Questions

1. What are some real-world situations that may require you to solve for interest rate or time?
2. What is the Rule of 72, and how is it used?

### Annuities

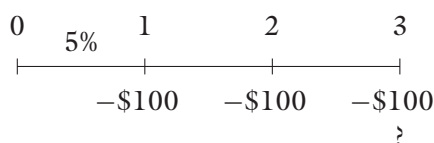
Whereas lump sums are single dollar amounts, an *annuity* is a series of equal amounts at **fixed intervals** for a specified number of periods. Annuity amounts, which often are called *payments* and given the symbol *PMT*, can occur at the beginning or end of each period. If the payments occur at the end of each period as they typically do, the annuity is an *ordinary*, or *deferred*, or *regular annuity*. If payments are made at the beginning of each period, the annuity is an *annuity due*. Because ordinary annuities are by far the most common, the term *annuity* without further description usually means an ordinary annuity.

#### Ordinary Annuities



A series of equal payments at the end of each period constitute an ordinary annuity. If Meridian Clinic were to deposit \$100 at the end of each year for three years in an account that paid 5 percent interest per year, how much would Meridian accumulate at the end of three years? The answer to this question is the *future value* of the annuity.

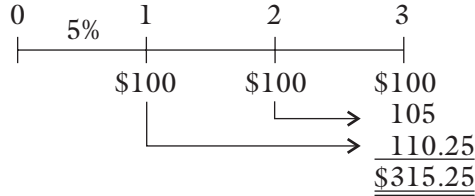
*Time line:*



The future value of any annuity occurs at the end of the final period. Thus, for regular annuities, the future value coincides with the last payment.

*Regular calculator solution:*

One approach is to treat each individual cash flow as a lump sum, compound it to Year 3, then sum the future values:



*Spreadsheet solution:*

	A	B	C	D
1				
2	3	Nper	Number of periods	
3	\$ (100.005)	Pmt	Payment	
4	5.0%	Rate	Interest rate	
5				
6				
7				
8	\$ 315.25	=FV(A4,A2,A3) (entered into Cell A8)		
9				
10				

Here, we again use the FV function, but now we will use the payment (Pmt) entry in the function wizard to recognize that the problem involves annuities. Place the cursor in Cell A8. Then, click on the function wizard; select Financial for the function category and FV for the function name; and enter A4 for Rate, A2 for Nper (number of periods), and A3 for Pmt. (Note that the Pv and Type entries are left blank for this problem.) Finally, press OK and the result, \$315.25, appears in Cell A8.

Suppose that Meridian Clinic was offered the following alternatives: (a) a three-year annuity with payments of \$100 at the end of each year or (b) a lump sum payment today. Meridian has no need for the money during the next three years. If it accepts the annuity, it would deposit the payments in an account that pays 5 percent interest per year. Similarly, the lump sum payment would be deposited into the same account. How large must the lump sum payment be today to make it equivalent to the annuity? In other words, what is the present value of the annuity?

*Spreadsheet solution:*

	A	B	C	D
1				
2		3	Nper	Number of periods
3	\$ (100.00)	Pmt		Payment
4	5.0%	Rate		Interest rate
5				
6				
7				
8	\$ 272.32	=PV(A4,,A2,A3) (entered into Cell A8)		
9				
10				

Here, we use the present value function, but again with a payment entry to recognize that the problem involves annuities. Place the cursor in Cell A8. Then, click on the function wizard; select Financial for the function category and PV for the function name; and enter A4 for Rate, A2 for Nper (number of periods), and A3 for Pmt. (Note that the Fv and Type entries are left blank for this problem.) Finally, press OK and the result, \$272.32, appears in Cell A8.

One especially important application of the annuity concept relates to loans with constant payments such as mortgages, auto loans, and many bank loans to businesses. Such loans are examined in more depth in a later section on amortization.

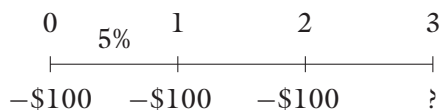
### Annuities Due



If the three \$100 payments in the previous example had been made at the beginning of each year, the annuity would have been an *annuity due*. When compared to an ordinary annuity, each payment is shifted to the left one year. Because the payments come in faster, an annuity due is more valuable than an ordinary annuity.

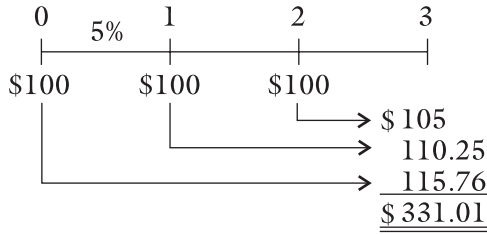
The *future value* of our example, assuming an annuity due, is found as follows:

*Time line:*



Note that the future value of an annuity due occurs one period after the final payment, while the future value of an ordinary annuity coincides with the final payment.

*Regular calculator solution:*



In the case of an annuity due, as compared with an ordinary annuity, all the cash flows are compounded for one additional period, and hence the future value of an annuity due is greater than the future value of a similar ordinary annuity by  $(1 + I)$ . Thus, the future value of an annuity due also can be found as follows:

$$\begin{aligned} \text{FV (Annuity due)} &= \text{FV of a regular annuity} \times (1 + I) \\ &= \$315.25 \times 1.05 = \$331.01. \end{aligned}$$

*Spreadsheet solution:*

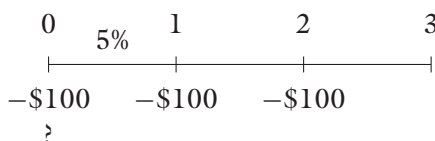
	A	B	C	D
1				
2	3	Nper	Number of periods	
3	\$ (100.00)	Pmt	Payment	
4	5.0%	Rate	Interest rate	
5				
6	\$ 331.01	=FV(A4,A2,A3,1) (entered into Cell A6)		
7				
8	\$ 331.01	=FV(A4,A2,A3)*(1+A4) (entered into Cell A8)		
9				
10				

One approach (as shown in Cell A6) is to use the spreadsheet FV function, but with a “1” entered for Type (as opposed to a blank). Now, the spreadsheet treats the entries as an annuity due, and \$331.01 is displayed as the answer.

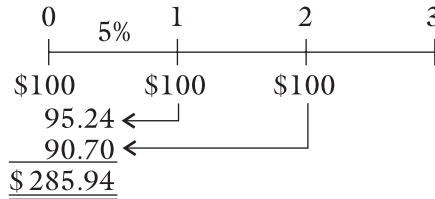
As an alternative, note that the solution is the same as for an ordinary annuity, except the result must be multiplied by  $(1 + \text{Rate})$ , which is  $(1 + A4)$  in this example. This solution approach is given in Cell A8. The result, \$331.01, is the future value of the annuity due.

The present value of an annuity due is found in a similar manner.

*Time line:*



*Regular calculator solution:*



The present value of an annuity due can be thought of as the present value of an ordinary annuity that is compounded for one period, so it also can be found as follows:

$$\begin{aligned} \text{PV(Annuity due)} &= \text{PV of a regular annuity} \times (1 + I) \\ &= \$272.32 \times 1.05 = \$285.94. \end{aligned}$$

*Spreadsheet solution:*

	A	B	C	D
1				
2	3	Nper	Number of periods	
3	\$ (100.00)	Pmt	Payment	
4	5.0%	Rate	Interest rate	
5				
6	\$ 285.94	=PV(A4,A2,A3,,1) (entered into Cell A6)		
7				
8	\$ 285.94	=PV(A4,A2,A3)*(1+A4) (entered into Cell A8)		
9				
10				

As with future value, one approach (as shown in Cell A6) is to use the spreadsheet PV function, but with a “1” entered for Type (as opposed to a blank). Now, the spreadsheet treats the entries as an annuity due, and \$285.94 is displayed as the answer.

Note that the solution is the same as for an ordinary annuity, except the function in Cell A8 is multiplied by  $(1+A4)$ . The result, \$285.94, is the present value of the annuity due.

## Self-Test Questions

1. What is an annuity?
2. What is the difference between an ordinary annuity and an annuity due?
3. Which annuity has the greater future value: an ordinary annuity or an annuity due? Why?
4. Which annuity has the greater present value: an ordinary annuity or an annuity due? Why?

## Perpetuities



Most annuities call for payments to be made over some finite period of time—for example, \$100 per year for three years. However, some annuities go on indefinitely, or perpetually. Such annuities are called *perpetuities*. The present value of a perpetuity is found as follows:

$$PV (\text{Perpetuity}) = \frac{\text{Payment}}{\text{Interest rate}} = \frac{PMT}{I}.$$

Perpetuities can be illustrated by some securities issued by General Healthcare, Inc. Each security promises to pay \$100 annually in perpetuity (forever). What would each security be worth if the opportunity cost rate, or discount rate, was 10 percent? The answer is \$1,000:

$$PV (\text{Perpetuity}) = \frac{\$100}{0.10} = \$1,000.$$

	A	B	C	D
1				
2				
3	\$ 100.00	Pmt	Payment	
4	10.0%	Rate	Interest rate	
5				
6				
7				
8	\$ 1,000.00	=A3/A2 (entered into Cell A8)		
9				
10				

Using a spreadsheet, merely enter the perpetuity formula into a cell, as shown here in Cell A8.

Suppose interest rates, and hence the opportunity cost rate, rose to 15 percent. What would happen to the security's value? The interest rate increase would lower its value to \$666.67:

$$PV (\text{Perpetuity}) = \frac{\$100}{0.15} = \$666.67.$$

Assume that interest rates fell to 5 percent. The rate decrease would increase the perpetuity's value to \$2,000:

$$PV (\text{Perpetuity}) = \frac{\$100}{0.05} = \$2,000.$$

The value of a perpetuity changes dramatically when interest (opportunity cost) rates change. All securities' values are affected by interest rate changes, but some, like perpetuities, are more sensitive to interest rate changes than others such as short-term government bonds. The risks associated with interest rate changes are discussed in more detail in Chapter 7.



## Self-Test Questions

1. What is a perpetuity?
2. What happens to the value of a perpetuity when interest rates increase or decrease?

## Uneven Cash Flow Streams

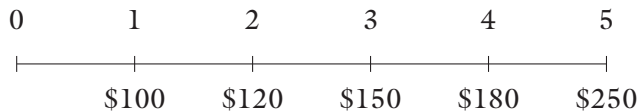
The definition of an annuity includes the words “constant amount,” so annuities involve cash amounts that are the same in every period. Although some financial decisions, such as bond valuation, do involve constant cash amounts, most important healthcare financial analyses involve uneven, or nonconstant, amounts. For example, the financial evaluation of a proposed outpatient clinic or MRI facility rarely involves constant cash amounts.

In general, the term *payment (PMT)* is reserved for annuity situations, in which the dollar amounts are constant, and the term *cash flow* denotes uneven cash flows.

### Present Value



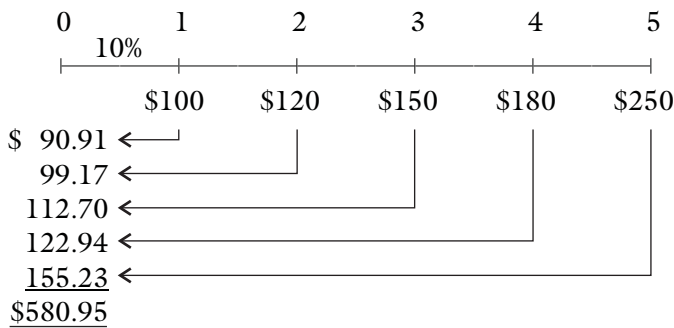
The present value of an uneven cash flow stream is found as the sum of the present values of the individual cash flows of the stream. For example, suppose that Wilson Memorial Hospital is considering the purchase of a new x-ray machine. The hospital’s managers forecast that the operation of the new machine would produce the following stream of cash inflows (in thousands of dollars):



What is the present value of the new x-ray machine investment if the appropriate discount rate (i.e., the opportunity cost rate) is 10 percent?

*Regular calculator solution:*

The PV of each individual cash flow can be found using a regular calculator, then these values are summed to find the PV of the stream, \$580,950:



*Spreadsheet solution:*

	A	B	C	D
1				
2	10.0%	Rate	Interest rate	
3				
4	\$ 100	Value 1	Year 1 CF	
5	\$ 120	Value 1	Year 2 CF	
6	\$ 150	Value 1	Year 3 CF	
7	\$ 180	Value 1	Year 4 CF	
8	\$ 250	Value 1	Year 5 CF	
9				
10	\$ 580.95	=NPV(A2,A4:A8) (entered into Cell A10)		

The NPV function calculates the present value of a stream, called a spreadsheet *range*, of cash flows. First, the cash flow values must be entered into consecutive cells in the spreadsheet, as shown above in Cells A4 through A8. Next, the discount (opportunity cost) rate must be placed into a cell (as in Cell A2 above). Then, place the cursor in Cell A10, use the function wizard to select Financial and NPV, and then enter A2 as Rate and A4:A8 as Value1. Press OK, and the value \$580.95 is displayed in the cell. (Note that the Value1 entry is the range of cash flows contained in Cells A4 through A8. Also, note that NPV stands for *net present value*, which indicates that the resulting present value is the net of the present values of two or more cash flows.)

The NPV function assumes that cash flows occur at the **end** of each period, so NPV is calculated as of the **beginning** of the period of the first cash flow specified in the range, which is one period before the cash flow occurs. Because the cash flow specified as the first flow in the range is a Year 1 value, the calculated NPV occurs at the beginning of Year 1, or the end of Year 0, which is correct for this illustration. However, if a Year 0 cash flow is included in the range, the NPV would be calculated at the beginning of Year 0, or the end of Year -1, which typically is incorrect. This problem will be addressed in the next major section.

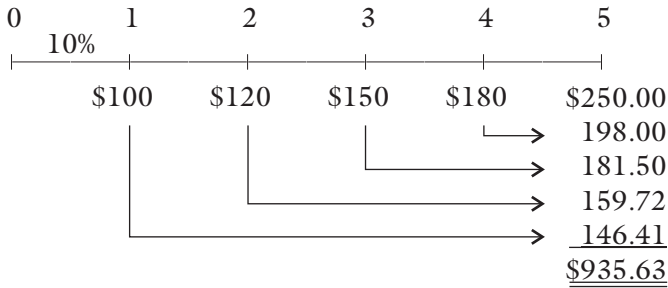
### Future Value



The future value of an uneven cash flow stream is found by compounding each payment to the end of the stream and then summing the future values.

*Regular calculator solution:*

The future value of each individual cash flow can be found using a regular calculator. Then, these values are summed to find the future value of the stream, \$935,630:



### Spreadsheet solution:

Most spreadsheet programs do not have a function that computes the future value of an uneven cash flow stream. However, future values can be found by building a formula in a cell that replicates the regular calculator solution.

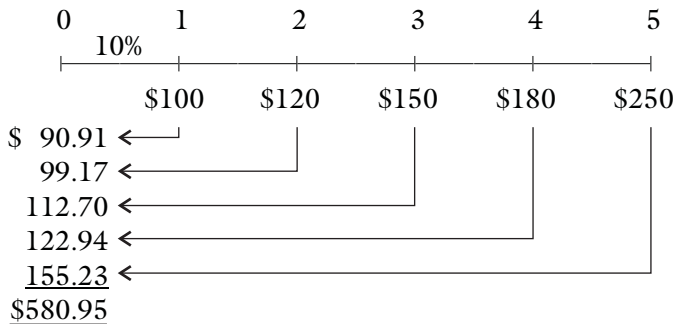
## Self-Test Questions

1. Give two examples of financial decisions that typically involve uneven cash flows.
2. Describe how present values of uneven cash flow streams are calculated using a regular calculator. Using a spreadsheet.
3. What is meant by net present value (NPV)?

## Using Time Value Analysis to Measure ROI

In most investments, an individual or business spends cash today with the expectation of receiving cash in the future. The financial attractiveness of such investments is measured by *return on investment (ROI)*, or just *return*. There are two basic ways of expressing ROI: (1) in dollar terms and (2) in percentage terms.

To illustrate the concept, let's reexamine the cash flows expected to be received if Wilson Memorial Hospital buys its new x-ray machine (shown on the time line in thousands of dollars). In the last section, we determined that the PV of these flows, when discounted at a 10 percent rate, is \$580,950:



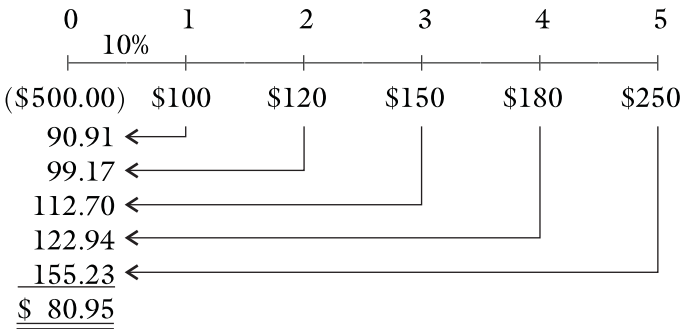
**Dollar Return**



The \$580,950 calculated above represents the present value (in financial terms) of the cash flows that the x-ray machine is **expected** to provide to Wilson Memorial Hospital. Note that these cash flows are not known with certainty but represent the best estimates of the hospital’s managers.

To measure the *dollar return* on the investment, typically called NPV, the cost of the x-ray machine must be compared to the present value of the expected benefits (the cash inflows). If the machine is expected to cost \$500,000, and the present value of the inflows is \$580,950, then the NPV on the machine is  $\$580,950 - \$500,000 = \$80,950$ . Note that this measure of dollar return incorporates time value through the discounting process. Also, the opportunity cost inherent in the use of the \$500,000 is accounted for because the 10 percent discount rate reflects the return that can be earned on alternative investments of similar risk. Thus, the x-ray machine is expected to produce an \$80,950 return above that required for its riskiness as accounted for by the 10 percent opportunity cost rate.

The dollar return process can be combined into a single calculation by adding the cost of the x-ray machine to the time line:



*Spreadsheet solution:*

	A	B	C	D
1				
2	10.0%	Rate	Interest rate	
3	\$ (500)		Year 0 CF	
4	\$ 100	Value 1	Year 1 CF	
5	\$ 120	Value 1	Year 2 CF	
6	\$ 150	Value 1	Year 3 CF	
7	\$ 180	Value 1	Year 4 CF	
8	\$ 250	Value 1	Year 5 CF	
9				
10	\$ 80.95	=NPV(A2,A4:A8)+A3 (entered into Cell A10)		

Note that the situation here is the same as in the previous cash flow stream, except there is an initial investment outlay of \$500 added in Cell A3. Because the NPV of the cash inflows in Cells A4 through A8 represents the

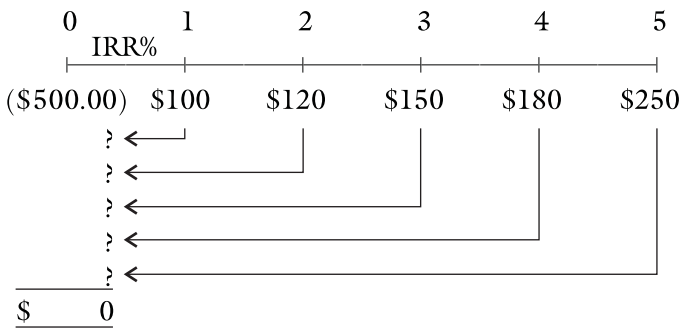
value one period before the first (A4) cash flow, all that must be done is to add the investment outlay to the calculated NPV. This is done in Cell A10 above by adding A3 to the NPV function and the result, \$80.95, appears in that cell.

### Rate of Return



The second way to measure ROI is by *rate of return*, or *percentage return*. This measures the interest rate that must be earned on the investment outlay to generate the expected cash inflows. In other words, this measure provides the expected periodic rate of return on the investment. If the cash flows are annual, as in this example, the rate of return is an annual rate. In effect we are solving for I, the interest rate that equates the present value of the cash inflows to the dollar amount of the cash outlay.

Mathematically, if the PV of the cash inflows equals the investment outlay, then the NPV of the investment is forced to \$0. This relationship is shown here:



Note that the rate of return on an investment, particularly an investment in plant or equipment, typically is called the *internal rate of return (IRR)*. Although a trial-and-error procedure can be used on a regular calculator to determine the rate of return, it is better to use a financial calculator or spreadsheet.

*Spreadsheet solution:*

	A	B	C	D
1				
2	10.0%	Guess	Interest rate	
3	\$ (500)	Values	Year 0 CF	
4	\$ 100	Values	Year 1 CF	
5	\$ 120	Values	Year 2 CF	
6	\$ 150	Values	Year 3 CF	
7	\$ 180	Values	Year 4 CF	
8	\$ 250	Values	Year 5 CF	
9				
10	15.3%	=IRR(A3:A8,A2) (entered into Cell A10)		

The IRR function is used to calculate rate of return. Choose Financial and IRR on the function wizard, then enter A3:A8 as Values and A2 as Guess.

The result, 15.3%, appears in Cell A10, the cell that has the IRR function in it. Note that IRR stands for internal rate of return, a somewhat archaic term that is still used instead of ROI or just rate of return. (Note that a starting guess is required to calculate the IRR because the methodology used by the spreadsheet IRR function is actually a trial-and-error process that requires a starting point.)

We will have much more to say about investment returns in Chapters 7, 11, and 12. For now, an understanding of the basic concept is sufficient.

1. What does the term “ROI” mean?
2. Differentiate between dollar return and rate of return.
3. Is the calculation of ROI an application of time value analysis? Explain your answer.

**Self-Test Questions**

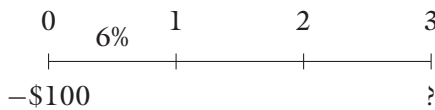
**Semiannual and Other Compounding Periods**



In all the examples thus far, the assumption was that interest is compounded once a year, or annually. This is called *annual compounding*. Suppose, however, that Meridian Clinic puts \$100 into a bank account that pays 6 percent annual interest, but it is compounded *semiannually*. How much would the clinic accumulate at the end of one year, two years, or some other period? Semiannual compounding means that interest is paid each six months, so interest is earned more often than under annual compounding.

To illustrate semiannual compounding, assume that the \$100 is placed into the account for three years. The following situation occurs under **annual** compounding:

*Time line:*



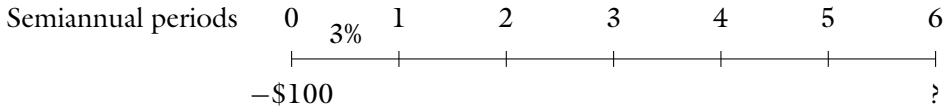
$$FV_N = PV \times (1 + I)^N = \$100 \times (1.06)^3$$

*Spreadsheet solution:*

	A	B	C	D
1				
2	3	Nper	Number of periods	
3	\$ 100.00	Pv	Present value	
4	6.0%	Rate	Interest rate	
5				
6	\$ 119.10	=100*(1.06)^3 (entered into Cell A6)		
7				
8	\$ 119.10	=A3*(1+A4)^A2 (entered into Cell A8)		
9				
10	\$ 119.10	=FV(A4,A2,-A3) (entered into Cell A10)		

Now, consider what happens under **semiannual** compounding. Because interest rates usually are stated as annual rates, this situation would be described as 6 percent interest, compounded semiannually. With semiannual compounding,  $N = 2 \times 3 = 6$  semiannual periods, and  $I = 6/2 = 3\%$  per semiannual period. Here is the solution.

*Time line:*



$$FV_N = PV \times (1 + I)^N = \$100 \times (1.03)^6$$

*Spreadsheet solution:*

	A	B	C	D
1				
2	6	Nper	Number of periods	
3	\$ 100.00	Pv	Present value	
4	3.0%	Rate	Interest rate	
5				
6	\$ 119.41	=100*(1.03)^6 (entered into Cell A6)		
7				
8	\$ 119.41	=A3*(1+A4)^A2 (entered into Cell A8)		
9				
10	\$ 119.41	=FV(A4,A2,-A3) (entered into Cell A10)		

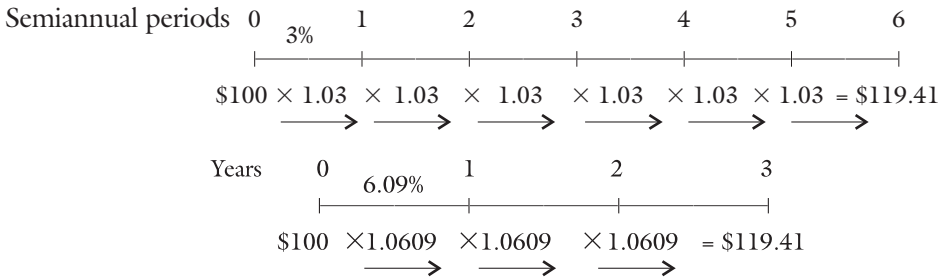
The \$100 deposit grows to \$119.41 under semiannual compounding, but only to \$119.10 under annual compounding. This result occurs because interest on interest is being earned more frequently under semiannual compounding.

Throughout the economy, different compounding periods are used for different types of investments. For example, bank accounts often compound interest monthly or daily, most bonds pay interest semiannually, and stocks generally pay quarterly dividends.<sup>3</sup> Furthermore, the cash flows stemming from capital investments, such as new hospital wings or diagnostic equipment, can be analyzed in monthly, quarterly, or annual periods or even some other interval. Time value analyses with different compounding periods must be put on a common basis to make meaningful comparisons.

To begin, note that the *stated*, or *nominal*, *interest rate* in the Meridian Clinic semiannual compounding example is 6 percent. The *effective annual rate*, which accounts for intrayear compounding, is the rate that produces the same ending value under annual compounding. In the example, the effective annual rate is the rate that would produce a future value of \$119.41 at the end of Year 3 under **annual compounding**. The solution is 6.09 percent:

	A	B	C	D
1				
2				
3	3	Nper	Number of periods	
4	\$ (100.00)	Pv	Present value	
5	\$ 119.41	Fv	Future value	
6				
7				
8	6.09%	=RATE(A3,A4,A5) (entered into Cell A8)		
9				
10				

Thus, if one bank offered to pay 6 percent interest with semiannual compounding on a savings account, while another offered 6.09 percent with annual compounding, both banks would be paying the same effective annual rate because the ending value is the same under both sets of terms:



In general, the effective annual rate (EAR) can be determined, given the stated rate and number of compounding periods per year, by using this equation:

$$\text{Effective annual rate (EAR)} = (1 + I_{\text{Stated}}/M)^M - 1.0.$$

Here,  $I_{\text{Stated}}$  is the stated (nominal) interest rate and  $M$  is the number of compounding periods per year. The term  $I_{\text{Stated}}/M$  is the *periodic* interest rate, so the EAR equation can be restated as:

$$\text{Effective annual rate (EAR)} = (1 + \text{Periodic rate})^M - 1.0.$$

To illustrate use of the EAR equation, consider that the effective annual rate when the stated rate is 6 percent and semiannual compounding occurs is 6.09 percent:

$$\begin{aligned} \text{EAR} &= (1 + 0.06/2)^2 - 1.0 \\ &= (1.03)^2 - 1.0 \\ &= 1.0609 - 1.0 = 0.0609 = 6.09\%. \end{aligned}$$

As shown in the preceding calculations, semiannual compounding, or for that matter any compounding that occurs more than once a year, can be handled two ways. First, the input variables can be expressed as periodic



variables rather than annual variables. In the Meridian Clinic example, use  $N = 6$  periods, rather than  $N = 3$  years, and  $I = 3\%$  per period, rather than  $I = 6\%$  per year. Second, find the effective annual rate and then use this rate as an annual rate over the number of years. In the example, use  $I = 6.09\%$  and  $N = 3$  years.

For another illustration of the concept, consider the interest rate charged on credit cards. Many banks charge 1.0 percent per month and, in their advertising, state that their annual percentage rate (APR) is 12.0 percent.<sup>4</sup> However, the true cost rate to credit card users is the effective annual rate of 12.7 percent:

$$\begin{aligned} \text{EAR} &= (1 + \text{Periodic rate})^M - 1.0 \\ &= (1.01)^{12} - 1.0 = 0.127 = 12.7\%. \end{aligned}$$

## Self-Test Questions

1. What changes must be made in the calculations to determine the future value of an amount being compounded at 8 percent semiannually versus one being compounded at 8 percent annually?
2. Why is semiannual compounding better than annual compounding from an investor's standpoint?
3. How does the effective annual rate differ from the stated (nominal) rate?

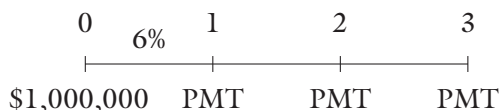
## Amortized Loans



One important application of time value analysis involves loans that are to be paid off in equal installments over time, such as automobile loans, home mortgage loans, and most business debt other than very short-term loans and long-term bonds. If a loan is to be repaid in equal periodic amounts—monthly, quarterly, or annually—it is said to be an *amortized loan*. The word *amortize* comes from the Latin *mors*, meaning *death*, so an amortized loan is one that is “killed off” over time.

To illustrate the concept, suppose Santa Fe Healthcare System borrows \$1 million from the Bank of New Mexico that will be repaid in three equal installments at the end of each of the next three years. The bank is to receive 6 percent interest on the loan balance that is outstanding at the beginning of each year. The first task in analyzing the loan is to determine the amount Santa Fe must repay each year, or the annual payment. To find this amount, recognize that the loan represents the present value of an annuity of PMT dollars per year for three years, discounted at 6 percent.

*Time line:*



Spreadsheet solution:

	A	B	C	D
1				
2	6.0%	Rate	Interest rate	
3	3	Nper	Number of periods	
4	\$ 1,000,000	Pv	Present value	
5				
6				
7				
8	\$ 374,110	=PMT(A2,A3,-A4)	(entered into Cell A8)	
9				
10				

Therefore, if Santa Fe pays the bank \$374,110 at the end of each of the next three years, the percentage cost to Santa Fe, and the rate of return to the bank, will be 6 percent.

Each payment consists partly of interest and partly of repayment of principal. This breakdown is given in the *amortization schedule* shown in Table 3.1. The interest component is largest in the first year, and it declines as the outstanding balance of the loan is reduced over time. For tax purposes, a taxable business borrower reports the interest payments in Column 3 as a deductible expense each year, while the lender reports these same amounts as taxable income.

The spreadsheet function PPMT can be used to construct the amortization table. This function calculates the principal payment for any given input year.

1. When constructing an amortization schedule, how is the periodic payment amount calculated?
2. Does the periodic payment remain constant over time?
3. Do the principal and interest components remain constant over time? Explain your answer.

**Self-Test Questions**

Year	Beginning Amount (1)	Payment (2)	Interest <sup>a</sup> (3)	Repayment of Principal <sup>b</sup> (4)	Remaining Balance (5)
1	\$1,000,000	\$ 374,110	\$ 60,000	\$ 314,110	\$685,890
2	685,890	374,110	41,153	332,957	352,933
3	352,933	374,110	21,177	352,933	0
		<u>\$1,122,330</u>	<u>\$122,330</u>	<u>\$1,000,000</u>	

**TABLE 3.1**  
Loan Amortization Schedule

<sup>a</sup>Interest is calculated by multiplying the loan balance at the beginning of each year by the interest rate. Therefore, interest in Year 1 is  $\$1,000,000 \times 0.06 = \$60,000$ ; in Year 2 is  $\$685,890 \times 0.06 = \$41,153$ ; and in Year 3 is  $\$352,933 \times 0.06 = \$21,177$ .

<sup>b</sup>Repayment of principal is equal to the payment of \$374,110 minus the interest charge for each year.

## A Review of Interest Rate Types

This chapter has covered many time value concepts, including three different types of interest rate. In this section, we review these rates.

### Stated Rate

The *stated (nominal) rate* is the rate that is stated in financial contracts. Convention in the stock, bond, mortgage, commercial loan, consumer loan, and other markets calls for terms to be expressed in stated rates. A banker, broker, or mortgage lender will normally quote the stated rate. However, if compounding is not annual, the stated rate must indicate the number of compounding periods per year. For example, a bank savings account may offer 10 percent interest compounded quarterly, or a money market mutual fund may offer a 12 percent rate, with interest paid monthly. The stated rate is **not** used for calculations (i.e., never use  $I_{\text{Stated}}$  on a time line, in the calculator, or in a spreadsheet formula or function) **unless compounding occurs once a year** ( $M = 1$ ). In this case,  $I_{\text{Stated}} = \text{Periodic rate} = \text{Effective annual rate}$ .

### Periodic Rate

The periodic rate is the rate charged by a lender or paid by a borrower, or any other time value rate, expressed on a per period basis. It can be a rate per year, per six months, per quarter, per month, per day, or per any other time interval. For example, a bank may charge 1 percent per month on its credit card loans or a finance firm may charge 3 percent per quarter on consumer loans.  $\text{Periodic rate} = I_{\text{Stated}}/M$ , which implies that  $I_{\text{Stated}} = \text{Periodic rate} \times M$ , where  $M$  is the number of compounding periods per year. To illustrate the concept, consider the finance firm loan at 3 percent per quarter:

$$I_{\text{Stated}} = \text{Periodic rate} \times M = 3\% \times 4 = 12\%,$$

and

$$\text{Periodic rate} = I_{\text{Stated}}/M = 12\%/4 = 3\% \text{ per quarter.}$$

The periodic rate can be used when cash flows occur more frequently than once a year, and the number of cash flows per year corresponds to the number of compounding periods per year. Thus, if dealing with a retirement annuity that provides monthly payments; a semiannual payment bond; a consumer loan with quarterly payments; or with a credit card loan with monthly payments, the calculations would use  $\text{Periodic rate} = I_{\text{Stated}}/M$ . The implication in all these examples is that the interest compounding period is the same as the cash flow period. **The periodic rate can only be used directly in calculations when the cash flow period coincides with the interest rate compounding period (e.g., quarterly payments and quarterly compounding).**

## Effective Annual Rate

This is the rate that, under annual compounding ( $M = 1$ ), would produce the same results as a given stated rate with compounding more frequently than annual ( $M > 1$ ). The effective annual rate (EAR) is found as follows:

$$\begin{aligned}(\text{EAR}) &= (1 + I_{\text{Stated}}/M)^M - 1.0 \\ &= (1 + \text{Periodic rate})^M - 1.0.\end{aligned}$$

For example, suppose that either a 1 percent per month credit card loan or a 3 percent per quarter consumer loan can be used to make a purchase. Which one should be chosen? To answer this question, the cost rate of each alternative must be expressed as an EAR.

$$\begin{aligned}\text{EAR}_{\text{Credit card loan}} &= (1 + 0.01)^{12} - 1.0 = (1.01)^{12} - 1.0 \\ &= 1.127 - 1.0 = 0.127 = 12.7\%.\end{aligned}$$

$$\begin{aligned}\text{EAR}_{\text{Consumer loan}} &= (1 + 0.03)^4 - 1.0 = (1.03)^4 - 1.0 \\ &= 1.126 - 1.0 = 0.126 = 12.6\%.\end{aligned}$$

Thus, the consumer loan is slightly less costly than the credit card loan. This result should have been intuitive because although both loans have the same 12 percent stated rate, monthly payments would have to be made on the credit card, while under the consumer loan terms, only quarterly payments would have to be made.

The EAR is also used when the interest-rate compounding period occurs more often than the period between payments or cash flows. For example, if payments occur semiannually, but interest is compounded quarterly, then the EAR must be used. In this case, the EAR is really an “effective semiannual rate” calculated as  $(1 + I_{\text{Stated}}/4)^2 - 1.0$ , which is then applied to the semiannual payment stream.

1. Define the stated rate, the periodic rate, and the effective annual rate.
2. How are these three rates related?
3. Can you think of a situation where all three of these rates are the same?

## Self-Test Questions

### Key Concepts

Financial decisions often involve situations in which future cash flows must be valued. The process of valuing future cash flows is called *time value analysis*. Here are the key concepts behind this type of analysis:

- *Times lines* are used to help analysts lay out the cash flows involved in a time value analysis.

- *Compounding* is the process of determining the *future value (FV)* of a lump sum, an annuity, or an uneven cash flow stream.
- *Discounting* is the process of finding the *present value (PV)* of a lump sum, an annuity, or an uneven cash flow stream.
- An *annuity* is a series of equal, periodic cash flows, which are often called *payments (PMT)*.
- An annuity that has payments occurring at the end of each period is called an *ordinary* annuity.
- If each annuity payment occurs at the beginning of the period rather than at the end, the annuity is an *annuity due*.
- A *perpetuity* is an annuity that lasts forever.
- If an analysis involving more than one cash amount does not meet the definition of an annuity, it is called an *uneven cash flow stream*.
- The financial attractiveness of an investment is measured by its *return on investment (ROI)*.
- ROI can be measured either in *dollar* or *percentage* terms.
- The *stated (nominal) rate* is the annual rate normally quoted in financial contracts.
- The *periodic rate* equals the stated rate divided by the number of compounding periods per year.
- If compounding occurs more frequently than once a year, it is often necessary to calculate the *effective annual rate (EAR)*, which is the rate that produces the same results under annual compounding as compared with more frequent compounding.
- An *amortized* loan is one that is paid off in equal amounts over some specified number of periods. An *amortization schedule* shows how much of each payment represents interest, how much is used to reduce the principal, and the remaining balance on each payment date.

Time value analysis is one of the cornerstones of healthcare financial management, so readers should feel comfortable with this material before moving ahead.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used to solve time value analysis problems.

In addition, the chapter has 13 problems in spreadsheet format that allow students to practice their time value analysis skills.

Both the model and problem spreadsheet are available on this book's companion website at [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

## Selected References

Owner's manual for your calculator.

After-market reference manual for your spreadsheet software.

Help menu for your spreadsheet software.

## Selected Websites

- There are many websites that contain online time value analysis calculators. For example, see [www.easysurf.cc/vfpt2.htm](http://www.easysurf.cc/vfpt2.htm).
- For a single online time value calculator, see [www.arachnoid.com/lutus/finance.html](http://www.arachnoid.com/lutus/finance.html).

## Selected Case

The following case in *Cases in Healthcare Finance* can be assigned to help students learn more about time value analysis:

- Case 12: Panhandle Surgery Centers, which examines the time value analysis techniques discussed in this chapter.

## Notes

1. Time value analyses also can be solved using mathematical multipliers obtained from tables. At one time, tables were the most efficient way to conduct time value analyses, but newer solution techniques have made tabular solutions obsolete.
2. Actually, owning a single nursing home is riskier than owning the stock of a firm that has a large number of nursing homes with geographical diversification. Also, an owner of Manor Care's stock can easily sell the stock if things go sour, whereas it would be much more difficult for Oakdale to sell its nursing home. These differences in risk and liquidity suggest that the true opportunity cost rate is probably higher than the return that is expected from owning the stock of a large long-term care company. However, direct ownership of a nursing home implies control, while ownership of the stock of a large firm usually does not. Such control rights would tend to reduce the opportunity cost rate. The main point here is that in practice it may not be possible to obtain a "perfect" opportunity cost rate. Nevertheless, an imprecise one is better than none at all.
3. Some financial institutions even pay interest that is compounded *continuously*. However, continuous compounding is not relevant to healthcare financial management, so it will not be discussed here.
4. The *annual percentage rate (APR)* and *annual percentage yield (APY)* are terms defined in Truth in Lending and Truth in Savings Laws. APR is defined as Periodic rate  $\times$  Number of compounding periods per year, so it ignores the consequences of compounding. Although the APR on a credit card with interest charges of 1.0 percent per month is  $1.0\% \times 12 = 12.0\%$ , the true effective annual rate as calculated in the text is 12.7 percent.



## FINANCIAL RISK AND REQUIRED RETURN

### Learning Objectives

After studying this chapter, readers should be able to:

- Explain in general terms the concept of financial risk.
- Define and differentiate between stand-alone risk and portfolio risk.
- Define and differentiate between corporate risk and market risk.
- Explain the Capital Asset Pricing Model (CAPM) relationship between market risk and required return.

### Introduction

Two of the most important concepts in healthcare financial management are financial risk and required return. What is financial risk, how is it measured, and what effect, if any, does it have on required return and hence on managerial decisions? Because so much financial decision making involves risk and return, it is impossible to gain a good understanding of healthcare financial management without having a solid appreciation of risk and return concepts.

If investors—both individuals and businesses—viewed risk as a benign fact of life, it would have little impact on decision making. However, decision makers are, for the most part, averse to risk, believing that risk is to be avoided. Furthermore, if risks must be taken, there must be a reward for doing so. Thus, investments of higher risk, whether an individual investor's security investment or a radiology group's investment in diagnostic equipment, must offer higher returns to make the investment financially attractive.

In this chapter, basic risk concepts are presented from the perspective of both individual investors and businesses. Healthcare managers must be familiar with both contexts because investors supply the capital that businesses need to function. In addition, the chapter discusses the relationship between risk and required rate of return. To be truly useful in financial decision making, it is necessary to know the impact of risk on investors' views of investment acceptability.

### The Many Faces of Financial Risk

Unfortunately, a full discussion of financial risk would take many chapters, perhaps even an entire book, because financial risk is a very complicated



subject. First of all, it depends on whether the investor is an individual or a business. Then, if the investor is an individual, it depends on the *investment horizon*, or the amount of time until the investment proceeds are needed. To make the situation even more complex, it may even be difficult to define, measure, or translate financial risk into something usable for decision making. For example, the risk that individual investors face when saving for retirement is the risk that the amount of funds accumulated will not be sufficient to fund the lifestyle expected during the full term of retirement. Needless to say, incorporating such a definition of risk into investment decisions is not easy. The good news is that our primary interest concerns the financial risk inherent in making decisions within businesses. Thus, our discussion can focus on the fundamental factors that influence the riskiness of real asset investments (land, buildings, equipment, and so on).

Still, two factors come into play that complicate our discussion of financial risk. The first complicating factor is that financial risk is seen both by businesses and the investors in businesses. There is some risk inherent in the business itself that depends primarily on the type of business. For example, pharmaceutical firms are generally acknowledged to face a great deal of risk, while healthcare providers typically have less risk. Then, investors (i.e., stockholders and creditors) bear the riskiness inherent in the business, but as modified by the contractual nature of the securities they hold. For example, the stock of Manor Care is more risky than its debt, although the risk of both securities depends on the inherent risk of a business that operates in the long-term care industry. Not-for-profit firms have the same partitioning of risk, but now the inherent riskiness of the business is split between creditors and the *implied* stockholders, who generally are considered to be the community at large.

The second complicating factor for our discussion stems from the fact that the riskiness of an investment depends on the context in which it is held. For example, a stock held alone is riskier than the same stock held as part of a large portfolio of stocks. Similarly, an MRI system operated independently is riskier than the same system operated as part of a large, geographically diversified business that owns and operates numerous types of diagnostic equipment.

### Self-Test Question

1. What are the complications that arise when dealing with financial risk in a business setting?

## Introduction to Financial Risk

Generically, *risk* is defined as “a hazard; a peril; exposure to loss or injury.” Thus, risk refers to the chance that an unfavorable event will occur. If an individual engages in skydiving, he or she is taking a chance with injury or

death; skydiving is risky. If an individual gambles at roulette, he or she is not risking injury or death but is taking a *financial risk*. Even when an individual invests in stocks or bonds, he or she is taking a risk in the hope of earning a positive rate of return. Similarly, when a healthcare business invests in new assets, such as diagnostic equipment, new hospital beds, or a new managed care plan, it is taking a financial risk.

To illustrate basic financial risk, consider two potential personal investments. The first investment consists of a one-year, \$1,000 face value U.S. Treasury bill (T-bill) that is bought for \$950. Treasury bills are short-term federal debt securities that are sold at a *discount* (i.e., less than face value) and return *face*, or *par*, *value* at maturity. The investor expects to receive \$1,000 at maturity in one year, so the anticipated rate of return on the T-bill investment is 5.26 percent. Using a spreadsheet:

	A	B	C	D
1				
2	1	Nper	Number of periods	
3	\$ (950.00)	Pv	Present value	
4	\$ 1,000	Fv	Future value	
5				
6				
7				
8	5.26%	=RATE(A3,,A4,A5) (entered into Cell A8)		
9				
10				

The \$1,000 payment is fixed by contract (the T-bill promises to pay this amount), and the U.S. government is certain to make the payment except for a national disaster—a very unlikely event. Thus, there is virtually a 100 percent probability that the investment will actually earn the roughly 5.3 percent rate of return expected. In this situation, the investment is defined as being *riskless*, or *risk free*.<sup>1</sup>

Now, assume that the \$950 is invested in a biotechnology partnership that will be terminated in one year. If the partnership develops a new commercially valuable product, its rights will be sold and \$2,000 will be received from the partnership, for a rate of return of 110.53 percent:

	A	B	C	D
1				
2	1	Nper	Number of periods	
3	\$ (950.00)	Pv	Present value	
4	\$ 2,000	Fv	Future value	
5				
6				
7				
8	110.53%	=RATE(A3,,A4,A5) (entered into Cell A8)		
9				
10				

But if nothing worthwhile is developed, the partnership would be worthless, no money would be received, and the rate of return would be  $-100$  percent:

	A	B	C	D
1				
2	1	Nper	Number of periods	
3	\$ (950.00)	Pv	Present value	
4	\$ 0.01	Fv	Future value	
5				
6				
7				
8	-100.00%	=RATE(A3,,A4,A5) (entered into Cell A8)		
9				
10				

Note that spreadsheets give no solution when the future value is entered as zero, but if a very small number—for example, 0.01—is entered for the future value, the solution for interest rate is  $-100.00\%$ .

Now, assume that there is a 50 percent chance that a valuable product will be developed. In this admittedly unrealistic situation, the expected rate of return—a statistical concept that will be discussed shortly—is the same 5.3 percent as on the T-bill investment:  $(0.50 \times 110.53\%) + (0.50 \times [-100\%]) = 5.3\%$ . However, the biotechnology partnership is a far cry from being riskless. If things go poorly, the entire \$950 investment will be lost, and the realized rate of return will be  $-100$  percent. Because there is a significant chance of actually earning a return that is far less than expected, the partnership investment is described as being very risky.

Thus, financial risk is related to the probability of earning a return less than expected. The greater the chance of low or negative returns, the greater the amount of financial risk.

## Self-Test Questions

1. What is a generic definition of risk?
2. Explain the general concept of financial risk.

## Risk Aversion

Why is it so important to define and measure financial risk? The reason is that both individual and business investors, for the most part, dislike risk. Suppose you were given the choice between a sure \$1 million and the flip of a coin for either \$0 or \$2 million. You, and just about everyone else, would likely “take the \$1 million and run.” An individual who takes the sure \$1 million is *risk averse*; an individual who is indifferent between the two alternatives, or views them as the same, is *risk neutral*; and an individual who prefers the gamble to the sure thing is a *risk seeker*.

Of course, people and businesses do gamble and take chances, so all of us typically exhibit some risk-seeking behavior at one time or another.

However, most individual investors would never put a sizable proportion of their net worth at risk, and most business executives would never “bet the business,” because most people are risk averse when it really matters.

What are the implications of risk aversion for financial decision making? First, given two investments with similar returns but differing risk, investors will favor the lower-risk alternative. Second, investors will require higher returns to invest in higher-risk investments. These typical outcomes of risk-averse behavior have a significant impact on many facets of financial decision making, and hence these results will appear time and time again in later chapters.

1. What does “risk aversion” mean?
2. What are the implications of risk aversion for financial decision making?

## Self-Test Questions

### Probability Distributions

The chance that an event will occur is called *probability of occurrence*, or just *probability*. For example, a weather forecast might predict a 40 percent chance of rain. Or, when rolling a single die, the probability of rolling a two is one out of six, or  $1/6 = 0.1667 = 16.67\%$ . If all possible outcomes related to a particular event are listed, and a probability is assigned to each outcome, the result is a *probability distribution*. In the example of the weather forecast, the probability distribution looks like this:

<i>Outcome</i>	<i>Probability</i>
Rain	0.40 = 40%
No rain	0.60 = 60%
	1.00 = 100%

In the example of the role of a die, the probability distribution looks like this:

<i>Outcome</i>	<i>Probability</i>
1	0.1667 = 16.67%
2	0.1667 = 16.67%
3	0.1667 = 16.67%
4	0.1667 = 16.67%
5	0.1667 = 16.67%
6	0.1667 = 16.67%
	1.0000 = 100.00%

All possible outcomes (i.e., the number of dots showing after the die roll) are listed in the left column, while the probability of each outcome is listed in the right column and is expressed as both decimals and percentages. If the

probability distribution is complete, the probabilities must sum to 1.0, or 100 percent.

Probabilities can also be assigned to possible outcomes—in this case, returns—on both personal and business investments. If an individual buys stock, the return will usually come in the form of *dividends* and *capital gains* (selling the stock for more than the individual paid for it) or *losses* (selling the stock for less than the individual paid for it). Because all stock returns are uncertain, there is some chance that the dividends will not be as high as expected and that the stock price will not increase as much as expected or that it will even decrease. The higher the probabilities of dividends and stock price well below those expected, the higher the probability that the return will be significantly less than expected and hence the greater the risk.

To illustrate the concept using a business investment, consider a hospital evaluating the purchase of a new MRI system. The cost of the system is an investment, and the net cash inflows that stem from patient utilization of the MRI provide the return. The net cash inflows, in turn, depend on the number of procedures, charge per procedure, payer discounts, operating costs, and so on. These values typically are not known with certainty but rather are dependent on factors such as patient demographics, physician acceptance, local market conditions, labor costs, and so on. Thus, the hospital actually faces a probability distribution of returns, rather than a single return known with certainty. The greater the probability of returns well below the return anticipated, the greater the risk of the MRI investment.

## Self-Test Questions

1. What is a probability distribution?
2. How are probability distributions used in financial decision making?

### Expected and Realized Rates of Return



To be most useful, the concept of financial risk must be defined more precisely than just the chances of a return well below that anticipated. Table 4.1 contains the estimated return distributions developed by the financial staff of Norwalk Community Hospital for two proposed investments: (1) an MRI system and (2) a walk-in clinic. Here, each economic state reflects a combination of factors that dictate each project's profitability. For example, for the MRI project, the very poor economic state signifies very low physician acceptance and hence very low utilization, very high discounts on reimbursements, very high operating costs, and so on. The economic states are defined in a similar fashion for the walk-in clinic.

The *expected rate of return*, defined in the statistical sense, is the weighted average of the return distribution, where the weights are the probabilities of occurrence. For example, the expected rate of return on the MRI system,  $E(R_{\text{MRI}})$ , is 10 percent:

$$\begin{aligned}
 E(R_{MRI}) &= (\text{Probability of Return 1} \times \text{Return 1}) \\
 &\quad + (\text{Probability of Return 2} \times \text{Return 2}) \\
 &\quad + (\text{Probability of Return 3} \times \text{Return 3}) \text{ and so on} \\
 &= (0.10 \times [-10\%]) + (0.20 \times 0\%) + (0.40 \times 10\%) \\
 &\quad + (0.20 \times 20\%) + (0.10 \times 30\%) \\
 &= 10.0\%.
 \end{aligned}$$

Calculated in a similar manner, the expected rate of return on the walk-in clinic is 15 percent.

The expected rate of return is the average return that would result, given the return distribution, if the investment were randomly repeated many times. In this illustration, if 1,000 clinics were built in different areas, each of which faced the return distribution given in Table 4.1, the average return on the 1,000 investments would be 15 percent, assuming the returns in each area are independent of one another. However, only one clinic would actually be built, and the realized rate of return may be less than the expected 15 percent. Therefore, the clinic investment, as well as the MRI investment, is risky.

Expected rate of return expresses expectations for the future. When the managers at Norwalk Community Hospital analyzed the MRI investment, they expected it to earn 10 percent. However, assume that economic conditions took a turn for the worse and the very poor economic scenario actually occurred. In this case, the *realized rate of return*, which is the rate of return that the investment actually produced as measured at termination, would be a negative 10 percent. It is the potential of realizing a return of -10 percent on an investment that has an expected return of +10 percent that produces risk. Note that in many situations, especially those arising in textbook illustrations, the expected rate of return is not even achievable. For example, an investment that has a 50 percent chance of a 5 percent return and a 50 percent chance of a 15 percent return has an expected rate of return of 10 percent. Yet, there is zero probability of actually realizing the 10 percent expected rate of return.

**TABLE 4.1**

<i>Economic State</i>	<i>Probability of Occurrence</i>	<i>Rate of Return if State Occurs</i>	
		<i>MRI</i>	<i>Clinic</i>
Very poor	0.10	-10%	-20%
Poor	0.20	0	0
Average	0.40	10	15
Good	0.20	20	30
Very good	0.10	30	50
	<u>1.00</u>		

Norwalk Community Hospital: Estimated Returns for Two Proposed Investments

## Self-Test Questions

1. How is the expected rate of return calculated?
2. What is the economic interpretation of the expected rate of return?
3. What is the difference between the expected rate of return and the realized rate of return?

### Stand-Alone Risk



We can look at the two distributions in Table 4.1 and intuitively conclude that the clinic is more risky than the MRI system because the clinic has a chance of a 20 percent loss, while the worst possible loss on the MRI system is 10 percent. This intuitive risk assessment is based on the *stand-alone risk* of the two investments; that is, we are focusing on the riskiness of each investment under the assumption that it would be the business's only asset (operated in isolation). In the next section, portfolio effects will be introduced, but for now let's continue our discussion of stand-alone risk.

Stand-alone risk depends on the “tightness” of an investment's return distribution. If an investment has a tight return distribution, with returns falling close to the expected return, it has relatively low stand-alone risk. Conversely, an investment with a return distribution that is “loose,” and hence has values well below the expected return, is relatively risky in the stand-alone sense.

It is important to recognize that risk and return are **separate** attributes of an investment. An investment may have a very tight distribution of returns, and hence very low stand-alone risk, but its expected rate of return might be only 2 percent. In this situation, the investment probably would not be financially attractive, in spite of its low risk. Similarly, a high-risk investment with a sufficiently high expected rate of return would be attractive.<sup>2</sup>

To be truly useful, any definition of risk must have some measure, or numerical value, so we need some way to specify the “degree of tightness” of an investment's return distribution. One such measure is the *standard deviation*, which is often given the symbol “ $\sigma$ ” (Greek lowercase sigma). Standard deviation is a common statistical measure of the dispersion of a distribution about its mean—the smaller the standard deviation, the tighter the distribution, and hence the lower the riskiness of the investment. To illustrate the calculation of standard deviation, consider the MRI investment's estimated returns listed in Table 4.1. Here are the steps:

1. The expected rate of return on the MRI,  $E(R_{\text{MRI}})$ , is 10 percent.
2. The *variance* of the return distribution is determined as follows:

$$\begin{aligned} \text{Variance} = & (\text{Probability of Return 1} \times [\text{Rate of Return 1} - E(R_{\text{MRI}})]^2) \\ & + (\text{Probability of Return 2} \times [\text{Rate of Return 2} - E(R_{\text{MRI}})]^2) \text{ and so on} \end{aligned}$$

$$\begin{aligned}
 &= (0.10 \times [-10\% - 10\%]^2) + (0.20 \times [0\% - 10\%]^2) + (0.40 \times [10\% - 10\%]^2) \\
 &\quad + (0.20 \times [20\% - 10\%]^2) + (0.10 \times [30\% - 10\%]^2) \\
 &= 120.00.
 \end{aligned}$$

Variance, like standard deviation, is a measure of the dispersion of a distribution about its expected value, but it is less useful than standard deviation because its measurement unit is percent or dollars **squared**, which has no economic meaning.

3. The standard deviation is defined as the square root of the variance:

$$\begin{aligned}
 \text{Standard deviation } (\sigma) &= \sqrt{\text{Variance}} \\
 &= \sqrt{120.00} = 10.95\% \approx 11.0\%.
 \end{aligned}$$

Using the same procedure, the clinic investment listed in Table 4.1 was found to have a standard deviation of returns of about 18 percent. Because the clinic investment's standard deviation of returns is larger than that of the MRI investment, the clinic investment has more stand-alone risk than the MRI investment.

As a general rule, investments with higher expected rates of return have larger standard deviations than investments with smaller expected returns.<sup>3</sup> This situation occurs in our MRI and clinic example. In situations where expected rates of return on investments differ substantially, standard deviation may not give a good picture of one investment's stand-alone risk relative to another. The *coefficient of variation (CV)*, which is defined as the standard deviation of returns divided by the expected return, measures the risk per unit of return and hence standardizes the measurement of stand-alone risk. To illustrate the concept, consider that the MRI investment has a CV of 1.10, while the clinic's CV is 1.20:

$$\begin{aligned}
 \text{Coefficient of variation} &= \text{CV} = \frac{\sigma}{E(R)}. \\
 \text{CV}_{\text{MRI}} &= 11.0\%/10.0\% = 1.10. \\
 \text{CV}_{\text{Clinic}} &= 18.0\%/15.0\% = 1.20.
 \end{aligned}$$

In this situation, the clinic investment has slightly more risk per unit of return, so it is riskier than the MRI as measured by both standard deviation and coefficient of variation. However, note that the clinic's stand-alone risk as measured by the coefficient of variation is not as great relative to the MRI as it is when measured by standard deviation. This difference in relative risk occurs because the clinic has a higher expected rate of return. Finally, note that coefficient of variation has no units; it is just a raw number.



## Self-Test Questions

1. What is stand-alone risk?
2. What are some measures of stand-alone risk?
3. Is one measure better than another?

## Portfolio Risk and Return



The preceding section developed a risk measure—standard deviation—that applies to investments held in isolation. (We also discussed coefficient of variation, but for now our focus will be on standard deviation.) However, most investments are not held in isolation. Instead, they are held as part of a collection, or *portfolio*, of investments. Individual investors typically hold portfolios of **securities** (i.e., stocks and bonds), while businesses generally hold portfolios of **projects** (i.e., product or service lines). When investments are held in portfolios, the primary concern of investors is not the realized rate of return on each individual investment but rather the realized rate of return on the entire portfolio. Similarly, the riskiness of each individual investment in the portfolio is not important to the investor; what matters is the aggregate riskiness of the portfolio. Thus, the whole nature of risk, and how it is defined and measured, changes when one recognizes that investments are not held in isolation but rather as parts of portfolios.

### Portfolio Returns

Consider the returns estimated for the seven investment alternatives listed in Table 4.2. The single investment alternatives (Investments A, B, C, and D) could be projects under consideration by South West Clinics, Inc., or they could be securities that are being evaluated as personal investments. The remaining three alternatives in Table 4.2 are portfolios. Portfolio AB consists of 50 percent invested in Investment A and 50 percent in Investment B (e.g., \$10,000 invested in A and \$10,000 invested in B), while Portfolio AC is an equal-weighted portfolio of Investments A and C, and Portfolio AD is an

**TABLE 4.2**

Estimated Returns for Four Individual Investments and Three Portfolios

<i>Economic State</i>	<i>Probability of Occurrence</i>	<i>Rate of Return if State Occurs</i>						
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>AB</i>	<i>AC</i>	<i>AD</i>
Very poor	0.10	−10%	30%	−25%	15%	10%	−17.5%	2.5%
Poor	0.20	0	20	−5	10	10	−2.5	5.0
Average	0.40	10	10	15	0	10	12.5	5.0
Good	0.20	20	0	35	25	10	27.5	22.5
Very good	0.10	30	−10	55	35	10	42.5	32.5
	<u>1.00</u>							
Expected rate of return		10.0%	10.0%	15.0%	12.0%	10.0%	12.5%	11.0%
Standard deviation		11.0%	11.0%	21.9%	12.1%	0.0%	16.4%	10.1%

equal-weighted portfolio of Investments A and D. As shown in the bottom of the table, Investments A and B have 10 percent expected rates of return, while the expected rates of return for Investments C and D are 15 percent and 12 percent, respectively. Investments A and B have identical stand-alone risk (i.e., standard deviations of 11.0 percent), while Investments C and D have greater stand-alone risk than A and B.

The *expected rate of return on a portfolio*,  $E(R_{Portfolio})$ , is the weighted average of the expected returns on the investments that make up the portfolio, with the weights being the proportion of the total portfolio invested in each asset:

$$E(R_{Portfolio}) = (w_1 \times E[R_1]) + (w_2 \times E[R_2]) + (w_3 \times E[R_3]) \text{ and so on}$$

where  $w_1$  is the proportion of Investment 1 in the overall portfolio and  $E(R_1)$  is the expected rate of return on Investment 1, and so on. Thus, the expected rate of return on Portfolio AB is 10 percent:

$$E(R_{AB}) = (0.5 \times 10\%) + (0.5 \times 10\%) = 5\% + 5\% = 10\%,$$

while the expected rate of return on Portfolio AC is 12.5 percent and on AD is 11.0 percent.

Alternatively, the expected rate of return on a portfolio can be calculated by looking at the portfolio's return distribution. To illustrate the concept, consider the return distribution for Portfolio AC contained in Table 4.2. The portfolio return in each economic state is the weighted average of the returns on Investments A and C in that state. For example, the return on Portfolio AC in the very poor state is  $(0.5 \times [-10\%]) + (0.5 \times [-25\%]) = -17.5\%$ . Portfolio AC's return in each other state is calculated similarly. Portfolio AC's return distribution now can be used to calculate its expected rate of return:

$$\begin{aligned} E(R_{AC}) &= (0.10 \times [-17.5\%]) + (0.20 \times [-2.5\%]) + (0.40 \times 12.5\%) \\ &\quad + (0.20 \times 27.5\%) + (0.10 \times 42.5\%) \\ &= 12.5\%. \end{aligned}$$

This is the same value as calculated from the expected rates of return of the two portfolio components:

$$E(R_{AC}) = (0.5 \times 10\%) + (0.5 \times 15\%) = 12.5\%.$$

After the fact, the actual, or realized, returns on Investments A and C will probably be different from their expected values, and hence the realized rate of return on Portfolio AC will likely be different from its 12.5 percent expected return.

### Portfolio Risk: Two Investments

When an investor holds a portfolio of investments, the portfolio is in effect a stand-alone investment, so the riskiness of the **portfolio** is measured by

the standard deviation of portfolio returns, which is the previously discussed measure of stand-alone risk. How does the riskiness of the individual investments in a portfolio combine to create the overall riskiness of the portfolio? Although the rate of return on a portfolio is the weighted average of the returns on the component investments, a portfolio's standard deviation (i.e., riskiness) is generally **not** the weighted average of the standard deviations of the individual components. The portfolio's riskiness may be smaller than the weighted average of each component's riskiness. Indeed, the riskiness of a portfolio may be less than the least risky portfolio component. Under certain conditions, a portfolio of risky assets may even be riskless.

A simple example can be used to illustrate this concept. Suppose that an individual is given the opportunity to flip a coin once. If it comes up heads, the individual wins \$10,000, but if it comes up tails, he or she loses \$8,000. This is a reasonable bet; the expected dollar return is  $(0.5 \times \$10,000) + (0.5 \times [-\$8,000]) = \$1,000$ . However, it is a highly risky proposition; the individual has a 50 percent chance of losing \$8,000. Thus, because of risk aversion, most people would refuse to make the bet, especially if the \$8,000 potential loss would result in financial hardship.

Alternatively, suppose that individual is given the opportunity to flip the coin 100 times, and he or she would win \$100 for each head but lose \$80 for each tail. It is possible, although extremely unlikely, that the individual would flip all heads and win \$10,000. It is also possible, and also extremely unlikely, that he or she would flip all tails and lose \$8,000. But the chances are very high that the individual would actually flip close to 50 heads and 50 tails and net about \$1,000. Even if he or she flipped a few more tails than heads, the individual would still make money on the gamble.

Although each flip is a very risky bet in the stand-alone sense, collectively the individual has a low-risk proposition. In effect, the multiple flipping has created a portfolio of investments; each flip of the coin can be thought of as one investment, so the individual now has a 100-investment portfolio. Furthermore, the return on each investment is independent of the returns on the other investments; the individual has a 50 percent chance of winning on each flip of the coin regardless of the results of the previous flips. By combining the flips into a single gamble (i.e., into an investment portfolio), the gambler can reduce the risk associated with each bet. In fact, if the gamble consisted of a very large number of flips—say, 1,000—almost all risk would be eliminated; the probability of a near-equal number of heads and tails would be extremely high, and the result would be a sure profit. The key to the risk reduction inherent in the portfolio is the fact that the negative consequences of tossing a tail can now be offset by the positive consequences of tossing a head.

To examine portfolio effects in more depth, consider Portfolio AB in Table 4.2. Each individual investment (A and B) is quite risky when held in isolation; each has a standard deviation of returns of 11 percent. However, a portfolio of the two investments has a rate of return of 10 percent in every

possible state of the economy, and hence it offers a riskless 10 percent return. This result is verified by the value of zero for Portfolio AB's standard deviation of returns. The reason Investments A and B can be combined to form a riskless portfolio is that their returns move exactly opposite one another. Thus, in economic states when A's returns are relatively low, those of B are relatively high, and vice versa, so the gains on one investment in the portfolio exactly offset losses in the other.

The movement relationship of two variables (i.e., their tendency to move either together or in opposition) is called *correlation*. The *correlation coefficient*,  $r$ , measures this relationship. Investments A and B can be combined to form a riskless portfolio because the returns on A and B are *perfectly negatively correlated*, which is designated by  $r = -1.0$ . In every state where Investment A has a return higher than its expected return, Investment B has a return lower than its expected return, and vice versa.

The opposite of perfect negative correlation is *perfect positive correlation*, which is designated by  $r = +1.0$ . Returns on two perfectly positively correlated investments move up and down together as the economic state changes. When the returns on two investments are perfectly positively correlated, combining the investments into a portfolio will not lower risk; the standard deviation of the portfolio is merely the weighted average of the standard deviations of the two components.

To illustrate the impact of perfect positive correlation, consider Portfolio AC in Table 4.2:

1. Its expected rate of return,  $E(R_{AC})$ , is 12.5 percent
2. The variance of the portfolio is 270:

$$\begin{aligned} \text{Variance} &= (\text{Probability of Return 1} \times [\text{Rate of Return 1} - E(R_{AC})]^2) \\ &\quad + (\text{Probability of Return 2} \times [\text{Rate of Return 2} - E(R_{AC})]^2) \text{ and so on} \\ &= (0.10 \times [-17.5\% - 12.5\%]^2) + (0.20 \times [-2.5\% - 12.5\%]^2) \\ &\quad + (0.40 \times [12.5\% - 12.5\%]^2) + (0.20 \times [27.5\% - 12.5\%]^2) \\ &\quad + (0.10 \times [42.5\% - 12.5\%]^2) \\ &= 270.00. \end{aligned}$$

3. Finally, Portfolio AC's standard deviation is 16.4 percent:

$$\begin{aligned} \sigma_{AC} &= \sqrt{\text{Variance}} \\ &= \sqrt{270.00} = 16.4\%. \end{aligned}$$

Because of perfect positive correlation between the returns on A and C, Portfolio AC's standard deviation is the weighted average standard deviation of its components:

$$\begin{aligned}\sigma_{AC} &= (0.5 \times 11.0\%) + (0.5 \times 21.9\%) \\ &= 16.4\%.\end{aligned}$$

There is no risk reduction in this situation. The risk of the portfolio is less than the risk of Investment C, but it is more than the risk of Investment A. Forming a portfolio does not reduce risk when the returns on the two components are perfectly positively correlated; the portfolio merely **averages** the risk of the two investments.

What happens when a portfolio is created with two investments that have positive, but not perfectly positive, correlation? Combining the two investments can eliminate some, but not all, risk. To illustrate the concept, consider Portfolio AD in Table 4.2. This portfolio has a standard deviation of returns of 10.1 percent, so it is risky. However, Portfolio AD's standard deviation is not only less than the weighted average of its components' standard deviations,  $(0.5 \times 11\%) + (0.5 \times 12.1\%) = 11.6\%$ , it is also less than the standard deviation of each component. The correlation coefficient between the return distributions for A and D is 0.53, which indicates that the two investments are positively correlated, but the correlation is less than +1.0. Thus, combining two investments that are positively, but not perfectly, correlated lowers risk but does not eliminate it.<sup>4</sup>

Because returns correlation is the factor that drives risk reduction, a logical question here is: What is the correlation among the returns on “real-world” investments? Generalizing about the correlations among real-world investment alternatives is difficult. However, it is safe to say that the return distributions of two randomly selected investments, whether they are real assets in a hospital's portfolio of projects or financial assets in an individual's investment portfolio, are virtually never perfectly correlated, and hence correlation coefficients are never  $-1.0$  or  $+1.0$ . In fact, it is almost impossible to find actual investment opportunities with returns that are negatively correlated with one another or even to find investments with returns that are uncorrelated ( $r = 0$ ). Because all investment returns are affected to a greater or lesser degree by general economic conditions, investment returns tend to be positively correlated with one another. However, because investment returns are not affected identically by general economic conditions, returns on most real-world investments are not perfectly positively correlated.

The correlation coefficient between the returns of two randomly chosen investments will usually fall in the range of  $+0.3$  to  $+0.8$ . Returns on investments that are similar in nature, such as two inpatient projects in a hospital or two stocks in the same industry, will typically have return correlations at the upper end of this range. Conversely, returns on dissimilar projects or securities will tend to have correlations at the lower end of the range.

To illustrate real-world correlations, consider Table 4.3, which shows the correlation coefficients between several investment classes. The table uses securities—primarily stocks—to illustrate correlations because good data are

<i>Investment 1</i>	<i>Investment 2</i>	<i>Correlation Coefficient</i>
S&P 500	S&P 500	1.00
S&P 500	Domestic small stocks	0.79
S&P 500	Foreign stocks	0.53
S&P 500	Real estate	0.44
S&P 500	Treasury bonds	0.36
S&P 500	Gold stocks	0.30

**TABLE 4.3**  
Correlations  
Among Selected  
Investments

Source: Walter Updegrave, “Why Diversification Pays,” *Money Magazine*, December 1999.

just not available on other types of investments. Furthermore, the base for all correlations is the S&P 500 Index, which is a diversified portfolio of large-firm stocks. The data confirm the fact that even stocks that are considered to move counter to most other stocks—such as gold stocks—still have a significant positive correlation with the Standard & Poor’s (S&P 500) Index. Because all investments are affected to a greater or lesser degree by overall economic conditions, the correlations between returns on most investments are highly positive, but not perfectly so.

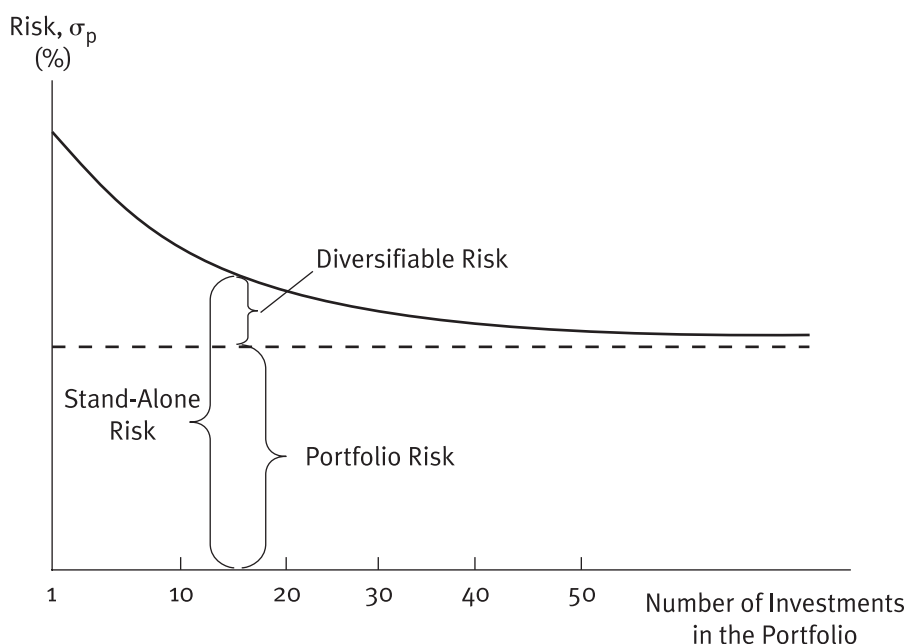
### **Portfolio Risk: Many Investments**

Businesses are not restricted to two projects, and individual investors are not restricted to holding two-security portfolios. Most firms have tens, or even hundreds or thousands, of individual projects (i.e., product or service lines), and most individual investors hold many different securities or mutual funds that may be composed of hundreds or even thousands of individual securities. Thus, what is most relevant to financial decision making is not what happens when two investments are combined into portfolios but rather what happens when many investments are combined.

To illustrate the risk impact of creating large portfolios, consider Figure 4.1. The figure illustrates the riskiness inherent in holding randomly selected portfolios of one, two, three, four investments, and so on, considering the correlations that occur among real-world investments. The plot is based on **historical** annual returns on common stocks traded on the New York Stock Exchange (NYSE), but the conclusions reached are applicable to portfolios made up of any type of investment, including healthcare providers that offer many different types of services.

The riskiness inherent in holding an average one-investment portfolio is relatively high, as measured by the standard deviation of annual returns. The average two-investment portfolio has a lower standard deviation, so holding an average two-investment portfolio is less risky than holding a single investment of average risk. The average three-investment portfolio has an even lower standard deviation of returns, so an average three-investment portfolio is even less risky than an average two-investment portfolio. As more investments are

**FIGURE 4.1**  
Portfolio Size  
and Risk



randomly added to create larger portfolios, the average riskiness of the portfolio decreases. However, as more and more investments are added, the incremental risk reduction of adding even more assets decreases. Regardless of how many investments are added, some risk always remains in the portfolio: Even with a portfolio of thousands of investments, substantial risk remains.<sup>5</sup>

The reason all risk cannot be eliminated by creating a very large portfolio is that the returns on the component investments, although not perfectly so, are still positively correlated with one another. In other words, all investments, both real and financial, are affected to a lesser or greater degree by general economic conditions.

### **Diversifiable Risk Versus Portfolio Risk**

Figure 4.1 shows what happens as investors create ever larger portfolios. As the size of a randomly created portfolio increases, the riskiness of the portfolio decreases. Thus, a large proportion of the stand-alone risk inherent in an individual investment can be eliminated if it is held as part of a large portfolio. For example, if a stock investor wanted to eliminate as much stand-alone risk as possible, he or she would have to own over 6,500 stocks. Fortunately, it is not necessary to purchase all the stocks individually because mutual funds are available that mimic all of the major stock indexes.<sup>6</sup>

A portfolio that consists of a large number of stocks is called a *market portfolio* because it consists of the entire stock market, or at least one entire segment of the stock market. Studies have found that a market portfolio has

only about one-half the standard deviation of an average stock. However, it is not necessary for individual investors to actually own the market portfolio to take advantage of the risk-reducing benefits of diversification. As illustrated in Figure 4.1, most of the benefit can be obtained by holding about 50 randomly selected stocks. Such a collection of investments is called a *well-diversified portfolio*.

The part of the stand-alone riskiness of a single investment that can be eliminated by diversification (i.e., by holding it as part of a well-diversified portfolio) is called *diversifiable risk*. The part of the riskiness of a single investment that cannot be eliminated by diversification is called *portfolio risk*. Thus, every investment, whether it is the stock of Manor Care held by an individual investor or an MRI system operated by a hospital, has some diversifiable risk that can be eliminated and some portfolio risk that cannot be diversified away.

Diversifiable risk, as seen by individuals who invest in stocks, is caused by events that are unique to a single business, such as new product or service introductions, strikes, and lawsuits. Because these events are essentially random and influence only one business, their effects can be eliminated by diversification. When one stock in a portfolio does worse than expected because of a negative event unique to that firm, another stock in the portfolio will do better than expected because of a firm-unique positive event. On average, bad events in some firms will be offset by good events in others, so lower-than-expected returns will be offset by higher-than-expected returns, leaving the investor with an overall portfolio return closer to that expected than would be the case if only a single stock were held.

The same logic can be applied to a business with a portfolio of projects. Perhaps hospital returns generated from inpatient surgery are less than expected because of the trend toward outpatient procedures, but this may be offset by returns that are greater than expected on state-of-the-art diagnostic services. (If the hospital offered both inpatient and outpatient surgery, it would be *hedging* itself against the trend toward more outpatient procedures because reduced demand for inpatient surgery would be offset by increased demand for outpatient surgery.)

The point to be made here is that the negative impact of random events that are unique to a particular firm, or to a particular product or service within a firm, can be offset by positive events in other firms or in other products or services. Thus, the risk caused by random, unique events can be eliminated by portfolio diversification. Individual investors can diversify by holding many securities, and businesses can diversify by operating many projects.

Note that not all investments benefit to the same degree from portfolio risk-reducing effects. Some have a large amount of diversifiable risk and hence have a great deal of risk reduction when added to a well-diversified portfolio. Others do not benefit nearly as much from portfolio risk reduction. For example, consider adding the stock of Tenet Healthcare, a hospital management company, to two portfolios. The first portfolio consists of the



stocks of 50 healthcare providers. The second portfolio consists of the stocks of 50 randomly selected firms from many different industries. Much less risk reduction will occur when the Tenet stock is added to the healthcare provider portfolio than when it is added to the randomly selected portfolio. The reason should be obvious. Tenet's returns are more highly correlated with healthcare providers than with firms in other industries. The lower the correlation, the greater the risk reduction.

This logic tells us that, potentially, there is more risk reduction inherent in adding a nursing home to a hospital business than there is adding it to a long-term care firm that already owns a large number of such investments. However, we should recognize that it is probably more difficult for managers of a hospital business to manage a nursing home than it is for managers of a firm that specializes in such investments.

Unfortunately, not all risk can be diversified away. Portfolio risk, the risk that remains even in well-diversified portfolios, stems from factors, such as wars, inflation, recessions, and high interest rates, that systematically affect all stocks in a portfolio or all products or services produced by a business. For example, the increasing power of managed care organizations or governmental payers could lower reimbursement levels for all services offered by a hospital. Because the portfolio risk inherent in single investments cannot be eliminated, even well-diversified investors, whether they are individuals with large securities portfolios or diversified healthcare businesses with many different service lines, face a considerable amount of risk.

### *Implications for Investors*

The ability to eliminate a portion of the stand-alone riskiness inherent in individual investments has two significant implications for investors, whether the investor is an individual who holds securities or a business that offers products or services:

1. Holding a single investment is **not** rational. Holding a portfolio can eliminate much of the stand-alone riskiness inherent in individual investments. Investors who are risk averse should seek to eliminate all diversifiable risk. Individual investors can easily diversify their personal investment portfolios by buying either many individual securities or mutual funds that hold diversified portfolios. Businesses cannot diversify their investments as easily as individuals, but businesses that offer a diverse line of products or services are less risky than businesses that rely on a single product or service.
2. Because an investment held in a portfolio has less risk than when held in isolation, the traditional stand-alone risk measure of standard deviation is no longer appropriate for individual assets. Thus, it is necessary to rethink the definition and measurement of financial risk for such assets. (Note, though, that standard deviation remains the correct measure for

the riskiness of an investor's portfolio because the portfolio is, in effect, a single asset held in isolation.)

1. What is a portfolio of investments?
2. What is a well-diversified portfolio?
3. What happens to the risk of a single investment when it is held as part of a portfolio of investments?
4. Explain the differences between stand-alone risk, diversifiable risk, and portfolio risk.
5. Why should all investors hold portfolios of investments rather than individual investments?
6. Is standard deviation the appropriate risk measure for an individual investment?
7. Is standard deviation the appropriate risk measure for an investor's portfolio of investments? Explain your answer.

## Self-Test Questions

### Portfolio Risk of Business Investments

Businesses typically offer a myriad of different products or services and thus can be thought of as having a large number (hundreds or even thousands) of individual activities. For example, most HMOs offer healthcare services to a large number of diverse groups of enrollees in numerous service areas, and many hospitals and hospital systems offer a large number of inpatient, outpatient, and even home health care services that cover a wide geographical area and treat a wide range of illnesses and injuries. Thus, healthcare managers operate a portfolio of individual products or services, or *projects*. Furthermore, when investors buy the stock of a for-profit healthcare business, they are really buying a portfolio of individual projects. So a portfolio of 50 or more healthcare stocks is really a portfolio of tens of thousands of individual projects run by the firms whose stocks are held in the portfolio.

From this description, it is obvious that individual projects undertaken by investor-owned businesses actually reside in two different portfolios. First, a project is part of the business's overall portfolio of projects. For example, the Women's Center at North Florida Regional Medical Center is just one of thousands of projects that make up HCA's portfolio of projects. Second, a project is one very small part of stockholders' well-diversified portfolios of security investments. Investors who own HCA stock own the Women's Center at North Florida Regional Medical Center along with thousands of other HCA projects, plus tens of thousands of projects owned by other firms in their stock portfolios.

Thus, the relevant portfolio risk of a business project depends on one's perspective. A healthcare manager sees project riskiness from the standpoint of the business's portfolio of projects, while a stock investor sees the riskiness

inherent in holding the project as part of a well-diversified stock portfolio. Because the context is different for each portfolio, the riskiness of a given project is also different. In the next sections, these two types of portfolio risk are discussed in detail.

### Corporate Risk: The Risk to Businesses

To begin, put your manager's hat on. What is the riskiness of a project to the business? Because the project is part of the business's portfolio of assets, and hence its diversifiable risk will be eliminated, stand-alone risk is **not** relevant. Rather, the relevant risk of a project to the business is its *contribution to the business's overall risk*, or the impact of the project on the variability of the business's overall rate of return. Some of the stand-alone riskiness of the project will be diversified away by combining the project with the business's other projects. The remaining portfolio risk, which uses the business's portfolio of projects as the benchmark, is called *corporate risk*.

To illustrate corporate risk, assume that Project P represents the expansion into a new service area by AtlantiCare, a for-profit HMO with many existing projects. Table 4.4 contains the estimated rate of return distributions both for Project P and for AtlantiCare as a whole. AtlantiCare's rate of return, like that of Project P, is uncertain and depends on future economic events. Overall, AtlantiCare's expected rate of return is 7.0 percent, with a standard deviation of 2.0 percent and a coefficient of variation of 0.3. Thus, looking at either the standard deviation or the coefficient of variation (stand-alone risk measures), Project P is riskier than the HMO in the aggregate; that is, Project P is riskier than AtlantiCare's *average project*.

However, the relevant risk of Project P is not its stand-alone risk but rather its contribution to AtlantiCare's overall riskiness. Project P's corporate risk depends not only on its standard deviation of returns but also on the correlation between the returns on Project P and the returns on the HMO's average project (AtlantiCare's rate of return distribution). If Project P's returns were

**TABLE 4.4**

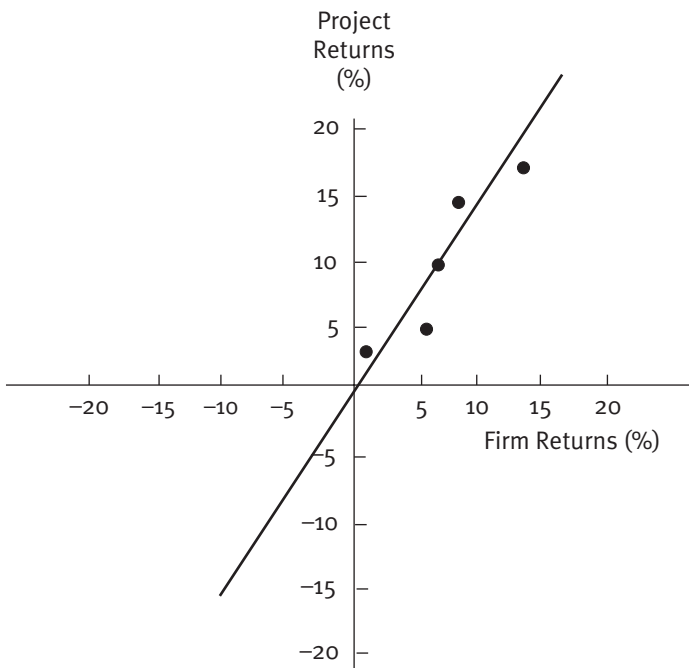
Estimated  
Return  
Distributions for  
Project P and  
AtlantiCare

State of the Economy	Probability of Occurrence	Rate of Return	
		Project P	AtlantiCare
Very poor	0.05	2.5%	1.0%
Poor	0.20	5.0	6.0
Average	0.50	10.0	7.0
Good	0.20	15.0	8.0
Very good	0.05	17.5	13.0
Expected return		10.0%	7.0%
Standard deviation		4.0%	2.0%
Coefficient of variation		0.4	0.3
Correlation coefficient			0.80

negatively correlated with the returns on AtlantiCare's other projects, which they are not, then accepting it would reduce the riskiness of the HMO's aggregate returns, and the larger Project P's standard deviation, the greater the risk reduction. (An economic state that results in a low return on AtlantiCare's average project would produce a high return on Project P, and vice versa, so the returns would offset one another and AtlantiCare's overall risk would be reduced.) In such a situation, Project P would actually have negative risk relative to the HMO's average project, in spite of its high stand-alone risk. In actuality, however, Project P's returns are positively correlated with AtlantiCare's aggregate returns, and the project has twice the standard deviation, so accepting it would increase the risk of AtlantiCare's aggregate returns.

The quantitative measure of a project's corporate risk is its *corporate beta*, or *corporate b*, which is the slope of the regression (scatter plot) line that results when the project's returns are plotted on the Y axis and the returns on the firm's average project are plotted on the X axis. Figure 4.2 contains this regression line, which is called the *corporate characteristic line*, for Project P. The slope (rise over run) of Project P's corporate characteristic line, which is Project P's corporate beta coefficient, is about 1.60, and it can be found algebraically as follows:

$$\text{Corporate } b_P = (\sigma_P / \sigma_F) \times r_{PF},$$



**FIGURE 4.2**  
Corporate  
Characteristic  
Line for  
Project P

where

$\sigma_P$  = standard deviation of Project P's returns,

$\sigma_F$  = standard deviation of AtlantiCare's returns  
(F stands for "firm"), and

$r_{PF}$  = correlation coefficient between the returns on Project P  
and AtlantiCare's returns.

Thus,

$$\text{Corporate } b_P = (4.0\%/2.0\%) \times 0.80 = 1.60.$$

A project's corporate beta measures the volatility of returns on the project **relative to the firm as a whole**, or relative to the firm's average project, which has a corporate beta of 1.0. (To estimate the corporate beta of the business's average project, the business's aggregate returns are plotted on both the X and Y axes, so the resulting slope of the corporate characteristic line is 1.0.)

If a project's corporate beta is 2.0, its returns are twice as volatile as the business's returns. Thus, if economic events lead to a 10 percent decrease in the business's profitability, the profitability of a project with a corporate beta of 2.0 would be expected to fall by 20 percent. Because of the higher relative volatility, adding such a project to the business will increase the overall volatility of the business's returns and hence will increase the riskiness of the business. A corporate beta of 1.0 indicates that the project's returns have the same volatility as the business, so taking on the project would add identical risk to the business's existing projects. A corporate beta of 0.5 indicates that the project's returns are less volatile than the business's returns, so taking on the project would lower the overall risk of the business.

Finally, a negative corporate beta, which results when a project's returns are negatively correlated with the business's returns, indicates that the returns on the project move countercyclical to the returns of the business. The addition of such a project to the business's portfolio of projects can reduce a firm's riskiness by a large amount (if the project is large enough). However, such projects are very hard to find because most projects are in a single line of business, or in related lines, so their returns are positively correlated.

With a corporate beta of 1.6, the returns on Project P are 1.6 times as volatile as the returns on AtlantiCare's average project. Thus, adding project P to AtlantiCare's portfolio of projects would increase the risk of the HMO, and hence Project P would be judged to have more corporate risk than AtlantiCare's average project. Note that Project P's stand-alone risk is twice as much as that of AtlantiCare ( $\sigma_P = 4\%$  versus  $\sigma_F = 2\%$ ). However, Project P's corporate (portfolio) risk is only 1.6 times as much ( $b^P = 1.6$  versus  $b_F = 1.0$ ), so a large amount of Project P's stand-alone risk has been eliminated by portfolio effects.

**Market Risk: The Risk to Owners (Stockholders)**

The last section discussed the portfolio risk of projects as seen by the business. This section discusses the portfolio risk of projects as seen by the owners (for corporations, stockholders) of a for-profit business. Why should a healthcare manager be concerned about how a business’s owners view risk? The answer is simple: Stock investors are the suppliers of equity capital to investor-owned businesses, so they set the rates of return that such businesses must pay to raise equity capital. These rates, in turn, set the minimum profitability that investor-owned businesses must earn on the equity portion of their real asset investments. Even managers of not-for-profit firms should have an understanding of how stock investors view risk because market-set required rates of return can play a role in estimating the opportunity costs inherent in not-for-profit businesses. (We will have much more to say about this in Chapter 9.)

Because stock investors hold well-diversified portfolios of stocks, the relevant riskiness of an individual project undertaken by a business whose stock is held in the portfolio is its contribution to the overall riskiness of the portfolio. Thus, the riskiness of the Women’s Center at North Florida Regional Medical Center to an individual investor who has a portfolio of 50 stocks, or to a trust officer who manages a 150-stock portfolio, or to a 500-stock mutual fund owner is the contribution that the project makes to the riskiness of the overall stock portfolio. Some of the stand-alone risk of the project will be diversified away by combining the project with all the other projects in the stock portfolio. The remaining portfolio risk is called *market risk*, which is defined as the *contribution of a project to the riskiness of a well-diversified stock portfolio*.

How should a project’s market risk be measured? A project’s *market beta*, or *market b*, measures the volatility of the project’s returns relative to the returns on a well-diversified stock portfolio. Table 4.5 contains hypothetical estimates of the rate of return on a well-diversified portfolio of stocks, which is commonly called the *market portfolio*, or just *the market*, along with

**TABLE 4.5**

Estimated Return Distributions for Project P and the Market

State of the Economy	Probability of Occurrence	Rate of Return	
		Project P	Market
Very poor	0.05	2.5%	-15.0%
Poor	0.20	5.0	5.0
Average	0.50	10.0	15.0
Good	0.20	15.0	25.0
Very good	0.05	17.5	45.0
Expected return		10.0%	15.0%
Standard deviation		4.0%	11.4%
Coefficient of variation		0.4	0.8
Correlation coefficient		0.94	

the returns on AtlantiCare's Project P. In practice, some stock index—say, the S&P 500 Index or the NYSE Index—is used as a proxy for the market portfolio. (The S&P 500 is an index made up of 500 stocks across many industries, while the NYSE Index is made up of the roughly 2,800 common stocks listed on the NYSE.)

The market beta of Project P is found by constructing the *market characteristic line* for the project, which is the regression (scatter plot) line that results from plotting the returns on Project P against the returns on the market. Project P's market characteristic line, which is shown in Figure 4.3, has a slope of 0.33, and hence Project P's market beta is 0.33.

Note that Project P's market beta can be calculated as follows:

$$\text{Market } b_P = (\sigma_P / \sigma_M) \times r_{PM},$$

where

$\sigma_P$  = standard deviation of Project P's returns,

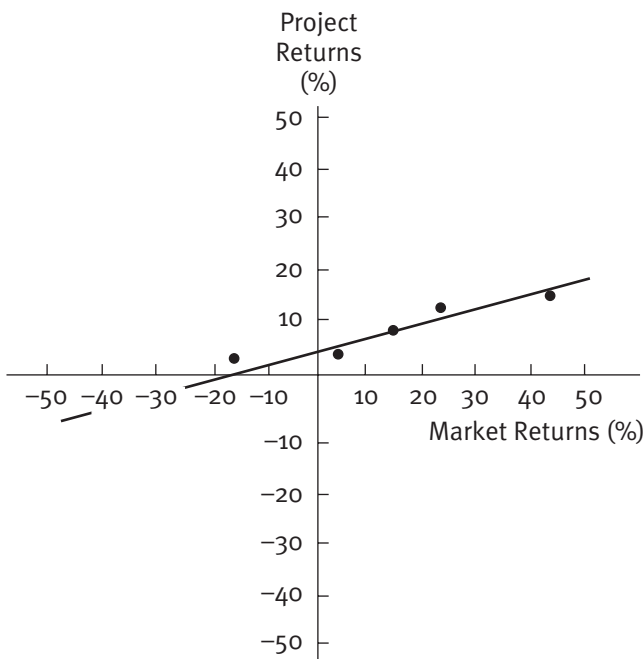
$\sigma_M$  = standard deviation of the market's returns, and

$r_{PM}$  = correlation coefficient of returns between Project P and the market.

Thus, using the data from Table 4.5,

$$\text{Market } b_P = (4.0\% / 11.4\%) \times 0.94 = 0.33.$$

**FIGURE 4.3**  
Market  
Characteristic  
Line for  
Project P



Project P's market beta measures its market risk, which is the risk relevant to AtlantiCare's well-diversified shareholders. Intuitively, a project's market beta measures the volatility of the project's returns relative to the returns on a well-diversified portfolio of stocks (the market portfolio), which has a beta of 1.0.

A project with a market beta of 2.0 has returns that are twice as volatile as the returns on the market, so adding it to a well-diversified portfolio will increase the portfolio's risk. A market beta of 1.0 indicates that the project's returns have the same volatility as the market, so adding such a project would have no impact on the riskiness of the market portfolio. A market beta of 0.5 indicates that the project's returns are half as volatile as the returns on the market, so adding such a project to a well-diversified portfolio would reduce its risk.

With a market beta of 0.33, Project P has only one-third the riskiness inherent in the market portfolio, and its acceptance by the HMO would reduce the riskiness of shareholder portfolios. (As you will see shortly, the beta of a portfolio is merely the weighted average of the betas of the individual components of the portfolio. Thus, adding a component with a lower beta than the portfolio average lowers the beta of the portfolio and hence lowers the riskiness of the portfolio.)

As in our discussion of corporate risk, a negative market beta indicates that the returns on the project move countercyclically to the returns on the market: when the market's return goes up, the project's return goes down, and vice versa. Negative beta projects are valuable to stockholders because of their risk-reduction characteristics. However, negative market beta projects are rare because most projects' returns, as well as the market's returns, are positively correlated with the economy as a whole.

Note that Project P's stand-alone risk is about 35 percent of that of the market ( $\sigma_P = 4\%$  versus  $\sigma_M = 11.4\%$ ). However, Project P's portfolio (market) risk is 33 percent as much as the market ( $b_P = 0.33$  versus  $b_M = 1.0$ ), so only a small amount of Project P's stand-alone risk has been eliminated by portfolio effects.<sup>7</sup>

1. A project in a for-profit business is held as part of what two portfolios?
2. How is corporate risk defined?
3. What is a corporate beta, and how is it determined?
4. How is market risk defined?
5. What is a market beta, and how is it determined?

## Self-Test Questions

### Portfolio Risk of Stocks (Entire Businesses)

Even though an individual investor's stock portfolio can be thought of as a portfolio of many separate projects, the portfolio actually consists of the stocks of firms, so individual investors are most concerned with the aggregate risk



and return characteristics of the firms themselves. Thus, individual investors are concerned with the stock's market beta rather than the market betas of individual projects. A stock's market beta is the slope of the market characteristic line formed by regressing the business's aggregate returns against market returns. For example, using the data in Tables 4.4 and 4.5, we find AtlantiCare's market beta to be 0.17. Because the average stock has a market beta of 1.0, AtlantiCare's market beta is very low, and adding the stock of AtlantiCare to a well-diversified portfolio would tend to lower the overall riskiness of the portfolio.

When individual investors assess the riskiness of individual stocks, the relevant measure is the stock's market beta, and the reference value is the market portfolio's overall beta of 1.0. When investor-owned firms conduct project market-risk analyses, the question that is relevant to managers is: How does the project's market risk compare to the market risk of the firm's average project? This question is answered by comparing the project's market beta to the business's market beta. Our illustrative Project P, with a market beta of 0.33, has significantly more market risk than AtlantiCare's average project, which has a market beta of only 0.17. Thus, although the market risk of Project P is quite low, the project's market risk relative to the market risk of the entire business is high.

### Self-Test Question

1. What is the difference between a project's market beta and the business's, or stock's, market beta?

## Portfolio Betas

Individual investors hold portfolios of stocks, each with its own market risk as measured by the stock's market beta coefficient, while businesses hold portfolios of projects, each with its own corporate and market betas. What impact does the beta of a portfolio component have on the overall portfolio's beta? The beta of any portfolio of investments is simply the weighted average of the individual investments' betas:

$$b_{\text{Portfolio}} = (w_1 \times b_1) + (w_2 \times b_2) + (w_3 \times b_3) + (w_i \times b_i) \text{ and so on.}$$

Here,  $b_{\text{Portfolio}}$  is the beta of the portfolio, which measures the volatility of the entire portfolio;  $w_i$  is the fraction of the portfolio invested in each particular asset; and  $b_i$  is the beta coefficient of that asset.

To illustrate the concept, consider the following example. HCA might have a market beta of 1.2, which indicates that the returns on its stock are slightly more volatile than the returns on a well-diversified portfolio (with a beta of 1.0), and hence the stock is somewhat riskier than the average stock. But each project within HCA has its own market risk, as measured by each project's market beta. Some projects may have very high market betas, say,

over 1.5, while other projects may have very low market betas, say, under 0.5. When all of the projects are combined, the overall market beta of the firm is 1.2. For ease of illustration, assume that HCA has only the following three projects:

<i>Project</i>	<i>Market Beta</i>	<i>Dollar Investment</i>	<i>Proportion</i>
A	0.5	\$ 15,000	15.0%
B	1.0	30,000	30.0
C	1.5	55,000	55.0
		<u>\$100,000</u>	<u>100.0%</u>

The weighted average of the project market betas, which is the firm's market beta, is 1.2:

$$b_{\text{Portfolio}} = (0.15 \times 0.5) + (0.30 \times 1.0) + (0.55 \times 1.5) \\ = 1.20.$$

Note that each project within HCA's fictitious portfolio of three projects also has a corporate beta that measures the volatility of the project's returns relative to that of the overall business. The weighted average of these project corporate betas must equal 1.00, which is the corporate beta of any business.

1. How is the beta of a portfolio related to the individual betas of the investments that make up the portfolio?

## Self-Test Question

## Relevance of the Risk Measures

Thus far, the chapter has discussed in some detail three measures of financial risk—stand-alone, corporate, and market—but it is still unclear which risk is the most relevant in financial decision making. It turns out that the risk that is relevant to any financial decision depends on the particular situation at hand. When the decision involves a single investment that will be held in isolation, stand-alone risk is the relevant risk. Here, the risk and return on the portfolio is the same as the risk and return on the single asset in the portfolio. In this situation, the riskiness faced by the investor, whether it be an individual considering a stock purchase or a business considering an MRI system investment, is defined in terms of returns less than expected, and the appropriate measure is the standard deviation or coefficient of variation of the return distribution.

In most decisions, however, the investment under consideration will not be held in isolation but rather will be held as part of an investment portfolio. Individual investors normally hold portfolios of securities, while businesses normally hold portfolios of real asset investments (projects). Thus,

it is clear that portfolio risk is more relevant to real-world decisions than is stand-alone risk. However, there are three distinct ownership situations that affect the relevancy of portfolio risk.

### ***Large Investor-Owned Businesses***

For large investor-owned businesses, the primary financial goal is shareholder wealth maximization. This means that managerial decisions should focus on risk and return as seen by the business's stockholders. Because stockholders tend to hold large portfolios of securities, and hence a very large portfolio of individual projects, the most relevant risk of a project under consideration by a large for-profit firm is the project's contribution to a well-diversified stock portfolio (the market portfolio). Of course, this is the project's market risk. Many would argue, and we agree, that corporate and stand-alone risk cannot be disregarded in all situations. For example, corporate risk, which best measures the impact of the project on the financial condition of the business, clearly is relevant to the business's other stakeholders, such as managers, employees, creditors, and suppliers, who should not be totally ignored. Also, the failure of a project that is large, relative to the business, can bring down the entire firm. Under such circumstances, the project clearly has high risk to stockholders even if its market risk is low. The bottom line here is that market risk should be of primary importance in large investor-owned businesses, but corporate and stand-alone risk should not be totally ignored.

### ***Small Investor-Owned Businesses***

For small investor-owned businesses, the situation is more complicated. Take, for example, a three-physician group practice. Here, there is no separation between management and ownership and the equity investment position is complicated by the fact that the business is also the owners' employer. In this situation, the primary goal of the business is more likely to be maximization of the owners' overall well-being rather than strict shareholder wealth maximization. For example, owner/managers may value leisure time, as exemplified by three afternoons of golf, as being more important than additional wealth creation. To complicate the situation even more, shareholder wealth consists of both the value of the ownership position and the professional fees (salaries) derived from the business.

Thus, in small for-profit businesses, corporate risk is probably more relevant than market risk. The owner/managers would not want to place the viability of the business in jeopardy just to increase their expected ownership value by a small amount. Put another way, the owner/managers are not well diversified in regards to the business because a large proportion of their wealth comes from future employment earnings. Because of this, market risk loses relevance and corporate risk becomes most important. However, the potential relevancy of stand-alone risk as described in the previous section also applies.

### Not-for-Profit Businesses

Not-for-profit businesses do not have owners, and their goals stem from a mission statement that generally involves service to society. In this situation, market risk clearly is not relevant; the concern to managers is the impact of the project on the riskiness of the business, which is measured by a project's corporate risk. Thus, the risk measure most relevant here is corporate risk. Again, however, the stand-alone risk of large projects that can sink the business is relevant.

1. Explain the situations in which each of the risk types—stand-alone, corporate, and market—are relevant.

### Self-Test Question

### Interpretation of the Risk Measures

It is important to recognize that none of the risk measures discussed can be interpreted without some standard of reference. For example, if we are focusing on stand-alone risk, does Project P's coefficient of variation of returns of 0.4 indicate high risk, low risk, or moderate risk? We don't know the answer without more information. However, knowing that AtlantiCare in the aggregate has a coefficient of variation of returns of 0.3 enables us to state that Project P has more stand-alone risk than the HMO's average project.

Similarly, Project P's corporate beta of 1.6, when compared to AtlantiCare's overall corporate beta of 1.0 (by definition), indicates that the project has above-average corporate risk. Similarly, Project P's market beta of 0.33, when compared to AtlantiCare's market beta of 0.17, indicates that the project has above-average market risk as compared to the entire business. The point to remember is that in practice risk is always interpreted against some standard because without a standard it is impossible to make judgments.

Which risk is most relevant to AtlantiCare? As discussed in the previous section, market risk is most relevant because AtlantiCare is a large investor-owned business, and hence managers should be most concerned about the impact of new projects on stockholders' risk. With a market beta of 0.17, Project P's relevant (market) risk is much less than the average ( $b = 1.0$ ) risk borne by AtlantiCare's well-diversified stockholders, so the project's market risk is quite low.

1. How are risk measures interpreted?

### Self-Test Question

### The Relationship Between Risk and Return



This chapter contains a great deal of discussion that focuses on defining and measuring financial risk. However, being able to define and measure financial

risk is of no value in financial decision making unless risk can be related to return—that is, the answer to this question is needed: How much return is required to compensate investors for assuming a given level of risk? In this section, we focus on setting required rates of return on stock investments because the basic theory of risk and return was developed for stock investments. However, in later chapters the focus will be on setting required rates of return on individual projects within firms.

The relationship between the market risk of a stock, as measured by its market beta, and its required rate of return is given by the *Capital Asset Pricing Model (CAPM)*. To begin, some basic definitions are needed:

- $E(R_i)$  = Expected rate of return on Stock  $i$ , any stock.
- $R(R_i)$  = Required rate of return on Stock  $i$ . If  $E(R_i)$  is less than  $R(R_i)$ , the stock should not be purchased or it should be sold if it was owned. If  $E(R_i)$  is greater than  $R(R_i)$ , the stock should be bought, and an individual should be indifferent about the purchase if  $E(R_i) = R(R_i)$ .
- $R_F$  = Risk-free rate of return. In a CAPM context,  $R_F$  is generally measured by the return on long-term U.S. Treasury bonds.
- $b_i$  = Market beta coefficient of Stock  $i$ . The market beta of an average-risk stock is  $b_A = 1.0$ .
- $R(R_M)$  = Required rate of return on a portfolio that consists of all stocks, which is the market portfolio.  $R(R_M)$  is also the required rate of return on an average ( $b_A = 1.0$ ) stock.
- $RP_M$  = Market risk premium =  $R(R_M) - R_F$ . This is the additional return over the risk-free rate required to compensate investors for assuming average ( $b_A = 1.0$ ) risk.
- $RP_i$  = Risk premium on Stock  $i = [R(R_M) - R_F] \times b_i = RP_M \times b_i$ . Stock  $i$ 's risk premium is less than, equal to, or greater than the premium on an average stock, depending on whether its beta is less than, equal to, or greater than 1.0. If  $b_i = b_A = 1.0$ , then  $RP_i = RP_M$ .

Using these definitions, the CAPM relationship between risk and required rate of return is given by the following equation, which is called the *Security Market Line (SML)*:

$$\begin{aligned} R(R_i) &= R_F + (R[R_M] - R_F) \times b_i \\ &= R_F + (RP_M \times b_i). \end{aligned}$$

To illustrate use of the SML, assume that the risk-free rate ( $R_F$ ) is 6 percent; the required rate of return on the market,  $R[R_M]$ , is 10 percent; and the market beta of Regis Healthcare is 1.1. According to the SML, the required rate of return on Regis stock is 10.4 percent:

$$R(R_{\text{Regis}}) = 6\% + (10\% - 6\%) \times 1.1$$

$$\begin{aligned}
 &= 6\% + (4\% \times 1.1) \\
 &= 6\% + 4.4\% = 10.4\%.
 \end{aligned}$$

If the expected rate of return,  $E(R_{\text{Regis}})$ , were 15 percent, investors should buy the stock because  $E(R_{\text{Regis}})$  is greater than  $R(R_{\text{Regis}})$ . Conversely, if the expected rate of return were  $E(R_{\text{Regis}}) = 8\%$ , investors should sell the stock because  $E(R_{\text{Regis}})$  is less than  $R(R_{\text{Regis}})$ .

A stock with a beta of 2.0, one that is riskier than Regis Healthcare, would have a required rate of return of 14 percent:

$$\begin{aligned}
 R(R_{b=2.0}) &= 6\% + (4\% \times 2.0) \\
 &= 6\% + 8\% = 14\%
 \end{aligned}$$

while an average stock, with  $b_i = 1.0$ , would have a required return of 10 percent, which is the same as the market return:

$$\begin{aligned}
 R(R_{b=1.0}) &= 6\% + (4\% \times 1.0) \\
 &= 6\% + 4\% = 10\% = R(R_M).
 \end{aligned}$$

A stock with below-average risk, for example,  $b_i = 0.5$ , would have a required return of 8 percent:

$$\begin{aligned}
 R(R_{b=0.5}) &= 6\% + (4\% \times 0.5) \\
 &= 6\% + 2\% = 8\%.
 \end{aligned}$$

The market-risk premium,  $RP_M$ , depends on the degree of aversion that investors in the aggregate have to risk. In this example, T-bonds yielded  $RF = 6\%$ , and an average share of stock had a required rate of return of  $R(R_M) = 10\%$ , so  $RP_M$  is 4 percentage points. If the degree of risk aversion increased,  $R(R_M)$  might increase to 12 percent, which would cause  $RP_M$  to increase to 6 percentage points. Thus, the greater the overall degree of risk aversion, the higher the required rate on the market and hence the higher the required rates of return on all stocks.

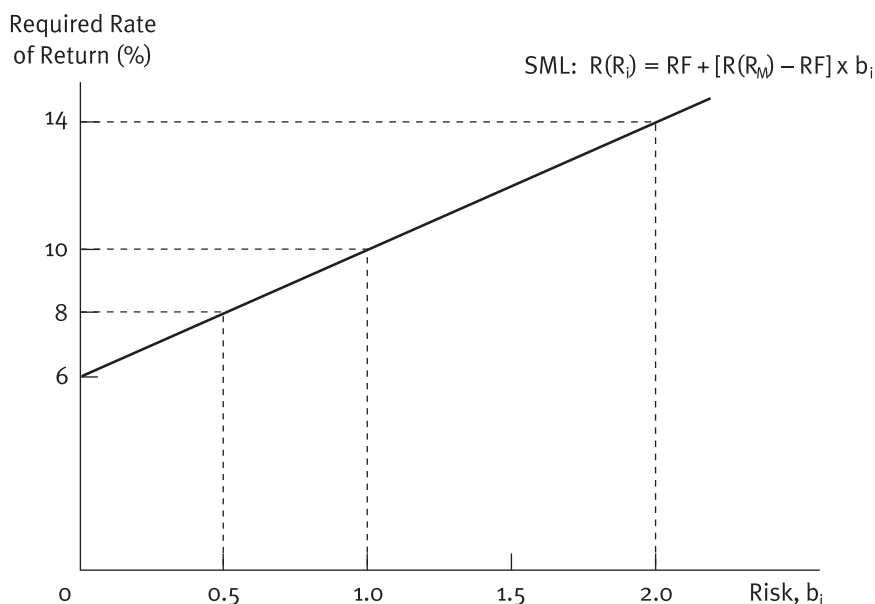
Also, values for the risk-free rate,  $RF$ , and the required rate of return on the market,  $R(R_M)$ , are influenced by inflation expectations. The higher the expectations of investors regarding inflation, the greater these values and hence the greater the required rates of return on all stocks.

The SML is often depicted in graphical form, as in Figure 4.4, which shows the SML when  $RF = 6\%$  and  $R(R_M) = 10\%$ . Here are the relevant points concerning the figure:

- Required rates of return are shown on the vertical axis, while risk as measured by market beta is shown on the horizontal axis.
- Riskless securities have  $b_i = 0$ ; therefore,  $RF$  is the vertical axis intercept.
- The slope of the SML reflects the degree of risk aversion in the economy.

**FIGURE 4.4**

The Security Market Line



The greater the average investor's aversion to risk (1) the steeper the slope of the SML, (2) the greater the risk premium for any stock, and (3) the higher the required rate of return on stocks.

- The Y axis intercept reflects the level of expected inflation. The higher inflation expectations, the greater both  $RF$  and  $R(R_M)$ . Thus, the higher the SML plots on the graph.
- The values previously calculated for the required rates of return on stocks with  $b_i = 0.5$ ,  $b_i = 1.0$ , and  $b_i = 2.0$  agree with the values shown on the graph.

Both the SML and a firm's position on it change over time because of changes in interest rates, investors' risk aversion, and individual firm's betas. Thus, the SML, as well as a firm's risk, must be evaluated on the basis of current information. The SML, its use, and how its input values are estimated are covered in greater detail in Chapter 9.

### Self-Test Questions

1. What is the Capital Asset Pricing Model (CAPM)?
2. What is the appropriate measure of risk in the CAPM?
3. Write out the equation for the Security Market Line (SML) and graph it.
4. How do changes in risk aversion and inflation expectations affect the SML?

## Some Thoughts About Beta and the CAPM

The CAPM is more than just an abstract theory described in textbooks. It is widely used by analysts, investors, and corporate managers. However, despite its intuitive appeal, a number of serious concerns surround the CAPM. First, it is built on a very restrictive set of assumptions that does not conform well to real-world conditions. Second, it has been shown that it is impossible to prove; that is, studies that do demonstrate the linear relationship between market risk and required return prove nothing because the results stem from the mathematical properties of the model and not because it is theoretically correct. Third, some studies find no relationship between stocks' returns and market betas. Finally, the market betas that are actually used in the CAPM measure the historical relative volatility of a stock but conditions often change, so its future volatility, which is of real concern to investors, might be quite different from its past volatility.

In spite of these concerns, the CAPM is extremely appealing because it is simple and logical. It focuses on the impact that a single investment has on a portfolio, which in most situations is the correct way to think about risk. Furthermore, it tells us that the required rate of return on an investment is composed of the risk-free rate, which compensates investors for time value, plus a risk premium that is a function of investors' attitudes toward risk bearing in the aggregate and the specific portfolio risk of the investment being evaluated. Because of these points, the CAPM is an important conceptual tool. However, its actual use to set required rates of return must be viewed with some caution. We will have more to say about this in Chapter 9.

1. What are the pros and cons regarding the Capital Asset Pricing Model (CAPM)?

### Self-Test Question

### Key Concepts

This chapter has covered the very important concepts of financial risk and return. Here are its key concepts:

- Risk definition and measurement are very important in financial management because decision makers, in general, are *risk averse* and hence require higher returns from investments that have higher risk.
- *Financial risk* is associated with the prospect of returns less than anticipated. The higher the probability of a return being far less than anticipated, the greater the risk.
- The riskiness of investments held in isolation, called *stand-alone risk*, can be measured by the dispersion of the rate of return distribution



about its *expected value*. One commonly used measure of stand-alone risk is the *standard deviation* of the return distribution.

- Most investments are not held in isolation but rather as part of *portfolios*. Individual investors hold portfolios of securities and businesses hold portfolios of projects (i.e., products and services).
- When investments with returns that are less than perfectly positively correlated are combined in a portfolio, risk is reduced. The risk reduction occurs because less-than-expected returns on some investments are offset by greater-than-expected returns on other investments. However, among real-world investments, it is impossible to eliminate all risk because the returns on all assets are influenced to a greater or lesser degree by overall economic conditions.
- The portion of the stand-alone risk of an investment that can be eliminated by holding the investment in a portfolio is called *diversifiable risk*, while the risk that remains is called *portfolio risk*.
- There are two different types of portfolio risk. *Corporate risk* is the riskiness of business projects when they are considered as part of a business's portfolio of projects. *Market risk* is the riskiness of business projects, or of the stocks of entire businesses, when they are considered as part of an individual investor's well-diversified portfolio of securities.
- Corporate risk is measured by a project's *corporate beta*, which reflects the volatility of the project's returns relative to the volatility of returns of the aggregate business.
- Market risk is measured by a project's, or stock's, *market beta*, which reflects the volatility of a project's, or stock's, returns relative to the volatility of returns on a well-diversified stock portfolio.
- *Stand-alone risk* is most relevant to investments held in isolation; *corporate risk* is most relevant to projects held by not-for-profit businesses and by small investor-owned businesses; and *market risk* is most relevant to projects held by large investor-owned firms.
- The *beta coefficient of a portfolio of investments* is the weighted average of the betas of the components of the portfolio, where the weights are the proportion of the overall investment in each component. Therefore, the weighted average of corporate betas of all projects in a business must equal 1.0, while the weighted average of all projects' market betas must equal the market beta of the firm's stock.
- The *Capital Asset Pricing Model (CAPM)* is an equilibrium model that describes the relationship between market risk and required rates of return.
- The *Security Market Line (SML)* provides the actual risk/required rate of return relationship. The required rate of return on any Stock  $i$  is equal to the risk-free rate plus the market-risk premium times the

stock's market beta coefficient:  $R(R_i) = R_F + [R(R_M) - R_F] \times b_i = R_F + (RP_M \times b_i)$ .

This concludes our discussion of basic financial management concepts, which included time value analysis, financial risk, and required rate of return. In the next chapter—Debt Financing—we begin our coverage of capital acquisition.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in financial risk-and-return problems.

In addition, the chapter has seven problems in spreadsheet format that allow students to practice their financial risk-and-return skills.

Both the model and problem spreadsheet are available on this book's companion website at [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5)

## Selected Reference

For a more complete discussion of financial risk, see Eugene F. Brigham and Michael C. Ehrhardt. 2005. *Financial Management: Theory and Practice*, Chapter 4 and 5. Fort Worth, TX: Thomson/South-Western.

## Selected Websites

There are a multitude of websites that pertain to this chapter:

- For stock market (company) betas, see [www.investor.reuters.com](http://www.investor.reuters.com). Then, in the box that contains the word “Quote” on the top bar, enter the stock symbol of a firm (for example, HCA) and click on GO. The beta for the company is reported in a table along with other stock market data.
- Try Morningstar for information about the riskiness of mutual funds at [www.morningstar.com](http://www.morningstar.com). Then, click on Funds on the menu bar. Next, type in a fund symbol—for example, VFINX for the Vanguard 500 Index Fund—in the Quotes box, then click on the right arrowhead. Finally, click on Risk Measures on the menu bar, which appears in the left column. The next screen will display several risk (volatility) measures including standard deviation.

## Selected Case

The following case in *Cases in Healthcare Finance* can be assigned to help students learn more about financial risk concepts:

- Case 13: Faculty Practice, Inc., which illustrates many of the concepts discussed in this chapter.

## Notes

1. If inflation is considered, the T-bill investment is not truly risk free. The *real return*, which recognizes inflation effects, is uncertain because it depends on the amount of inflation realized over the year.
2. In markets that are *efficient*, low-risk investments have low expected returns, while high-risk investments have high expected returns. However, not all markets are efficient. See Chapter 7 for a complete discussion of market efficiency.
3. See Footnote 2.
4. A portfolio of two investments will have lower risk than that of either one only when the correlation coefficient between the returns on the two investments is less than the ratio of the standard deviations constructed with the lower standard deviation in the numerator. For example, for Portfolio AD to have less risk than both A and D, the correlation coefficient between the returns on A and D must be less than  $\sigma_A/\sigma_D = 11.0\%/12.1\% = 0.91$ . The actual correlation coefficient is 0.53, so the condition is met in this example.
5. Although stocks actually can be combined with complex investments (derivatives) to form riskless portfolios, our emphasis here is on real-assets investments.
6. The Wilshire 5000 Index, also called the Total Stock Market Index, mimics the returns of all publicly traded U.S. stocks.
7. The amount of risk reduction that occurs when an investment is added to a portfolio is measured by the distance of the plot points from the characteristic line. The more the points plot away from the line, the greater the risk reduction when the investment is added to the portfolio. In other words, the distance of the plot points from the line measures the amount of diversifiable risk. In this illustration, the points are farther from the line in Figure 4.2 than in Figure 4.3, so more risk reduction occurs when Project P is added to the corporate portfolio than when it is added to the market portfolio.



## Capital Acquisition

Healthcare organizations need assets to provide services. For example, hospitals need facilities and equipment to provide inpatient and outpatient services, while clinics require similar (but somewhat different) assets to provide outpatient services. To obtain these assets, healthcare organizations need capital (money). A large hospital requires a very large amount of capital (some hospitals have more than \$1 billion of capital), while a small home health business requires a relatively small amount of capital. Regardless of size, all healthcare organizations need capital to acquire the facilities, equipment, and other assets needed to run the business.

There are many different types of capital available to healthcare organizations. Debt financing is supplied by lenders, while equity financing is obtained from owners in for-profit businesses and from the community at large in not-for-profit businesses. In addition to traditional financing (debt and equity), healthcare organizations can obtain the use of facilities and equipment by leasing. Because different types of financing have different characteristics, managers must understand both the differences in the types of capital and the impact of these differences on the financial condition of the business. Furthermore, to better understand how capital suppliers decide how much to charge for capital, managers need to know how securities are valued.

The four chapters in this section—Chapters 5 through 8—introduce students to the types of capital available to healthcare organizations and the way this capital is valued in the marketplace.



## DEBT FINANCING

### Learning Objectives

After studying this chapter, readers should be able to:

- Describe how interest rates are set in the economy.
- Discuss the various types of debt, including both long term and short term, and their features.
- Discuss credit ratings and their importance.
- Explain the term structure of interest rates and its implications.
- Discuss the components that make up the interest rate on a debt security.

### Introduction

If a business is to operate, it must have assets, and to acquire assets, it must raise *capital*. Capital comes in two basic forms: debt and equity. This chapter focuses on debt financing, while Chapter 6 focuses on equity financing. To illustrate the importance of debt financing to healthcare businesses, *Value Line* reports that, on average, providers finance their assets with roughly 5 percent short-term debt, 30 percent long-term debt, and 65 percent equity. Thus, over one-third of providers' financing comes from debt. In this chapter, many facets of debt financing are discussed, including important background information on how interest rates are set in the economy.

Unfortunately, the term “debt” can be interpreted in two ways. First, debt can refer to everything on the right side of a balance sheet that is not equity, including both interest-bearing debt and non-interest-bearing liabilities such as accruals and trade credit (accounts payable). For some purposes, this all-inclusive definition is appropriate. Second, debt can refer only to interest-bearing debt supplied by *creditors* such as banks and bondholders. For purposes of this chapter, we will use the second definition and confine our discussion to interest-bearing debt. Other types of liabilities, specifically accruals and trade credit, will be discussed in Chapter 15.

### The Cost of Money

Capital in a free economy is allocated through the price system. The *interest rate* is the price paid to obtain debt capital, whereas in the case of equity

capital in for-profit firms, investors' returns come in the form of *dividends* and *capital gains* or *losses*. The four most fundamental factors that affect the supply of and demand for investment capital, and hence the cost of money, are (1) investment opportunities, (2) time preferences for consumption, (3) risk, and (4) inflation. To see how these factors operate, visualize the situation facing Lori Gibbs, an entrepreneur who is planning to start a new home health agency. Lori does not have sufficient personal funds to finance the business, so she must go to the debt markets for additional capital.

### **Investment Opportunities**

If Lori estimates that the business will be highly profitable, she will be able to pay creditors a higher interest rate than if it is barely profitable. Thus, her ability to pay for borrowed capital depends on the business's *investment opportunities*. The higher the profitability of the business, the higher the interest rate that Lori can afford to pay lenders for use of their savings.

### **Time Preferences for Consumption**

The interest rate that lenders will charge depends, in large part, on their *time preferences for consumption*. For example, one potential lender, Jane Wright, may be saving for retirement, so she may be willing to loan funds at a relatively low rate because her preference is for future consumption. Another person, John Davis, may have a wife and several young children to clothe and feed, so he may be willing to lend funds out of current income, and hence forgo consumption, only if the interest rate is very high. John is said to have a high time preference for consumption and Jane a low time preference. If the entire population of an economy were living right at the subsistence level, time preferences for current consumption would necessarily be high, aggregate savings would be low, interest rates would be high, and capital formation would be difficult.

### **Risk**

The *risk* inherent in the prospective home health care business, and thus in Lori's ability to repay the loan, would also affect the return that lenders would require—the higher the perceived risk, the higher the interest rate. Investors would be unwilling to lend to high-risk businesses unless the interest rate was higher than on loans to low-risk businesses.

### **Inflation**

Finally, because the value of money in the future is affected by *inflation*, the higher the expected rate of inflation, the higher the interest rate demanded by savers. Note that to simplify matters, the illustration implied that savers would lend directly to businesses that need capital, but in most cases the funds would actually pass through a *financial intermediary* such as a bank or mutual fund.

**Self-Test  
Questions**

1. What is the “price” of debt capital?
2. What four factors affect the cost of money?

**Interest Rate Levels**

Like any free market, debt markets set prices on the basis of supply and demand. To illustrate the process, consider Figure 5.1, which shows how supply and demand interact in two debt markets—A and B. The going interest rate, designated  $I$ , is initially 10 percent for the low-risk securities in Market A. Borrowers whose credit is strong enough to qualify for this market can obtain funds at a cost of 10 percent. Riskier borrowers must obtain higher-cost funds in Market B. Investors who are more willing to take risks invest in Market B and expect to receive a 12 percent return, but they also realize that they might receive much less if the borrower fails.

If the demand for funds in a market declines, as it typically does during a business recession, the demand curve will shift to the left, as shown in Curve  $D_2$  in Market A. The market-clearing, or equilibrium, interest rate in this example declines to 8 percent. Similarly, you should be able to visualize what would happen if the Federal Reserve tightened credit: The supply curve,  $S_1$ , would shift to the left, which would raise interest rates and lower the level of borrowing in the economy.

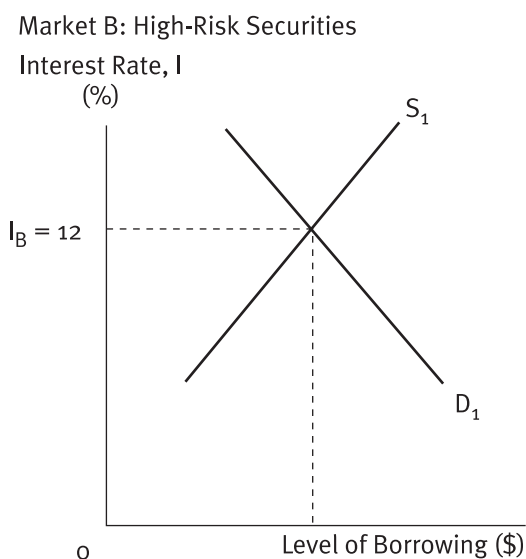
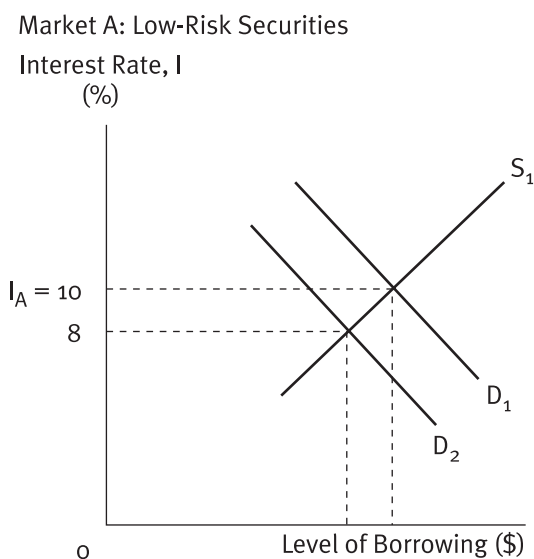
Debt markets, indeed all capital markets, are interdependent. For example, if Markets A and B were in equilibrium before the demand shift to  $D_2$  in Market A, then investors were willing to accept the higher risk in Market B in exchange for a *risk premium* of  $12\% - 10\% = 2$  percentage points. After the shift to  $D_2$ , the risk premium would initially increase to  $12\% - 8\% = 4$  percentage points. In all likelihood, this much larger premium would induce some of the lenders in Market A to move to Market B, which, in turn, would cause the supply curve in Market A to shift to the left, or up, and the supply curve in Market B to shift to the right. This transfer of capital between markets would raise the interest rate in Market A and lower it in Market B, thus bringing the risk premium back closer to its original level—2 percentage points.

There are many capital markets in the United States, including markets for short-term debt (*money markets*) and for long-term debt and equity (*capital markets*). These markets are further broken down into markets for home loans; farm loans; business loans for both taxable and tax-exempt firms; federal, state, and local government loans; and consumer loans. Within each category, there are regional markets as well as different types of submarkets. For example, within the business sector there are dozens of types of debt and also several sharply differentiated markets for common stocks. There is a price for each type of capital, and these prices change over time as shifts occur in supply-and-demand conditions.



**FIGURE 5.1**

Interest Rates  
as a Function of  
Supply and  
Demand for  
Funds



### Self-Test Questions

1. How do interest rates serve to allocate debt capital among borrowers?
2. How does risk affect interest rates?
3. What happens to the market-clearing, or equilibrium, interest rate when the loan demand changes?

### Long-Term Debt

One of the most important ways of categorizing debt is by *maturity*, or the length of the loan. In general, debt is categorized as long term or short term.

Although the definitions of “long” and “short” depend somewhat on the type of debt under discussion, in most situations *short-term debt* is defined as having a maturity of one year or less, while *long-term debt* has maturities greater than one year. Even when the focus is solely on long-term debt, there are still hundreds, if not more, of different types. In the following sections, we briefly discuss the long-term debt instruments most commonly used by healthcare businesses.

1. What is the difference between short-term debt and long-term debt?

## Self-Test Question

### Term Loans

A *term loan* is a contract under which a borrower agrees to make a series of payments, on specified dates, to the lender. These payments consist of *principal*, which pays back the amount borrowed, and *interest*, which provides the return to the lender for the use of the capital. In general, term loans are negotiated directly between the borrowing firm and a financial institution—generally, a bank, a mutual fund, an insurance company, or a pension fund. Thus, term loans are *private placements* as opposed to *public offerings*, which are typically used on bonds—the other major type of long-term debt. (The details of how securities are issued by businesses are discussed in Chapter 6.)

Most term loans have maturities in the range of two to seven years, with an average of about four years. Term loans usually are amortized in equal installments over the life of the loan, so part of the principal of the loan is retired with each payment. For example, Sacramento Cardiology Group has a \$100,000 five-year term loan with Bank of America to fund the purchase of new diagnostic equipment. The interest rate on the fixed-rate loan is 10 percent, which obligates the group to five end-of-year payments of \$26,379.75. Thus, loan payments total \$131,898.75, of which \$31,898.75 is interest and \$100,000 is repayment of principal.

Term loans have three major advantages over debt sold to the general public: (1) speed, (2) flexibility, and (3) low issuance costs. Because they are negotiated directly between the lender and the borrower, formal documentation is minimized. The key provisions of the loan can be worked out much more quickly, and with more flexibility, than can those for a public issue, and it is not necessary for a term loan to go through a complicated registration process. A further advantage of term loans over publicly held debt has to do with future flexibility. If many different investors hold a debt issue, it is virtually impossible to alter the terms of the agreement, even though new economic conditions may make such changes desirable. With a term loan, the borrower can generally negotiate with the lender to work out modifications in the contract.

The interest rate on a term loan can be either fixed for the life of the loan or variable. If *fixed*, the rate used will be close to the rate on bonds of equivalent maturity for firms of comparable risk. If *variable*, the rate is usually set at a certain number of percentage points over an *index rate*, such as the prime rate or the T-bill rate.<sup>1</sup> Then, when the index rate goes up or down, so does the rate on the outstanding balance of the term loan.

Although term loans have many advantages, there are two potential disadvantages. First, there is a limit to the size of a term loan. Although they can be quite large, such as when multiple banks combine to make a loan of \$100 million or more, most term loans are relatively small, with an average of less than one million dollars. Also, lenders typically will not extend term loans to the maturity that businesses can attain in a bond financing, which makes term loans inappropriate for use in financing assets with long lives, such as clinic buildings or hospital wings.

### Self-Test Question

1. Describe the key features of a term loan.

## Bonds

Like a term loan, a *bond* is a long-term contract under which a borrower agrees to make payments of interest and principal, on specific dates, to the holder of the bond. Although bonds are similar in some ways to term loans, a bond issue generally is registered with the Securities and Exchange Commission (SEC); advertised; offered to the public in relatively small increments—say, \$1,000 or \$5,000—through investment bankers; and actually sold to many different investors. Indeed, thousands of individual and institutional investors may participate when a firm, such as HCA, sells a bond issue, while there is generally only one lender in the case of a term loan.

Bonds are categorized as either government (Treasury), corporate, or municipal. *Government*, or *Treasury*, *bonds* are issued by the U.S. Treasury and are used by the federal government to raise money.<sup>2</sup>

### Corporate Bonds

*Corporate bonds* are issued by investor-owned firms, while *municipal bonds* are issued by governments and governmental agencies other than federal. In this section, the primary focus is on corporate bonds, but much of the discussion also is relevant to municipal bonds. The unique features of municipal bonds will be discussed in the next major section.

Although bonds generally have maturities in the range of 20 to 30 years, shorter maturities, as well as longer maturities, are occasionally used. In fact, in 1995, HCA issued \$200 million of 100-year bonds, following the issuance of 100-year bonds by Disney and Coca-Cola in 1993. These ultra-long-term bonds had not been used by any firm since the 1920s and have not

been used since. Unlike term loans, bonds usually pay only interest over the life of the bond, with the entire amount of principal returned to bondholders at maturity.

Most bonds have a *fixed* interest rate, which locks in the current rate for the entire maturity of the bond, and hence minimizes interest payment uncertainty. However, some bonds have a *floating, or variable, rate* that is tied to some interest rate index, so the interest payment moves up and down with the general level of interest rates. Floating rate bonds are more prevalent when rates are high, or when the yield curve (which is discussed in a later section) has a steep upward slope, or both. Floating rate bonds are riskier to the issuer because interest rates can rise in the future, but virtually all such debt has call provisions (which are discussed later) that permit issuers to replace the floating rate debt with fixed rate debt should conditions so dictate. Conversely, floating rate bonds are less risky to buyers, so they carry an interest rate that is lower than that set on similar fixed rate issues.

Some bonds do not pay any interest at all but are sold at a substantial discount from face (principal) value. Such bonds, called *zero-coupon bonds*, provide the investor (lender) with capital appreciation rather than interest income. For example, a zero-coupon bond with a \$1,000 face value and ten-year maturity might sell for \$385.54 when issued. An investor who buys the bond would realize a 10 percent annual rate of return if the bond were held to maturity, even though he or she would receive no interest payments along the way. Other bonds, instead of paying interest in cash, pay coupons that grant the lender additional bonds (or a proportion of an additional bond). These bonds are called *payment-in-kind (PIK)* bonds. PIK bonds usually are issued by companies in poor financial condition, and hence tend to be quite risky.

In rare cases, bonds have *step-up provisions*, which mean that the interest rate paid on the bond is increased if the bond's rating is downgraded. (A downgrading means that the company's financial condition has deteriorated. Bond ratings are discussed in a later section.) A step-up provision is very risky for the issuing company because they must pay a higher interest rate at the worst possible time—when their financial condition weakens. Conversely, such a provision reduces the risk to buyers (lenders).

The bottom line here is that bonds in general, and corporate bonds in particular, come in many different flavors. In an introductory healthcare financial management text, we can only scratch the surface.

Different types of corporate bonds provide different protections to bondholders. With a *mortgage bond*, the issuer pledges certain real assets as security for the bond. To illustrate the concept, consider the following example. Mid-Texas Healthcare System recently needed \$50 million to purchase land and to build a new hospital. *First mortgage bonds* in the amount of \$20 million, secured by a mortgage on the property, were issued. If the firm *defaults* (fails

### Mortgage Bonds

to make a promised payment) on the bonds, the bondholders could take possession of the hospital and sell it to satisfy their claims.

Mid-Texas could, if it so chose, also issue *second mortgage bonds* secured by the same \$50 million hospital. In the event of bankruptcy and liquidation, the holders of these second mortgage bonds would have a claim against the property only after the first mortgage bondholders had been paid off in full. Thus, second mortgages are sometimes called *junior mortgages*, or *junior liens*, because they are junior in priority to claims of senior mortgages, or first mortgage bonds.

### Debentures

A *debenture* is an unsecured bond, and as such it has no lien against specific property as security for the obligation. For example, Mid-Texas Healthcare System has \$5 million of debentures outstanding. These bonds are not secured by real property but are backed instead by the revenue-producing power of the corporation. Debenture holders are, therefore, general creditors whose claims, in the event of bankruptcy, are protected by property not otherwise pledged. In practice, the use of debentures depends on the nature of the firm's assets and general credit strength. If a firm's credit position is exceptionally strong, it can issue debentures: it simply does not need specific security. Debentures are also issued by firms with only a small amount of assets suitable as collateral. Finally, firms that have used up their capacity to borrow in the lower-cost mortgage market may be forced to use higher-cost debentures.

### Subordinated Debentures

The term *subordinate* means “below” or “inferior.” Thus, *subordinated debt* has a claim on assets in the event of bankruptcy only after senior debt has been paid off. Debentures may be subordinated either to designated debt, usually bank loans, or to all other debt. In the event of liquidation, holders of subordinated debentures cannot be paid until senior debt, as named in the debenture, has been paid. Subordinated debentures are normally quite risky and hence carry interest rates that are much higher than the rate on top-quality debt.

### Self-Test Question

1. Describe the primary features of the following long-term debt securities:
  - a. Corporate bond
  - b. First mortgage bond; junior mortgage
  - c. Debenture; subordinated debenture

### Municipal Bonds

Whereas corporate bonds are issued by investor-owned businesses, *municipal bonds*, or “munis,” are issued by states and their political subdivisions, includ-

ing counties and cities. Although most municipal bonds are backed by the taxing power of the issuing entity, *revenue bonds* are backed by the revenues derived from facilities, such as toll roads and airports, deemed to be beneficial to the community. In addition, not-for-profit healthcare providers are entitled to issue such securities through government-sponsored healthcare financing authorities.

Because the interest on municipal debt is exempt from federal income taxes, as well as state income taxes in the state of issue, investors are willing to accept lower interest rates on such debt than on comparable-risk taxable debt. To illustrate the concept, consider that in early 2006, the interest rate on a AAA-rated, long-term corporate bond was 6.2 percent, while the rate on a similar-risk healthcare muni was 5.0 percent. To an individual investor in the 40 percent federal-plus-state tax bracket, the muni bond's equivalent taxable yield is  $5.0\% / (1 - 0.40) = 5.0\% / 0.6 = 8.3\%$ , or about 2 percentage points above the corporate bond. It is easy to see why investors in high tax brackets are so enthusiastic about municipal bonds. On the surface, it might appear that the ability to obtain debt financing at relatively low rates (5.0 percent versus 6.2 percent in our example) creates a cost-of-financing advantage for not-for-profit providers. However, as we will discuss in Chapter 10, this advantage is offset by the ability of taxable providers to deduct interest expense from taxable income.

The issuance of municipal bonds by healthcare providers is big business. In 2005, not-for-profit healthcare companies issued over \$20 billion of municipal bonds, and the total amount of debt outstanding is approaching \$200 billion. Most municipal bonds are sold in *serial* form; that is, a portion of the issue comes due periodically, anywhere from six months after issue to 30 years or more. Municipal bonds usually are issued in denominations of \$5,000, or integral multiples of \$5,000, and although most municipal bonds are tax exempt, some are taxable to investors. Whereas the vast majority of federal government (Treasury) and corporate bonds are held by institutions, about half of all healthcare municipal bonds outstanding are held by individual investors.

In contrast to corporate bonds, municipal bonds are not required to be registered with the SEC. However, prior to bringing municipal debt to market, issuers are required to prepare an *official statement* that contains relevant financial information about the issuer and the nature of the bond issue. In addition, issuers are required to (1) provide annual financial statements that update the information contained in the official statement and (2) release information on material events that can affect bond values as such events occur. This information is not sent directly to investors but rather goes to data banks that can be easily accessed by investment bankers, mutual fund managers, and institutional investors. In theory, by making the information available to investment bankers who handle public trades, any individual who wants to buy or sell a municipal bond will also have access to current information that affects the bond's value.

To illustrate the use of municipal bonds by a healthcare provider, consider the \$56 million in municipal bonds issued in March 2006 by the Bay Area Health Facilities Authority. The Authority is a public body created under Florida's Health Facilities Authorities Law for the sole purpose of issuing health facilities municipal revenue bonds for qualifying healthcare providers. For this particular bond issue, the provider is Palm Coast Medical Center, a not-for-profit hospital, and the primary purpose of the issue is to raise funds to build and equip a new children's hospital. The bonds are secured solely by the revenues of Palm Coast Medical Center, so the municipal conduit agency—the Bay Area Health Facilities Authority—has no responsibility whatsoever regarding the interest or principal payments on the issue.

The bonds are rated AAA, not on the basis of the financial strength of Palm Coast Medical Center but rather because the bonds are insured by the Municipal Bond Investors Assurance Corporation (MBIA). (Municipal bond insurance, which is called *credit enhancement*, will be discussed in more detail later in the chapter.) Table 5.1 shows the maturities and interest rates associated with the issue.

Note the following points:

- The issue is a serial issue; that is, the \$56 million in bonds is composed of 13 series, or individual issues, with maturities ranging from one year to 30 years.
- Because the yield curve on municipal bonds was normal, or upward sloping, at time of issue, the interest rates increase across series as the maturities increase. (The yield curve is discussed in a later section.)

**TABLE 5.1**

Palm Coast  
Medical Center  
Municipal Bond  
Issue:  
Maturities,  
Amounts, and  
Interest Rates

<i>Maturity<sup>a</sup></i>	<i>Amount</i>	<i>Approximate Interest Rate</i>
2007	\$ 705,000	2.8%
2008	740,000	3.2
2009	785,000	3.5
2010	825,000	3.6
2011	880,000	3.8
2012	925,000	3.9
2013	985,000	4.0
2014	1,050,000	4.1
2015	1,115,000	4.2
2016	1,190,000	4.3
2021	5,590,000	4.6
2026	9,435,000	4.9
2036	31,775,000	5.0
	<u>\$56,000,000</u>	

<sup>a</sup>All serial issues mature on March 1 of the listed year.

- The bonds that mature in 2021, 2026, and 2036 have sinking fund provisions, which we discuss in a later section, whereby the hospital must place a specified dollar amount with a trustee each year to ensure that funds are available to retire the issues as they become due.
- Although it is not shown in the table, the hospital's *debt service requirements*—that is, the total amount of principal and interest that it has to pay on the issue—are relatively constant over time. The purpose of structuring the series so that the debt service requirements are spread evenly over time is to match the maturity of the issue to the maturity of the asset being financed. Think about it this way: The children's hospital has a life of about 30 years, and during this time, it will be generating revenues more or less evenly and its value will decline more or less evenly. Thus, the hospital has structured the debt series so that the debt service requirements can be met by the revenues associated with the children's hospital. At the end of 30 years, the debt will be paid off, and Palm Coast Medical Center will probably be planning for a replacement facility that will be funded, at least in part, by a new debt issue.

This illustration of a municipal bond issue focused on a typical large hospital transaction. However, the administrative costs associated with stand-alone municipal bond issues make it cost prohibitive for small hospitals. To provide the benefits associated with tax-exempt financing to small hospitals, many state hospital associations have established municipal *bond pools*. These pools raise funds by issuing municipal bonds that are then loaned to not-for-profit hospitals that are too small to “tap” the muni market directly. To avoid abuses of tax-sheltered debt, federal law requires that there be an expectation up front that at least 95 percent of the bond pool will be loaned out to individual hospitals within three years. Unfortunately, some pools, which loaned out only a small percentage of the total funds available, were unable to demonstrate that this requirement had been met and were fined for violating federal law.

1. What is the primary motivation for investors to purchase municipal bonds?
2. Describe the major differences between corporate and municipal bonds?
3. What is a serial issue and why is it used?
4. What is the purpose of a bond pool?

## Self-Test Questions

## Short-Term Debt

Thus far, we have focused on long-term debt. However, as pointed out in the introduction to this chapter, healthcare providers use about 5 percent short-



term debt in their total financing mix. This section provides some of the details associated with short-term debt financing.

Short-term credit has three primary advantages over long-term debt. First, a short-term loan can be obtained much faster than long-term credit. Lenders will insist on a more thorough financial examination before extending long-term credit, and the loan agreement will have to be spelled out in considerable detail because a lot can happen during the life of a ten-year term loan or a 30-year bond. Thus, businesses that require funds in a hurry look to the short-term markets.

Second, if the need for funds is seasonal or cyclical (i.e., temporary), a firm may not want to commit to long-term debt for the following four reasons:

1. *Issuance costs* are generally higher on long-term debt than on short-term debt. (Issuance costs, sometimes called *flotation costs*, are the administrative costs associated with obtaining financing. For debt financing, these costs include such items as legal and accounting fees, printing costs, loan application fees, and credit assessment fees.)
2. Although long-term debt can be repaid early, provided the loan agreement includes a prepayment provision, prepayment penalties can be expensive. Accordingly, if a firm thinks its need for funds may diminish in the near future, it should choose short-term debt for the flexibility it provides.
3. Long-term loan agreements always contain restrictive covenants that constrain the firm's future actions. Short-term credit agreements are generally much less onerous in this regard.
4. The interest rate on short-term debt generally is lower than the rate on long-term debt because, as we discuss in a later section, the yield curve normally is upward sloping. Thus, when coupled with lower issuance costs, short-term debt can have a significant total cost advantage over long-term debt.

In spite of these advantages, short-term credit has one serious disadvantage: it subjects the firm to more risk than does long-term financing. First, if a firm borrows on a long-term basis, its interest costs will be relatively stable over time, but if it uses short-term credit, its interest expense can fluctuate widely, at times possibly going quite high. For example, the short-term rate (the prime rate) that banks charge large corporations more than tripled over a two-year period in the early 1980s, rising from 6.25 to 21 percent. Many businesses that had borrowed heavily on a short-term basis simply could not meet their rising interest costs; as a result, bankruptcies hit record levels during that period. The exposure to increasing interest rates is called *rollover risk*.

Second, the principal amount on short-term debt comes due on a regular basis. If the financial condition of a business temporarily deteriorates, the business may find itself unable to repay this debt when it matures. Furthermore, the business may be in such a weak financial position that the lender

will not extend the loan. Such a scenario can result in severe problems for the borrower, which, like unexpectedly high interest rates, can force the business into bankruptcy. The risk that a business will not be able to roll over, or renew, its short-term debt is called *renewal risk*.

Because of the added risk associated with short-term debt, most businesses use such debt solely to meet short-term financing needs (such as to pay for a temporary build up in medical supplies inventory to meet seasonal demand). More permanent debt financing needs (such as to pay for construction of a new outpatient surgery center) typically are met by using long-term debt.

### **Types of Short-Term Debt**

The two most common types of short-term debt are commercial paper and bank loans.

#### **Commercial Paper**

*Commercial paper* is a type of unsecured debt issued by large, strong firms and sold primarily to other businesses, to insurance companies, to pension funds, to money market mutual funds, and to banks. Although the amount of commercial paper outstanding is smaller than bank loans outstanding, this form of financing has grown rapidly in recent years.

Maturities of commercial paper generally vary from one to nine months, with an average of about five months.<sup>3</sup> The rate on commercial paper fluctuates with supply-and-demand conditions; it is determined in the marketplace, varying daily as conditions change. Typically, commercial paper rates fall below the prime rate and slightly above the rate on short-term Treasury debt (the T-bill rate). Commercial paper rates are low because issuers usually obtain backup credit from banks to guarantee the commercial paper repayment.

The use of commercial paper is restricted to businesses that are exceptionally good credit risks. Dealers prefer to handle the paper of firms whose net worth is \$100 million or more and whose annual borrowing exceeds \$10 million. One potential problem with commercial paper is that a debtor who is in temporary financial difficulty may receive little help because commercial paper dealings are generally less personal than bank relationships. Thus, banks are generally more able and willing to help a good customer weather a temporary storm than is a commercial paper dealer. On the other hand, using commercial paper permits a business to tap a wide range of credit sources, including financial institutions outside its own area and industrial corporations across the country, which can reduce interest costs.

#### **Bank Loans**

Commercial banks, whose short-term loans generally appear on firms' balance sheets as *notes payable*, are the primary source of short-term financing. Although banks make longer-term loans, the bulk of their lending is on a

short-term basis; about two-thirds of all bank loans mature in a year or less. Bank loans to businesses are frequently written as 90-day notes, so the loan must be repaid or renewed at the end of 90 days. When a bank loan is approved, the bank credits the borrower's checking account with the amount of the loan, while both cash and notes payable increase on the borrower's balance sheet.

Banks sometimes require borrowers to maintain a checking account balance equal to 10 to 20 percent of the face amount of the loan. This requirement is called a *compensating balance*, and such balances raise the effective interest rate on the loan. For example, suppose that Pine Garden nursing home needs an \$80,000 short-term bank loan to meet temporary cash needs. If the loan requires a 20 percent compensating balance, then the nursing home must borrow \$100,000 to obtain a usable \$80,000, assuming that the business does not have an "extra" \$20,000 around to use as a compensating balance. If the stated interest rate is 8 percent, the effective cost rate is actually 10 percent:  $0.08 \times \$100,000 = \$8,000$  in interest expense divided by \$80,000 of usable funds.

A *line of credit*, sometimes called a *revolving credit agreement* or just *revolver*, is a formal agreement between the bank and a borrower that specifies the maximum credit the bank will extend over some specified period of time. For example, in December a bank loan officer might indicate to Pine Garden's manager that the bank regards the nursing home as being good for up to \$80,000 during the coming year. If on January 10, Pine Garden's manager decides to borrow \$15,000 from the line, this borrowing is called *taking down* \$15,000 of the credit line. This takedown would be credited to the nursing home's checking account at the bank, and before repayment of the \$15,000, Pine Garden could borrow additional amounts up to a total of \$80,000 outstanding at any one time. Lines of credit are generally for one year, and borrowers typically have to pay an up-front commitment fee of about 0.5 to 1 percent of the total amount of the line in addition to interest on the amount taken down. Many businesses have a continuing relationship with a bank, which allows them to automatically renew the credit line year after year. However, if the business's financial condition deteriorates, the bank has the right to deny renewal.

Revolvers typically involve large sums over longer periods. To illustrate the concept, consider the following example. In 2006, Colorado Healthcare negotiated a revolving credit agreement for \$100 million with a group of banks. The banks were formally committed for four years to lend the firm up to \$100 million if the funds were needed. Colorado Healthcare, in turn, paid an annual commitment fee of one-quarter of 1 percent on the unused credit to compensate the banks for making the commitment. Thus, if Colorado Healthcare did not take down any of the \$100 million commitment during a year, it would still be required to pay a \$250,000 annual fee in monthly installments of \$20,833.33. If it borrowed \$50 million on the first day of the

agreement, the unused portion of the credit line would fall to \$50 million and the annual fee would fall to \$125,000. But interest would have to be paid on the money Colorado Healthcare actually borrowed. As a general rule, the rate of interest on credit lines is pegged to the prime rate, so the cost of the loan varies over time as interest rates change. Colorado Healthcare's rate was set at prime plus 0.5 percentage points.

### Secured Short-Term Debt

Given a choice, it is ordinarily better to borrow on an unsecured basis because the administrative costs associated with secured loans are often high. However, weak businesses may find that they can borrow only if they put up some form of security to protect the lender, or that by using security they can borrow at a much lower rate.

Several kinds of *collateral*, or security, can be employed, including marketable securities, land or buildings, equipment, inventory, and accounts receivable. Marketable securities make excellent collateral, but businesses that need short-term credit generally do not hold large marketable securities portfolios. Both real property (i.e., land and buildings) and equipment are good forms of collateral. However, such assets are generally used as security for long-term debt rather than for short-term credit. Therefore, most secured short-term business borrowing involves the use of accounts receivable or inventories as collateral.

Accounts receivable financing involves either the pledging of receivables or the selling of receivables. Such financing is provided by commercial banks or by one of the large industrial finance firms, such as GE Capital. The *pledging* of accounts receivable is characterized by the fact that the lender not only has a claim against the dollar amount of the receivables but also has recourse against the pledging firm. This means that if the individual, or third-party payer, who owes the receivable does not pay, the business that borrows against the receivable must take the loss. Therefore, the risk of default on the accounts receivable pledged remains with the borrowing firm. When receivables are pledged, the payer is not ordinarily notified about the pledging, and payments are made on the receivables in the same way as when receivables are not used as loan security.

The second form of receivables financing is *factoring*, or *selling accounts receivable*. In this type of secured financing, the receivables account is actually "purchased" by the lender, generally without recourse to the borrowing business. In a typical factoring transaction, the buyer of the receivables pays the seller about 90 to 95 percent of the face value of the receivables. When receivables are factored, the individual, or third-party payer, who owes the receivable is often notified of the transfer and is asked to make payment directly to the firm that bought the receivables. Because the factoring firm assumes the risk of default on bad accounts, it must perform a credit check on the receivables prior to the purchase. Accordingly, *factors*, which are the firms that buy receivables,

can provide not only money but also a credit department for the borrower. Incidentally, the same financial institutions that make loans against pledged receivables also serve as factors. Thus, depending on the circumstances and the wishes of the borrower, a financial institution will provide either form of receivables financing.

Because healthcare providers tend to carry relatively large amounts of receivables, such firms are prime candidates for receivables financing. For example, hospitals alone have accounts receivable that total nearly \$15 billion. The selling of these receivables, especially by hospitals that are experiencing liquidity problems, represents one way to reduce carrying costs and stimulate cash flow.

To illustrate receivables financing for hospitals, consider the program recently instituted between Chase Manhattan Bank and Presbyterian Hospital, New York City's largest hospital. This program provides \$15 million in advance funding of receivables over a three-year period. Presbyterian sells its accounts receivable to Chase for cash. In turn, Chase obtains the cash it needs by selling commercial paper. The payers of the receivables technically make payments directly to Chase, although Chase actually pays Presbyterian a fee to service the receivables accounts. Chase charges an up-front fee for the program and then charges an interest rate of about 1 to 1.5 percent above the prime rate on the amount advanced.

Although receivables financing is a way to reduce current assets, and hence financing costs, critics contend that such programs are too expensive. Because of costs involved, most receivables financing programs are used by providers that have serious liquidity problems, although programs are being developed that can provide benefits even to well-run providers that are not facing a liquidity crunch. Although the illustrations here have focused on the use of receivables financing by hospitals, such financing is also used by medical group practices and other healthcare providers.

Receivables financing dominates healthcare providers' use of secured financing, but other healthcare businesses, such as equipment manufacturers and pharmaceutical firms, are more likely to obtain credit secured by business inventories. If a firm is a relatively good credit risk, the mere existence of the inventory may be sufficient to obtain an unsecured loan. However, if the firm is a relatively poor risk, the lending institution may insist on security, which can take the form of a blanket lien against all inventory or either trust receipts or warehouse receipts against specific inventory items. The *inventory blanket lien* gives the lending institution a lien against all the borrower's inventories. However, the borrower is free to sell inventories, so the value of the collateral can be reduced below the level that existed when the loan was granted.

Because of the inherent weakness of the blanket lien, another procedure for inventory financing was developed. The *security instrument*, also called a *trust receipt*, is an instrument that acknowledges that the goods are held in trust for the lender. When trust receipts are used, the borrowing firm signs

and delivers a trust receipt upon receiving funds from the lender. The goods pledged as collateral can be stored in a public warehouse or held on the premises of the borrower. The trust receipt acknowledges that the goods are held in trust for the lender and that any proceeds from the sale of trust goods must be transmitted to the lender at the end of each day.

1. What are the advantages and disadvantages of short-term debt versus long-term debt?
2. Explain the difference between rollover risk and renewal risk.
3. How might a hospital that expects to have a temporary cash shortage during the coming year make sure that needed funds will be available?
4. What are some types of current assets that might be pledged as security for short-term loans?

## Self-Test Questions

### Debt Contracts

Debt contracts, which spell out the rights of the borrower and lender(s), have different names depending on the type of debt. The contract between the issuer and bondholders is called an *indenture*. Indentures tend to be long—some run several hundred pages in length. For other types of debt, a similar, but much shorter, document called a *loan agreement* or *promissory note* is used. Healthcare managers are most concerned about the overall cost of debt, including issuance costs, as well as any provisions that may restrict the business's future actions. In this section, some debt contract features are discussed that can affect either the business's future flexibility or the interest rate on the issue.

### Restrictive Covenants

Many debt contracts include provisions, called *restrictive covenants*, that are designed to protect creditors from managerial actions that would be detrimental to creditors' best interests. For example, the Palm Coast Medical Center bond issue described earlier contains several restrictive covenants, including the covenant that the issuer must maintain a minimum current ratio of 2.0. The *current ratio* is defined as current assets divided by current liabilities, so a current ratio of 2.0 indicates that current assets are twice as large as current liabilities. Because the current ratio measures a business's *liquidity*—the ability to meet current cash obligations as they become due—setting a minimum current ratio requirement provides some assurance to bondholders that the interest and principal payments coming due can be paid. If Palm Coast violates any of its restrictive covenants—say, by allowing its current ratio to drop below 2.0—it is said to be in *technical default*. (“Regular” default occurs when an interest or principal payment is *missed*, or not paid on time.)

### Trustees

When debt is supplied by a single creditor, there is a one-to-one relationship between the lender and borrower. However, bond issues can have thousands of lenders, so a single voice is needed to represent bondholders. This function is performed by a *trustee*, usually an institution such as a bank, which represents the bondholders and ensures that the terms of the indenture are being carried out. The trustee is responsible for trying to keep the covenants from being violated and for taking appropriate action if a violation does occur. What constitutes appropriate action varies with the circumstances. A trustee has the power to *foreclose* on an issue in default, which makes the full amount of principal and unpaid interest due and payable immediately. However, insisting on immediate payment may result in bankruptcy and possibly large losses on the bonds. In such a case, the trustee may decide that the bondholders would be better served by giving the issuer a chance to work out its problems, which would avoid forcing the business into bankruptcy.

### Call Provisions

A *call provision* gives the issuer the right to call a bond for *redemption* prior to maturity; that is, the issuer can pay off the bondholders in entirety and *redeem*, or *retire*, the issue. If it is used, the call provision generally states that the firm must pay an amount greater than the initial amount borrowed. The additional sum required is defined as the *call premium*.

Many callable bonds offer a period of call protection, which protects investors from a call just a short time after the bonds are issued. For example, the 20-year callable bonds issued by Vanguard Healthcare in 2005 are not callable until 2015, which is ten years after the original issue date. This type of call provision is known as a *deferred call*.

The call privilege is valuable to the issuer but potentially detrimental to bondholders, especially if the bond is issued in a period when interest rates are cyclically high. In general, bonds are called when interest rates have fallen because the issuer usually replaces the old, high-interest issue with a new, lower-interest issue and hence reduces annual interest expense. When this occurs, investors are forced to reinvest the principal returned in new securities at the then current (lower) rate. As readers will see later, the added risk to investors of a call provision causes the interest rate on a new issue of callable bonds to exceed that on a similar new issue of noncallable bonds.

If a bond, or other debt security, has a call provision and interest rates drop, the issuer has to make a decision, called a *refunding decision*, whether or not to call the issue. In essence, the decision involves a cost/benefit analysis, wherein the costs are the issuance costs associated with calling one bond and issuing another and the benefits are lower future interest payments. We will discuss refunding decisions in some detail in Chapter 7.



## Sinking Funds

A *sinking fund* is a provision that provides for the systematic retirement of a bond issue. Typically, sinking fund provisions require the issuer to retire (i.e., redeem) a portion of the issue in each year. (A serial issue of municipal bonds can be thought of as a type of sinking fund.)

On some occasions, the issuer of bonds with a sinking fund may be required to deposit money with a trustee, who invests the funds and then uses the accumulated sum to retire the entire bond issue when it matures. Sometimes the stipulated sinking fund payment is tied to the level of revenues or earnings in each year, but usually it is a mandatory fixed amount. If it is mandatory, a failure to meet the sinking fund requirement places the issue in technical default.

Although a sinking fund is designed to protect the bondholders by assuring that the issue is retired in an orderly fashion, it must be recognized that, like a call provision, a sinking fund may at times work to the detriment of bondholders. However, securities that provide for a sinking fund are regarded as being safer than those without sinking funds, and that fact tends to balance the risk of a sinking fund call. Thus, sinking fund provisions generally have little effect on an issue's interest rate.

1. Describe the following debt contract features:
  - a. Restrictive covenant
  - b. Trustee
  - c. Call provision
  - d. Sinking fund
2. What is the difference between technical default and “regular” default?
3. What impact does a call provision have on an issue's interest rate?
4. How do sinking fund provisions differ from call provisions?

## Self-Test Questions

## Credit Ratings

Since the early 1900s, corporate and municipal bonds, as well as other types of debt, have been assigned credit ratings that reflect their probability of going into default. In addition to individual debt issues, a business's overall financial capacity, or *creditworthiness*, can also be rated. The three major credit rating agencies are Fitch Ratings (Fitch), Moody's Investors Service (Moody's), and Standard & Poor's Corporation (S&P).<sup>4</sup> On large issues, more than one agency will rate the debt, while on smaller deals, one agency is sufficient.

In general, the ratings of these agencies are consistent with one another, although occasionally the agencies will give different ratings to the same firm or issue. Although there are minor variations in the rating grades among the



three agencies, the S&P issue ratings, given in Table 5.2, are representative. Furthermore, in the discussion to follow, reference to the S&P code implies similar ratings by the other agencies as well.

Note that debt with a BBB and higher rating is called *investment grade*, which is the lowest-rated debt that many institutional investors are permitted by law to hold. Double B and lower debt, called *junk debt*, is more speculative in nature because it has a much higher probability of going into default than does higher-rated debt.

### Rating Criteria

Although the rating assignments are subjective, they are based on both qualitative characteristics and quantitative factors. Clearly, quantitative analyses that assess financial condition are an important consideration in the rating process. In addition, the quality and effectiveness of management, organi-

**TABLE 5.2**  
S&P Issue  
Credit Ratings

Rating	Description
AAA	The highest rating assigned. Issuer's capacity to meet the debt obligation is extremely strong.
AA	This rating differs from AAA by only a small degree. Issuer's capacity to meet the debt obligation is very strong.
A	The obligation is somewhat more susceptible to adverse changes in circumstances and economic conditions than those with higher ratings. However, the issuer's capacity to meet its financial commitment is still strong.
BBB	The obligation has adequate protection. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the issuer to meet its obligation. Note that debt rated lower than BBB is regarded as having significant speculative characteristics.
BB	This rating is less vulnerable to nonpayment than other speculative issues. However, ongoing uncertainties or exposure to adverse conditions can lead to inadequate capacity to meet the financial commitment.
B	The issuer currently has the capacity to meet the obligation, but adverse conditions will likely lead to inadequate capacity.
CCC	This issue is currently vulnerable to nonpayment. The ability of the issuer to meet its obligation is dependent on favorable conditions. Unfavorable conditions are likely to lead to nonpayment.
CC	This obligation is highly vulnerable to nonpayment.
C	Typically used on an obligation when a bankruptcy petition has been filed, but payments are still being made.
D	The obligation is in default.

*Note:* The credit rating agencies use "modifiers" for ratings below AAA. For example, S&P uses a plus and minus system. Thus, within the A rating category, A+ designates the strongest, and A- the weakest.

zational structure, competitiveness of the service area, risks associated with medical staff and third-party-payer relationships, and local demographic and economic considerations all influence credit ratings.

Analysts at the rating agencies have consistently stated that no precise formula is used to set a credit rating; many factors are taken into account but not in a mathematically precise manner. Statistical studies have supported this contention. Researchers who have tried to predict debt ratings on the basis of quantitative data alone have had only limited success, which indicates that the agencies do indeed use a good deal of subjective judgment in the rating process.

### **Importance of Credit Ratings**

Credit ratings are important both to businesses and to investors. First, a credit rating is an indicator of the default risk of the debt, or of the business as a whole, so the rating has a direct, measurable influence on the interest rate required by investors and hence on the firm's cost of debt capital. Second, most corporate bonds are purchased by institutional investors rather than by individuals. Many of these institutions are restricted by law or charter to investment-grade securities. Also, most individual investors who buy municipal bonds are unwilling to take high risks in their bond purchases. Thus, if an issue has a rating below BBB, the issuer will have a harder time trying to sell the debt because the number of potential purchasers is reduced. As a result of their higher risk and more restricted market, low-grade debt typically carries much higher interest rates than does high-grade debt. (We will illustrate the impact of credit rating on interest rate in the next major section.)

### **Changes in Ratings**

A change in a credit rating will have a significant effect on the business's ability to obtain debt capital and on the cost of that capital. Rating agencies continually review current information about issuers and debt that has been rated. If a major change occurs in an issuer's near-term or long-term credit outlook, the issuer's ratings are placed under review for possible change. For example, S&P will announce that a firm, or issue, has been placed on *CreditWatch* with either a positive or negative implication. Such an announcement provides warning to investors that a firm, or one or more of its issues, is under review and a ratings change could occur. If circumstances dictate such a change, the rating agency will later announce an upgrade or downgrade.

In recent years, the financial conditions of many healthcare businesses, especially not-for-profit hospitals and healthcare systems, has improved. To illustrate, in 2002, S&P reported that 48 healthcare bond issues were downgraded versus only 11 upgrades. However, in 2005, 36 issues were upgraded and only 20 were downgraded. According to S&P, there is some reason to believe that the worst is over. Specifically, a more favorable pricing environment

and partial relief from the cutbacks contained in the Balanced Budget Act of 1997 may help hospitals in the long run.

In addition to the routine review of credit ratings, an announcement that a firm plans to sell a new debt issue, or to merge with another firm and pay for the acquisition by issuing new debt, will trigger agency reviews and possibly lead to a rating change. Thus, if a business's situation has deteriorated somewhat, but its debt has not been reviewed and downgraded, it may choose to use a term loan or short-term debt rather than to finance through a public bond issue that would require regrading. Such a strategy is intended to postpone a rating agency review until the situation has had time to improve.

Rating agencies charge issuers an up-front fee to rate an issue. In addition, most agencies are now charging issuers an annual "surveillance fee" to cover the cost of monitoring creditworthiness. Although some people argue that ratings are skewed in favor of issuers because the issuers pay for the ratings service, others argue that unbiased ratings are essential to the agencies' credibility.

### Self-Test Questions

1. What are the major rating agencies?
2. What are some criteria that the rating agencies use when assigning ratings?
3. What impact do debt ratings have on the cost of debt to the issuing firm?

## Credit Enhancement

*Credit enhancement*, or *bond insurance*, which is primarily available for municipal bonds, is a means of upgrading the rating of a lower-rated bond to AAA. Credit enhancement is offered by several credit insurers, with the three largest being Municipal Bond Investors Assurance (MBIA) Corporation; Ambac Assurance Corporation; and Financial Guaranty Insurance Company. Currently, about half of all new healthcare municipal issues carry bond insurance.

Here is how credit enhancement works. Regardless of the inherent credit rating of the issuer, the bond insurer guarantees that bondholders will receive the promised interest and principal payments. Thus, bond insurance protects investors against default by the issuer. Because the insurer gives its guarantee that payments will be made, the bond carries the credit rating of the insurance company rather than that of the issuer. For example, Palm Coast Medical Center has an A rating, so new bonds issued by the hospital without credit enhancement would likely also be rated A. However, its 2006 serial municipal bond issue summarized in Table 5.1 carries a AAA rating because it is insured by MBIA.

Credit enhancement gives the issuer access to the lowest possible interest rate, but not without a cost. Bond insurers typically charge an up-front

fee stated as a percentage of the total debt service over the life of the bond. The lower the hospital's inherent credit rating and the worse the outlook for the industry, the higher the cost of bond insurance. Most of the newly issued insured municipal bonds have an underlying credit rating of AA or A. The remainder are still of investment grade, rated BBB. Interestingly, increasing competition in the market for credit enhancement as well as the reduced risk that results from larger insurer portfolios has lowered fees over time. Still, credit enhancement fees can vary significantly as industry conditions change. For example, the fees charged to AA-rated hospitals surged from only 35 basis points in early 1998 to 80 basis points in early 2000, which represents a 129 percent increase. Increasing uncertainty about the future operating environment of hospitals has increased the price of insuring default risk.

Upon careful analysis, it appears that the insurance costs on many issues fully negate the value inherent in lower-interest payments. Still, such “economically neutral” deals often appeal to issuers because insurance protects investors, and the reputation of the issuer, against future uncertainty. A provider with a solid rating today—say, A+—could easily fall on hard times 20 or so years down the road. Credit enhancement allows the issuer's creditworthiness to decline without having to explain the reasons to the investment community.

However, bond insurers are quick to take action when the underlying credit quality of an insured issue starts to fall. In the mildest cases, bond insurers demand quarterly or even monthly audited financial statements. If the situation worsens, it is common practice among credit insurers to pressure hospitals to merge, cut costs, or implement other actions that will improve their ability to make the debt payments and hence reduce the probability that the insurer will have to come to the rescue.

Thus far, municipal bond issuers have defaulted on very few insured issues. However, there has been an upturn in both corporate and municipal healthcare bond defaults in recent years, and some insurance analysts question the ability of bond insurers to cover default payments should a severe recession occur. Furthermore, the market as a whole has some reservations about bond insurance because interest rates on AAA insured issues tend to be slightly higher than rates on otherwise similar bonds that carry an uninsured AAA rating.

1. What does “credit enhancement” mean?
2. How is bond insurance priced?
3. Why would not-for-profit healthcare issuers seek bond insurance?

## Self-Test Questions

## Interest Rate Components



Although interest rates are actually set by the interaction of supply and demand, the suppliers of debt capital (creditors) base their supply decisions for

each debt security on the basis of a minimum required rate of return (interest rate), which depends on several components. By understanding these components, it is possible to gain insights on why interest rates change over time, differ among borrowers, and even differ on separate issues by the same borrower.

### Real Risk-Free Rate

The base on which all interest rates are built is the *real risk-free rate* (*RRF*). This is the rate that investors would demand on a debt security that is totally **riskless** when there is **no inflation**. Although difficult to measure, the RRF is thought to fall somewhere in the range of 2 to 4 percent. In the real world, inflation is rarely zero, and most debt securities have some risk. Thus, the actual interest rate on a given debt security will typically be higher than the RRF.

### Inflation Premium

Inflation has a major impact on interest rates because it erodes the purchasing power of the dollar and lowers the value of investment returns. Creditors, who are the suppliers of debt capital, are well aware of the impact of inflation. Thus, they build an *inflation premium* (*IP*) into the interest rate that is equal to the expected inflation rate over the life of the security.

For example, suppose that the real risk-free rate was  $RRF = 3\%$ , and that inflation is expected to be 4 percent, and hence  $IP = 4\%$ , during the next year. The rate of interest on a one-year riskless debt security would be  $3\% + 4\% = 7\%$ . The combination of the RRF and IP is called the *risk-free rate* (*RF*). Thus, the risk-free rate incorporates inflation expectations, but it does not incorporate any risk factors. In this example,  $RF = 7\%$ .

The rate of inflation built into interest rates is the rate of inflation **expected in the future**, not the rate experienced in the past. Thus, the latest reported figures may show an annual inflation rate of 1 percent, but that is for a past period. If investors expect a 3 percent inflation rate in the future, then 3 percent would be built into the current rate of interest. Also, the inflation rate built into the inflation premium is the average rate of inflation expected **over the life of the security**. Thus, the inflation rate built into a one-year bond is the expected inflation rate for the next year, but the inflation rate built into a 30-year bond is the average rate of inflation expected over the next 30 years.

### Default Risk Premium

The risk that a borrower will default (not make the payments promised) has a significant impact on the interest rate set on a debt security. This risk, along with the possible consequences of default, is captured by a *default risk premium* (*DRP*). Treasury securities have no default risk; thus, they carry the lowest interest rates on taxable securities in the United States. For corporate

and municipal bonds, the higher the bond's rating, the lower its default risk. All else the same, the lower the default risk, the lower the DRP and hence the interest rate.

Table 5.3 lists the interest rates on some representative long-term bonds with different ratings in early 2006. The difference between the interest rate on a T-bond and that on a corporate bond with similar maturity, liquidity, and other features is the DRP. Therefore, if the bonds listed were otherwise similar, the default risk premium would be  $DRP = 5.3\% - 4.8\% = 0.5$  percentage point for AAA corporate bonds,  $5.6\% - 4.8\% = 0.8$  percentage points for AA corporate bonds,  $5.8\% - 4.8\% = 1.0$  percentage points for A corporate bonds, and so on. As discussed previously, bonds that are rated below BBB are called *junk bonds*, and such bonds tend to have large default risk premiums. For example, the DRP for CCC-rated corporates is a whopping 8 percentage points. The DRPs for tax-exempt healthcare bonds use AAA-rated bonds as the base, so they are not "pure" DRPs as in the case of corporate bonds, which can be compared to default-free Treasury securities.

In addition to the probability of default, the DRP incorporates a second risk factor called *recovery risk*. To illustrate recovery risk, consider an issuer that has both mortgage bonds and subordinated debentures outstanding, each carrying the same default rating. Yet, if default occurred, the mortgage bondholders would have a much better chance of recovering the full amount due to them than would the debenture holders. Thus, the DRP would be higher on the debenture than on the mortgage bond, even though both bonds had the same credit rating.

Default risk premiums change over time as the degree of investors' risk aversion changes. For example, if investors believe that businesses will face a tougher operating environment in the future than in the immediate past, DRPs will increase. Thus, the spread between AAA-rated and BBB-rated municipal hospital issues was only 50 basis points in early 1998, but

Rating	Interest Rate	
	Taxable <sup>a</sup>	Tax-Exempt <sup>b</sup>
U.S. Treasury	4.8%	—
AAA	5.3	4.6%
AA	5.6	4.7
A	5.8	4.9
BBB	6.5	5.2
BB	8.3	6.6
B	9.1	8.0
CCC	12.8	9.6

**TABLE 5.3**  
Representative  
Long-Term  
Interest Rates in  
Early 2006

<sup>a</sup>The non-Treasury taxable bonds are corporate issues by industrial firms.

<sup>b</sup>The tax-exempt bonds are municipal issues by not-for-profit hospitals.

it increased to 120 basis points by early 2003 as investors became more concerned about the industry's financial future. Then, because of increasing margins and less concern over the impact of managed care, the spread was pushed back down to 60 basis points by early 2006.

### Liquidity Premium

A *liquid* asset is one that can be sold quickly at a predictable fair market price and thus can be converted to a known amount of cash on short notice. Active markets, which provide liquidity, exist for Treasury securities and for the stocks and bonds of large corporations. Securities issued by small businesses, including healthcare providers that issue municipal bonds, are somewhat *illiquid*: they can be sold to raise cash, but not very quickly and not at a predictable price. Furthermore, illiquid assets require more effort to sell and hence have relatively high *transactions costs*. (Transactions costs include commissions, fees, spreads between asking and selling prices, and other expenses associated with selling an investment.) Securities issued by very small businesses, which typically only have a local presence, are very illiquid.

If a security is illiquid, investors will add a *liquidity premium (LP)* when they set their required interest rate. It is very difficult to measure LPs with precision, but a differential of at least 2 percentage points is thought to exist between the least liquid and the most liquid financial assets of similar default risk and maturity.

### Price Risk Premium

As we will demonstrate in Chapter 7, the market value (price) of a long-term bond declines sharply when interest rates rise. Because interest rates can and do rise, all long-term bonds, including Treasury bonds, have an element of risk called *price risk*. For example, if an individual bought a 30-year Treasury bond in January 1999 for \$1,000 when the long-term interest rate on Treasury securities was 5.1 percent and held it for only one year, until January 2000 when T-bond rates were 6.7 percent, the value of the bond would have declined to about \$800. This decline would represent a loss of about 20 percent, which demonstrates that long-term bonds, even U.S. Treasury bonds, are not riskless.

As a general rule, the bonds of any organization, from the U.S. government to HCA to Palm Coast Medical Center, have more price risk the longer the maturity of the bond. Therefore, a *price risk premium (PRP)*, which is higher the longer the term to maturity, must be included in the interest rate. The effect of PRPs is to raise interest rates on long-term bonds relative to those on short-term bonds. This premium, like the others, is extremely difficult to measure, but it seems to vary over time; it rises when interest rates are more volatile and uncertain and falls when they are more stable. In recent years, the PRP on 30-year T-bonds has been in the range of 1/2 to 2 percentage points.

### Call Risk Premium

Bonds that are callable are riskier for investors than those that are noncallable because callable bonds have uncertain maturities. To compensate for bearing call risk, investors charge a *call risk premium (CRP)* on callable bonds. The amount of the premium depends on such factors as the interest rate on the bond, current interest rate levels, and time to first call. Historically, CRPs have been in the range of 30 to 50 basis points.

### Combining the Components

When all the interest rate components listed above are taken into account, the interest rate on any debt security is expressed as follows:

$$\text{Interest rate} = \text{RRF} + \text{IP} + \text{DRP} + \text{LP} + \text{PRP} + \text{CRP}.$$

To illustrate, assume that RRF is 2 percent and inflation is expected to average 3 percent in the coming year. Because T-bills have no default, liquidity, or call risk, and almost no price risk, the interest rate on a one-year T-bill would be 5 percent:

$$\begin{aligned} \text{Interest rate}_{\text{T-bill}} &= \text{RRF} + \text{IP} + \text{DRP} + \text{LP} + \text{PRP} + \text{CRP} \\ &= 2\% + 3\% + 0 + 0 + 0 + 0 = 5\%. \end{aligned}$$

As discussed previously, the combination of RRF and IP is the risk-free rate, so  $\text{RF} = 5\%$ . In general, the rate of interest on short-term Treasury securities (T-bills) is used as a proxy for the **short-term** risk-free rate.

Consider another illustration, the callable 30-year, A-rated bonds issued by HCA. Assume that these bonds have an inflation premium of 4 percent; default risk, liquidity, and price risk premiums of 1 percent each; and a call risk premium of 40 basis points. Under these assumptions, the HCA bonds would have an interest rate of 9.4 percent:

$$\begin{aligned} \text{Interest rate}_{\text{30-year bonds}} &= \text{RRF} + \text{IP} + \text{DRP} + \text{LP} + \text{PRP} + \text{CRP} \\ &= 2\% + 4\% + 1\% + 1\% + 1\% + 0.4\% = 9.4\%. \end{aligned}$$

When interest rates are viewed as the sum of a base rate plus premiums for inflation and risk, it is easy to visualize the underlying economic forces that cause interest rates to vary among different issues and over time.

1. Write out the equation for the required interest rate on a debt security.
2. What is the difference between the real risk-free rate (RRF) and the risk-free rate (RF)?
3. Do the interest rates on Treasury securities include a default risk premium (DRP)? A liquidity premium (LP)? A price risk premium (PRP)? Explain your answer.

### Self-Test Questions



4. Does the default risk premium incorporate only the probability of default? Explain your answer.
5. What is price risk? What type of debt securities would have the largest price risk premium?

## The Term Structure of Interest Rates

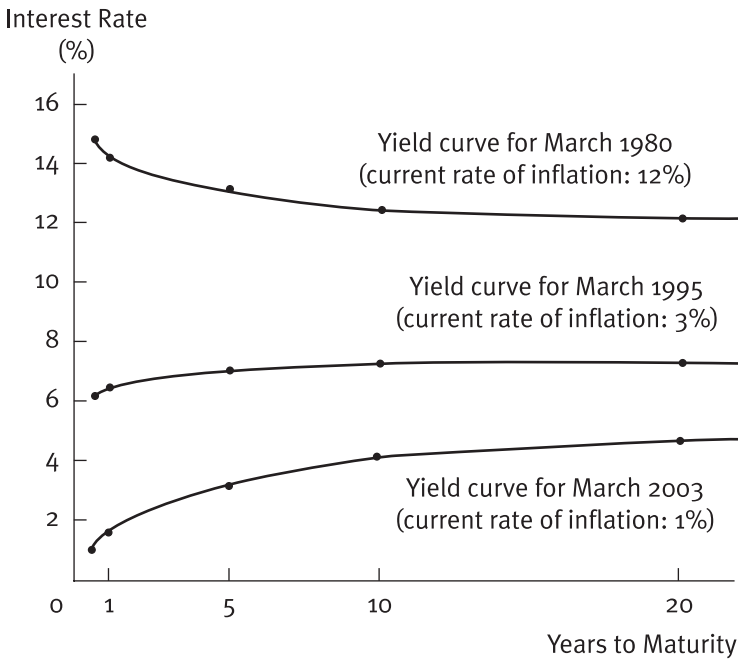


At most times, short-term interest rates are lower than long-term interest rates. However, at some times, short-term rates are higher than long-term rates. The relationship between long- and short-term rates, which is called the *term structure of interest rates*, is important to healthcare managers, who must decide whether to borrow by issuing long- or short-term debt, and to investors, who must decide whether to buy long- or short-term debt. Thus, it is important to understand how interest rates on long- and short-term debt are related to one another and what causes shifts in their relative positions.

To examine the current term structure, look up the interest rates on debt of various maturities by a single issuer (usually the U.S. Treasury) in a source such as the *Wall Street Journal* or the *Federal Reserve Bulletin*.<sup>5</sup> For example, the tabular section of Figure 5.2 presents interest rates for Treasury securities of different maturities on three dates. The set of data for a given date, when plotted on a graph, is called a *yield curve*. As shown in the figure, the yield curve changes both in position and in shape over time.

Figure 5.2 shows yield curves for U.S. Treasury securities, but the curves could have been constructed for similarly rated corporate or municipal (i.e., tax-exempt) bonds. In each case, the yield curve would be approximately the same shape but would differ in vertical position. For example, had the yield curve been constructed for Manor Care, a for-profit nursing home operator, it would fall above the Treasury curve because interest rates on corporate debt include default risk premiums while Treasury rates do not. Conversely, the curve for Palm Coast Medical Center, a not-for-profit hospital, would probably fall below the Treasury curve because the tax-exemption benefit, which lowers the interest rate on tax-exempt securities, generally outweighs the default risk premium. In every case, however, the riskier the issuer (i.e., the lower the bonds are rated), the higher the yield curve plots on the graph.

Historically, long-term rates have generally been above short-term rates, so usually the yield curve has been upward sloping. An *upward sloping curve* would be expected if the inflation premium is relatively constant across all maturities because the price risk premium applied to long-term issues will push long-term rates above short-term rates. Because an upward-sloping yield curve is most prevalent, this shape is also called a *normal yield curve*, as illustrated by the curves for March 1995 and March 2003. Conversely, a yield



**FIGURE 5.2**  
U.S. Treasury  
Bond Interest  
Rates on Three  
Dates

Term to Maturity	Interest Rate		
	March 1980	March 1995	March 2003
6 months	15.0%	6.2%	1.2%
1 year	14.0	6.5	1.4
5 years	13.5	7.0	3.1
10 years	12.8	7.2	4.1
20 years	12.5	7.3	4.5

curve that slopes downward is called an *inverted*, or *abnormal*, *yield curve*. Thus, in Figure 5.2, the yield curve for March 1980 illustrates an inverted curve. Additionally, yield curves can be “kinked” or exhibit other shapes, such as flat.<sup>6</sup> However, by far, the yield curve is normal (upward sloping) most of the time.

Healthcare managers use yield curve information to help make decisions regarding debt maturities. To illustrate the concept, assume for the moment that it is March 2003 and that the yield curve for that month in Figure 5.2 applies to Palm Coast Medical Center. Now, assume that the hospital plans to issue \$10 million of debt to finance a new outpatient clinic with a 20-year life. If it borrowed in 2003 on a short-term basis—say, for one year—Palm Coast’s interest cost for that year would be 1.4 percent, or \$140,000. If it used long-term (20-year) financing, its cost would be 4.5 percent, or \$450,000. Therefore, at first glance, it would seem that Palm Coast should use short-term debt.

However, if the hospital uses short-term debt, it will have to renew the loan every year at the then current short-term rate. Although unlikely, it is possible that interest rates could return to their March 1980 levels. If this happened, at some time in the future the hospital could be paying 14 percent, or \$1.4 million per year. Conversely, if Palm Coast used long-term financing in 2003, its interest costs would remain constant at \$450,000 per year, so an increase in interest rates in the economy would not hurt the hospital.

Does this suggest that businesses should always avoid short-term debt? Not necessarily. If Palm Coast had borrowed on a long-term basis for 4.5 percent in March 2003, it would be at a major disadvantage if interest rates remained low. Its interest expense would be locked in at \$450,000 a year, while any competitors that used short-term debt that cost 1.4 percent would be able to continually renew the debt at the lower rate, or even less. Conversely, inflation expectations could push interest rates up to record levels. If that situation occurred, all borrowers would wish that they had borrowed on a long-term basis in 2003.

Financing decisions would be easy if managers could develop accurate forecasts of future interest rates. Unfortunately, predicting future interest rates with consistent accuracy is somewhere between difficult and impossible—people who make a living by selling interest rate forecasts say it is difficult, but many others say it is impossible. Sound financial policy, therefore, calls for using a mix of long- and short-term debt, as well as equity, in such a manner that the business can survive in all but the most severe and hence unlikely interest rate environments. Furthermore, the optimal financing policy depends in an important way on the maturities of the firm's assets: In general, to reduce risk, managers try to match the maturities of the financing with the maturities of the assets being financed. The issue of optimal debt maturities will be addressed in more detail in Chapter 10.

### Self-Test Questions

1. What is a yield curve and what information is needed to create this curve?
2. What is the difference between a normal yield curve and an abnormal one?
3. If short-term rates are lower than long-term rates, why may a business still choose to finance with long-term debt?
4. Explain the following statement: "A firm's financing policy depends in large part on the nature of its assets."

### Economic Factors That Influence Interest Rate Levels

The general level of interest rates, as opposed to the rate set on a particular debt issue, and the shape of the yield curve are influenced by economic factors.

The three most important of these factors are (1) Federal Reserve policy, (2) federal budgetary policy, and (3) the overall level of business activity.

### **Federal Reserve Policy**

The money supply has a significant effect on both the level of economic activity and the inflation rate, and hence on the level of interest rates. In the United States, the money supply, along with short-term interest rates, is controlled by the *Federal Reserve Board* (the “*Fed*”). If the Fed wants to stimulate the economy, it increases the growth of the money supply and lowers the short-term interest rate that banks charge one another to borrow funds. Alternatively, if the Fed believes that the economy is overheated and inflation will be a problem in the future, it tightens (reduces) the money supply and raises short-term rates. During periods when the Fed is actively intervening in the credit markets, interest rates are affected and the yield curve may be temporarily distorted—that is, short-term rates may be temporarily “too high” or “too low.” Typically, the impact of the Fed’s actions on short-term interest rates is much greater than on long-term rates.

### **Budgetary Policy**

If the federal government spends more than it receives in tax revenues, it runs a deficit. Typically, the shortfall is covered by government borrowing (issuing treasury securities), which increases the amount of debt capital available and hence raises the general level of interest rates. The relative impact on short-term and long-term rates depends on how the deficit is financed. Reliance on short-term debt would raise short-term rates, while reliance on long-term debt would increase long-term rates. Over the past several decades, the federal government has, except for a few years, had an annual deficit, which has pushed the national debt to more than \$8 trillion. Clearly, federal borrowings have exerted upward pressure on the overall level of interest rates. Because the government uses both short- and long-term borrowing to finance its deficits, the impact on the yield curve is uncertain.

### **Level of Economic Activity**

Business conditions have a significant effect on interest rates. Consumer demand slows during recessions and low-growth periods, which means that fewer goods and services are sold, especially durable goods (houses, automobiles, and the like). At the same time, companies hire fewer employees and spend less on new capital assets (land, buildings, and equipment). The net result is downward pressure on inflation and on the demand for borrowed funds, and hence downward pressure on interest rates. At the same time, the Fed is trying to stimulate the economy by increasing the money supply and lowering short-term rates. In general, these conditions tend to have more of an impact on short-term rates than on long-term rates because (1) the Fed

operates in the short end of the credit markets and (2) long-term inflation expectations are not as volatile as short-term expectations. The story is reversed when the economy is booming.

### Self-Test Questions

1. Describe three economic factors that influence the general level of interest rates.
2. Do these factors have a greater influence on short-term rates or long-term rates? Explain.

## Advantages and Disadvantages of Debt Financing

From the viewpoint of the issuer, there are several advantages to using debt financing as opposed to equity financing:

- The cost of debt is independent of a business's earnings, so creditors do not participate if profits soar. This statement means that all of the "excess" value created by good business decisions accrues to the owner(s) of for-profit businesses.
- Because of the tax-deductibility of interest for investor-owned businesses, and the ability of not-for-profit firms to issue tax-advantaged (municipal) debt, the risk-adjusted component cost of debt is lower than that of common stock.
- The owners of a for-profit business do not have to share control with creditors.
- Debt financing allows not-for-profit businesses to offer more services than they could using only equity financing.

The major disadvantages are as follows:

- Because debt service (interest plus principal repayment) is a fixed charge, a decline in operating income can result in default and possibly even bankruptcy.
- As we discuss in Chapter 10, the use of debt financing increases the riskiness of the business and hence increases both debt and equity costs.
- Debt has a fixed maturity date and hence has to be repaid when due. If the business's financial capacity at the time of a large principal repayment is limited, financial problems can result.
- Debt contracts, especially those for long-term debt, often contain covenants that restrict managerial actions.
- The amount of debt that can be raised at "reasonable" interest rates is limited.

1. What are the primary advantages and disadvantages of debt financing compared to equity financing?

## Self-Test Question

### Key Concepts

This chapter provides an overview of debt financing, including how interest rates are determined and the characteristics of the major types of debt securities. Here are its key concepts:

- Any business must have assets if it is to operate, and to acquire assets, the business must raise *capital*. Capital comes in two basic forms: (1) *debt* and (2) *equity* (or *fund*) capital.
- Capital is allocated through the price system; a price is charged to “rent” money. Lenders charge *interest* on funds they lend, while equity investors receive *dividends* and *capital gains* in return for letting the firm use their money.
- Four fundamental factors affect the cost of money: (1) *investment opportunities*, (2) *time preferences for consumption*, (3) *risk*, and (4) *inflation*.
- *Term loans* and *bonds* are long-term debt contracts under which a borrower agrees to make a series of interest and principal payments on specific dates to the lender. A term loan is generally sold to one, or a few, lenders, while a bond is typically offered to the public and sold to many different investors.
- Many different types of bonds exist, including *mortgage bonds*, *debentures*, *subordinated debentures*, and *municipal bonds*. Prevailing interest rates, the bond’s riskiness, and tax consequences determine the return required on each type of bond.
- *Revenue bonds* are municipal bonds in which the revenues derived from projects, such as roads or bridges, airports, water and sewage systems, and not-for-profit healthcare facilities, are pledged as security for the bonds.
- The advantages of short-term credit are the *speed* of arranging such loans, increased *flexibility*, and the fact that short-term *interest rates* are generally *lower* than long-term rates. The principal disadvantage of short-term credit is the *extra risk* that borrowers must bear because lenders can demand payment on short notice, and the cost of the loan will increase if interest rates rise.
- *Bank loans* are an important source of short-term credit. When a bank loan is approved, a *promissory note* is signed.

- Banks sometimes require borrowers to maintain *compensating balances*, which are deposit requirements set at between 10 and 20 percent of the loan amount. Compensating balances raise the effective rate of interest on bank loans.
- *Lines of credit*, or *revolving credit agreements*, are formal understandings between the bank and the borrower in which the bank agrees to extend some maximum amount of credit to the borrower over some specified period.
- Sometimes a borrower will find that it is necessary to borrow on a *secured basis*, in which case the borrower uses assets, such as real estate, securities, equipment, inventories, or accounts receivable, as collateral for the loan.
- *Restrictive covenants* are placed in loan agreements to protect creditors from detrimental actions by borrowers.
- A *call provision* gives the issuer the right to redeem the bonds prior to maturity under specified terms, usually at a price greater than the maturity value (the difference is a *call premium*). A firm will call a bond issue and refund it if interest rates fall sufficiently after the bond has been issued.
- A *sinking fund* is a provision that requires the issuer to retire a portion of the bond issue each year. The purpose of the sinking fund is to provide for the orderly retirement of the issue. No call premium is paid to the holders of bonds called for sinking fund purposes.
- Bonds are assigned *ratings* that reflect the probability of their going into default. The higher a bond's rating and the greater the probability of recovering bondholder capital should default occur, the lower its interest rate.
- *Credit enhancement*, or *bond insurance*, upgrades a municipal bond rating to AAA. Regardless of the inherent credit rating of the issuer, the bond insurer guarantees that bondholders will receive the promised interest and principal payments.
- The *interest rate* on a debt security is composed of the real risk-free rate (RRF) plus premiums that reflect inflation (IP), default risk (DRP), liquidity (LP), price risk (PRP), and call risk (CRP):

$$\text{Interest rate} = \text{RRF} + \text{IP} + \text{DRP} + \text{LP} + \text{PRP} + \text{CRP}.$$

- The relationship between the yields on securities and the securities' maturities is known as the *term structure of interest rates*. The *yield curve* is a graph of this relationship.
- The general level of interest rates is influenced by several economic factors, including (1) Federal Reserve policy, (2) federal budget policy, and (3) the overall level of economic activity.
- Debt has several advantages and disadvantages when compared to equity financing. The primary advantages are fixed payments, lower

costs, and no control rights, whereas the primary disadvantage is the additional risk that debt financing brings to the business.

Debt provides a major source of capital for health services organizations. Thus, it is necessary for healthcare managers to be familiar with debt concepts. In the next chapter, we discuss equity financing, the second major type of capital.

## Chapter Models

This chapter has an accompanying spreadsheet model that helps students understand how interest rates are set on individual securities and the various factors that influence the yield curve.

The model is available on this book's companion website at [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

## Selected References

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## Selected Websites

There are a multitude of websites that pertain to this chapter.

- For both tabular term structure data and a graph of the yield curves for both Treasury and municipal securities, see [www.bloomberg.com/markets/index.html](http://www.bloomberg.com/markets/index.html).
- For current (updated daily) interest rate information, see the Federal Reserve site at [www.federalreserve.gov/releases/H15/update](http://www.federalreserve.gov/releases/H15/update). Note that this site includes data on commercial paper, corporate bonds, and other rates in addition to the rates on Treasury securities.
- The S&P website provides a great deal of information on bond ratings. See [www.standardandpoors.com](http://www.standardandpoors.com). To learn more about bond insurance (credit enhancement), see the Client Tools section of the MBIA site at [www.mbia.com](http://www.mbia.com).

## Selected Cases

There are no cases that focus on the institutional details of debt financing. However, the following case in *Cases in Healthcare Finance* can be assigned to help students understand bond valuation, which is covered in Chapter 7:

- Case 14: Potomac Healthcare (A), which focuses on the valuation of corporate bonds as opposed to the managerial decisions inherent in floating a bond issue.
- In addition, here is another case that focuses on related (Chapter 7)

material: Case A: Waverly Enterprises, which focuses on the bond refunding decision. (Available online only.)

## Notes

1. The *prime rate* is the base rate that banks charge on loans to businesses. Theoretically, the prime rate is set separately by each bank, but in practice all banks follow the lead of the major New York City banks, so there is usually a single prime rate in the United States. The prime rate changes—sometimes quite rapidly—to changing economic conditions, primarily inflation expectations. In mid-2006, the prime rate was 8.25 percent.
2. Treasury bonds, or T-bonds, have original maturities at issue of more than ten years. The Treasury also issues *notes*, called *T-notes*, which have maturities of more than one to ten years, and *bills*, called *T-bills*, which have maturities of one year or less. Note that the names of Treasury securities are fixed at issue even though their maturities shorten over time. Thus, a 30-year T-bond that was issued 25 years ago now has only five years remaining to maturity, but it is still classified as a bond, not a note.
3. The maximum maturity without SEC registration is 270 days. Also, commercial paper can only be sold to “sophisticated” investors; otherwise, SEC registration would be required even for maturities of 270 days or less.
4. A fourth rating agency, Duff & Phelps, was acquired by Fitch in 2000. Also, note that Moody’s and S&P dominate the credit-rating industry, handling about 85 percent of all bond deals.
5. Current interest rates are readily available online. See the selected websites section at the end of this chapter.
6. For a discussion of the forces that influence the shape of the yield curve, see Eugene F. Brigham and Michael C. Ehrhardt, 2005, *Financial Management: Theory and Practice*, Chapter 1. Fort Worth, TX: Thomson/South-Western.



# EQUITY FINANCING AND INVESTMENT BANKING

## Learning Objectives

After studying this chapter, readers should be able to:

- Describe the key features associated with preferred stock financing.
- Explain the rights and privileges associated with common stock ownership.
- Discuss the different methods by which new common stock can be sold.
- Describe the market for common stock.
- Describe how businesses actually sell securities.
- Explain how not-for-profit businesses obtain “equity” financing.

## Introduction

Debt financing concepts were discussed in Chapter 5, including how interest rates are set in the economy, types of debt, and how various debt features affect the interest rate on any particular issue. The second source of capital for healthcare businesses is *equity financing*. Within investor-owned, or for-profit, firms, equity financing is obtained from shareholders through the sale of *stock* and by retaining earnings within the business. The equivalent financing in not-for-profit firms, sometimes called *fund capital*, is raised through contributions, grants, and retaining earnings. From a financial perspective, common stock and fund financing serve the same basic purpose, so the generic term *equity* will be used to refer to all nondebt capital, regardless of a business’s ownership.<sup>1</sup>

In this chapter, we discuss the same general issues as in Chapter 5, but the focus is on equity financing. In addition, we will provide some supplemental information on how securities are sold, or the investment banking process.

## Preferred Stock

*Preferred stock*, which can be issued only by investor-owned firms, is a hybrid—it is similar to bonds in some respects and to common stock in other ways. Accountants classify preferred stock as equity, so it is shown on the balance sheet as an equity account. However, from a financial management perspec-

tive, preferred stock is closer in nature to debt than to equity. Preferred stock imposes a fixed charge on the firm, and hence it has the same impact on the riskiness of the business as does debt financing. However, unlike interest on debt, if a payment is missed on preferred stock, the holders do not have the legal right to force the business into bankruptcy.

### Basic Features

Preferred stock usually has a stated *par*, or *face, value*—often \$100. The *dividend* on preferred stock, which is the equivalent to interest on a debt security, typically is paid quarterly. When a preferred issue is sold, the dividend is stated either as some percentage of par value or as so many dollars per share. For example, in 2006, Regent Healthcare, a large for-profit integrated healthcare system, sold 50,000 shares of \$100 par value preferred stock, raising a total \$5 million of new capital. This issue had a stated dividend of 5 percent, so the annual dollar dividend was \$5, or \$1.25 each quarter. Preferred dividends are generally fixed at issue, so Regent's preferred dividend will remain at \$5 per year regardless of interest rate changes over time. Thus, if the required rate of return on Regent's preferred dividend increases to 7 percent, the value of the stock will fall, just as it will with debt securities.

Although preferred stock contains a promise to pay the stated dividend, issuers do not have the contractual obligation to make the payment. Thus, like common stock, preferred stock dividends are declared each quarter by the business's board of directors; and if the issuer's financial condition deteriorates, the board can elect to *omit*, or *pass*, the dividend. However, most preferred issues are *cumulative*, which means that the cumulative total of all unpaid preferred dividends must be paid before dividends can be paid on the firm's common stock. Unpaid preferred dividends are called *arrearages*, and all arrearages must be paid before common dividends can be paid.

Preferred stock typically carries no voting privileges, so preferred stockholders have no ownership rights. However, most preferred issues stipulate that preferred stockholders can elect a minority of directors—say, 3 out of 12—if the preferred dividends are passed. Even though nonpayment of preferred dividends will not bankrupt a firm, businesses issue preferred stock with every intention of paying the promised dividends. Passing a dividend usually precludes the payment of common dividends and places preferred stockholders on the board. Furthermore, firms with preferred dividends in arrears have a difficult time selling new debt and find it almost impossible to sell new common or preferred stock.

Investors regard preferred stock as being riskier than debt for two reasons: (1) preferred dividends will be omitted before interest payments because default on interest payments has more serious consequences; and (2) in the event of bankruptcy and liquidation, preferred stockholders' claims are junior (subordinate) to debtholders' claims. Accordingly, investors require a higher rate of return on a firm's preferred stock than on its bonds. However,

preferred stock has tax advantages to **corporate buyers** because 70 percent of the preferred dividends received by a corporation are exempt from corporate taxes. Thus, a corporate buyer of Regent's preferred stock in the 40 percent tax bracket would pay 40 percent taxes on 30 percent of the preferred dividend for an effective tax rate of only  $0.40 \times 0.30 = 0.12 = 12\%$ . If the corporate buyer purchased Regent's debt, it would have to pay taxes on the interest earned at the full 40 percent rate. In addition, under current tax law (which is subject to frequent changes), dividends received **by individuals** are taxed at a 15 percent rate as compared to the top rate on earned income of 35 percent. Because of these tax advantages to buyers, dividend rates on preferred stock are pushed down to the point where before-tax returns typically are lower on preferred stocks than on lower-risk bonds.

Almost half of all preferred stock sold in recent years is *convertible*, which means that the preferred stock can be converted, or exchanged, into a set number of shares of common stock. The number of common shares obtained by conversion is fixed when the preferred stock is issued so that immediate conversion makes no financial sense. Over time, however, if the price on the firm's common stock rises, a point is reached when the holders of the preferred stock will be better off if they convert the preferred into common.

Some older preferred stocks are similar to perpetual bonds in that they have no maturity date. However, all preferred stock issued today has either a sinking fund or call provisions that limit the life of the issue. For example, many preferred shares have a sinking fund that calls for the retirement of 2 percent of the issue each year, which means that the average maturity of the issue is 25 years and that the issue will be totally refunded in 50 years.

### **Advantages and Disadvantages of Preferred Stock Financing**

There is a lot more that can be said about preferred stock, particularly about the type that is convertible into common stock. However, this type of equity is not a major source of funding for healthcare businesses, so we will conclude our discussion with the advantages and disadvantages of "regular" preferred stock.<sup>2</sup> From the viewpoint of the issuer, there are three primary advantages:

1. Unlike debt financing, the obligation to pay preferred dividends is not contractual, so passing (omitting) a preferred dividend cannot force a business into bankruptcy.
2. By issuing preferred stock, rather than common stock, the firm avoids the dilution of adding more shares of common stock as well as the additional sharing of control.
3. Because preferred stock often has a longer maturity than debt, preferred stock pushes principal repayments further into the future than typically occurs with debt issues.

There are two major disadvantages, however:

1. Preferred stock dividends are not deductible from taxable income by the issuer, so the after-tax cost on a preferred issue is higher than the cost of a similar debt issue. However, the fact that preferred stock has tax advantages to buyers means that the difference in cost is not as great as it first appears.
2. Although preferred dividends can be passed, investors expect them to be paid. If they are not, there are negative consequences for the issuer, so preferred dividends impose a more stringent fixed cost on a business than do common dividends. Thus, like the use of debt, the use of preferred stock increases the financial risk of a business and hence its cost of common stock.

### Self-Test Questions

1. What are the general features of preferred stock?
2. Should preferred stock be considered as equity or debt financing? Explain your answer.
3. What are the tax advantages to purchasers of preferred stock?
4. What are the advantages and disadvantages of preferred stock financing?

## Rights and Privileges of Common Stockholders

Common stockholders are the owners of for-profit corporations and as such have certain rights and privileges. The most important of these rights and privileges are discussed in this section.

### *Claim on Residual Earnings*

The reason that most people buy common stocks is to gain the right to a proportionate share of the residual earnings of the firm. A firm's net income, which is the residual earnings after all expenses have been paid, belongs to the firm's common stockholders. For many firms, particularly mature ones, some portion of net income will be paid out to common stockholders as *dividends*. Although the predominant timing of dividend payments is quarterly, some firms are now changing to annual dividends to reduce the administrative costs associated with such payments. The portion of net income that is retained within the firm will be invested in new assets, which presumably will increase the firm's earnings over time and hence contribute to even greater dividends in the future.

An increasing dividend stream means that the firm's stock will be more valuable in the future than it is today because dividends will be higher, say, in five years, than they are today. Thus, common stockholders typically expect to be able to sell the stock they purchased at some time in the future at a higher price than they paid for it and hence realize a *capital gain*. To illustrate

the payment of dividends, consider Table 6.1, which lists the annual per share dividend payment and earnings, as well as the average annual stock price, for Big Sky Healthcare from 1996 through 2006. Over the ten growth periods, Big Sky's dividend grew by 275 percent, or at an average annual growth rate of 14.1 percent. At the same time, the firm's stock price grew by 247 percent, which is an average annual growth rate of 13.2 percent.

Note that Big Sky's dividend growth was not a constant 14.1 percent each year. Many firms hold the dividend constant for several years to allow earnings to climb to a point where they can support a higher dividend payment. For example, Big Sky kept its dividend at \$0.23 a share from 1997 through 1999, while earnings per share were flat at about \$0.55.

In general, managers are very reluctant to reduce dividends because investors interpret lower dividends as a signal that management forecasts poor times ahead.<sup>3</sup> Thus, when Big Sky saw its earnings per share tumble from \$1.25 in 2002 to \$0.45 in 2003, it maintained its \$0.58 per share dividend. Big Sky was able to pay a cash dividend that exceeded earnings in 2003 because the firm's cash flow, which is roughly equal to Net income + Depreciation, easily supported the dividend. When earnings picked up again in 2004, Big Sky increased its dividend to \$0.65.

Over the entire period, Big Sky has proved to be a good investment for stockholders. For example, assume that you bought the stock for \$7.70 in 1996, received a \$0.20 dividend payment, and then sold the stock one year later for \$10.95. For simplicity, assume that the dividend payment was paid at the end of the one-year holding period rather than quarterly. Thus, you paid \$7.70, and one year later you received  $\$10.95 + \$0.20 = \$11.15$ . The total return earned was  $\text{Total profit}/\text{Amount of investment} = (\$11.15 - \$7.70)/\$7.70 = 0.448 = 44.8\%$ . Note, however, that investors who bought Big Sky's stock in 1998 or 2002 and then sold it one year later would have

<i>Year</i>	<i>Annual per Share Dividend</i>	<i>Annual per Share Earnings</i>	<i>Average Annual Stock Price</i>
1996	\$0.20	\$0.48	\$ 7.70
1997	0.23	0.55	10.95
1998	0.23	0.52	11.00
1999	0.23	0.58	10.40
2000	0.48	0.85	15.30
2001	0.52	1.10	18.70
2002	0.58	1.25	20.60
2003	0.58	0.45	19.50
2004	0.65	1.35	23.20
2005	0.70	1.50	24.40
2006	0.75	1.55	26.70

**TABLE 6.1**  
Big Sky  
Healthcare:  
Dividends,  
Earnings, and  
Stock Price,  
1996–2006



had a capital loss, rather than a capital gain, on the sale. Of course, they would have received quarterly dividends over the one-year holding period. We will have much more to say about stock valuation in Chapter 7.<sup>4</sup>

### Control of the Firm

Common stockholders have the right to elect the firm's directors, who in turn elect the officers who will manage the business. In small, privately owned corporations, the major stockholders typically assume all of the management leadership positions. However, in large, publicly owned firms, managers typically have some stock, but their personal holdings are insufficient to allow them to exercise voting control. Thus, the management of most publicly owned firms can be removed by the stockholders if they decide a management team is not effective.

Various state and federal laws stipulate how stockholder control is to be exercised. First, corporations must hold an election of directors periodically, usually once a year, and take votes at the annual meeting. Frequently, one third of the directors are elected each year for a three-year term. Each share of stock has one vote; thus, the owner of 1,000 shares has 1,000 votes.<sup>5</sup> Stockholders can appear at the annual meeting and vote in person, but typically they transfer their right to vote to a second party by means of a *proxy*. Management always solicits stockholders' proxies and usually gets them. However, if the common stockholders are dissatisfied with current management, an outside group may solicit the proxies in an effort to overthrow management and take control of the business. This is known as a *proxy fight*. In addition, one corporation can take over another by purchasing a majority of the outstanding stock. A *hostile takeover* occurs when such a control change takes place without approval by the managers of the firm being bought.

Obviously, managers who do not have majority control are very concerned about proxy fights and hostile takeovers. One of the most common tactics to thwart hostile takeovers is to place a *poison pill* provision in the corporate charter. A poison pill typically permits stockholders of the firm that is taken over to buy shares of the firm that instituted the takeover at a greatly reduced price. Obviously, shareholders at the acquiring firm do not want an outside group to get bargain-priced stock, so such provisions effectively stop hostile takeovers. Although poison pill provisions of this type might appear to be illegal, they have withstood many court challenges. The ultimate effect of poison pills is to force acquiring firms to get the approval of the managers of the other firm prior to the takeover. Although the stated reason for poison pills is to protect shareholders against a hostile takeover at a price that is too low, many people believe that they protect managers more than stockholders.

### The Preemptive Right

Common stockholders often have the right, called the *preemptive right*, to purchase any new shares sold by the corporation. In some states, the pre-

emptive right is mandatory; in others, it can be specified in the corporate charter.

The purpose of the preemptive right is twofold. First, it protects current stockholders' power of control. If it were not for this safeguard, the management of a corporation under criticism from stockholders can secure its position by issuing a large number of additional shares and purchasing these shares itself. Management would thereby gain a controlling position in the corporation and frustrate the outside stockholders.

The second, and more important, reason for the preemptive right is that it protects stockholders against a dilution of value. For example, suppose HealthOne HMO has 1,000 shares outstanding at a price of \$100 per share, so the total market value of the firm is \$100,000. If an additional 1,000 shares were sold at \$50 a share, or for \$50,000, it would raise the total market value of HealthOne's stock to \$150,000. When the new total market value is divided by the new number of shares outstanding, a value of \$75 per share is obtained. HealthOne's old stockholders lose \$25 per share, and the new stockholders have an instant profit of \$25 per share. Thus, selling common stock at a price below the current market price dilutes its market value and, at the same time, transfers wealth from the present stockholders to those who purchase the new shares. The preemptive right prevents such wealth transfers.

1. In what forms do common stock investors receive returns?
2. How do common stockholders exercise their right of control?
3. What is the preemptive right, and what is its purpose?

## Self-Test Questions

## Classified Stock

*Classified stock* is sometimes used to meet the special needs of corporations, especially start-up businesses. Generally, when special classifications of stock are used, one type is designated *Class A*, another *Class B*, and so on. Small, new firms seeking to obtain funds from outside sources frequently use different types of common stock. For example, when Genetic Research, Inc., went public in 2004, its Class A stock was sold to the public and paid a token dividend but carried no voting rights for five years. Its Class B stock was retained by the organizers of the firm and carried full voting rights for five years; but dividends could not be paid on the Class B stock until the firm had established its earning power by building up retained earnings to a designated level. The firm's use of classified stock allowed the public to take a position in a conservatively financed growth firm and to earn a small amount of dividend income, while the founders retained absolute control during the crucial early stages of the firm's development. At the same time, outside investors were protected against excessive withdrawals of funds by the original owners. As is often the case in such situations, the Class B stock was also called *founders' shares*.

Note that “Class A,” “Class B,” and so on have no standard meanings. Most corporations have no classified shares, but a firm that does can designate its Class B shares as founders’ shares and its Class A shares as those sold to the public, while another firm can reverse these designations. Other firms can use the A and B designations for entirely different purposes.

In general, voting rights is one of the distinguishing features of classified stock. For example, suppose that Big East Healthcare had two classes of stock that differed only with respect to voting rights: Class V had such rights, while Class N did not. As you would expect, the Class V stock would be more valuable than the Class N stock, typically by about 2 to 5 percent. Thus, if the Class N stock were selling at \$100 per share, the Class V stock might sell for \$104.

## Self-Test Questions

1. Name several types of classified stock and explain their uses.
2. How would the values of voting and nonvoting stock differ?

## Selling New Common Stock

New stock usually is sold to raise equity capital. In addition, new stock sometimes is distributed to current shareholders without raising additional funds, for example, in a spin-off. When stock is issued to raise new equity capital, the new shares may be sold in one of six ways:

1. on a pro rata basis to existing stockholders through a rights offering;
2. through investment bankers to the general public in a public offering;
3. to a single buyer, or a very small number of buyers, in a private placement;
4. to employees through employee stock purchase plans;
5. through a dividend reinvestment plan; and
6. through direct purchase plans.

The following sections provide more information on these methods.

### Rights Offerings

As discussed earlier, common stockholders often have the *preemptive right* to purchase any additional shares sold by the firm. If the preemptive right is contained in a particular firm’s charter, the firm must offer any newly issued common stock to existing stockholders. If the charter does not prescribe a preemptive right, the firm can choose to sell to its existing stockholders or to the public at large. If it sells to the existing stockholders, the stock sale is called a *rights offering*. Each stockholder is issued an option to buy a certain number of new shares at a price below the existing market price, and the terms of the option are listed on a certificate called a *stock purchase right*, or simply a *right*. If a stockholder does not wish to purchase any additional shares in the firm,

then he or she can sell the rights to some other person who does want to buy the stock.

### Public Offerings

If the preemptive right exists in a firm's charter, it must sell new stock through a rights offering. If the preemptive right does not exist, the firm may choose to offer the new shares to the general public through a *public offering*. We discuss procedures for public offerings in detail in a later section.

### Private Placements

In a *private placement*, securities are sold to one or a few investors—generally institutional investors. Private placements are most common with bonds, but they also occur with stocks. The primary advantages of private placements are lower issuance costs and greater speed because the shares do not have to go through the SEC registration process.

The primary disadvantage of a private placement is that because the securities generally will not have gone through the SEC registration process, they must be sold initially to a large, “sophisticated” investor—usually an insurance firm, mutual fund, or pension fund. Furthermore, in the event that the original purchaser wants to sell the securities, they must be sold to other large, “sophisticated” investors. However, the SEC currently allows any institution with a portfolio of \$100 million or more to buy and sell private placement securities. Because there are thousands of institutions with assets that exceed this limit, private placements are becoming more and more popular with issuers.

To illustrate a private equity placement, consider the situation facing Healthcon/WebMD in early 2000. Healthcon needed cash quickly to help pay for an acquisition. At the same time, the managers at Janus funds were flush with cash that they wanted to invest in the stocks of fast-growing firms. Within 24 hours, a win-win deal was struck in which Healthcon sold \$930 million of newly issued stock directly to the Janus funds. The deal was good for Healthcon because it got its equity infusion without bearing the costs of going through an investment banker, which for this issue would have been about \$30 million. In addition, Healthcon did not have to spend the time and money to do a “road show” to convince prospective investors to buy the issue. Janus was able to acquire a sizable chunk of a fast-growing Internet firm without having to battle other institutional investors for a share of the new issue. Additionally, Janus was able to buy the stock at a discount to what it would have cost if a public placement had been used.

### Employee Purchase Plans and ESOPs

Many firms have plans that allow employees to purchase stock on favorable terms. First, under executive incentive *stock option plans*, key managers are given options to purchase stock. These managers generally have a direct,

material influence on the firm's fortunes, so if they perform well, the stock price will go up and the options will become valuable. Second, there are plans for lower-level employees. For example, Texas HealthPlans, Inc., a regional investor-owned HMO, permits employees who are not participants in its stock option plan to allocate up to 10 percent of their salaries to its *stock purchase plan*, and the funds are then used to buy newly issued shares at 85 percent of the market price on the purchase date. Often the firm's contribution—in this case, the 15 percent discount—is not vested in an employee until five years after the purchase date. Thus, the employee cannot realize the benefit of the firm's contribution without working an additional five years. This type of plan is designed both to improve employee performance and to reduce turnover.

A third type of plan is related to the second one, but here the stock bought for employees is purchased out of a share of the firm's profits. Under an *employee stock ownership plan (ESOP)*, firms can claim a tax credit equal to a percentage of wages, provided that the funds are used to buy newly issued stock for the benefit of employees. The amount of the credit varies from year to year, depending on the whims of Congress: currently it is 1/2 of 1 percent of total wages. Because of their favorable tax treatment, and because they are thought to create a more loyal and productive workforce, many firms have created ESOPs in recent years. Now, over 10,000 firms have such plans that cover over 12 million employees.

### **Dividend Reinvestment Plans**

During the 1970s, many large firms instituted *dividend reinvestment plans (DRIPs)*, whereby stockholders can automatically reinvest their dividends in the stock of the paying corporation. There are two types of DRIPs: (1) plans that involve only "old" stock that is already outstanding, and (2) plans that involve newly issued stock. In either case, the stockholder must pay income taxes on the amount of the dividends even though stock, rather than cash, is received.

Under both types of DRIPs, stockholders must choose between continuing to receive cash dividends or using the cash dividends to buy more stock in the corporation. Under the "old" stock type of plan, a bank, which acts as a trustee, takes the total funds available for reinvestment from each quarterly dividend, purchases the corporation's stock on the open market, and allocates the shares purchased to the participating stockholders on a pro rata basis. The brokerage costs of buying the shares are low because of volume purchases, so these plans benefit small stockholders who do not need cash for current consumption.

The "new" stock type of DRIP provides for dividends to be invested in newly issued stock; hence, these plans raise new capital for the firm. No fees are charged to participating stockholders, and some firms offer the new stock at a discount of 3 to 5 percent below the prevailing market price. The firms absorb these costs as a trade-off against the issuance costs that would

be incurred if the stock were sold through investment bankers rather than through the DRIP.

### **Direct Purchase Plans**

In recent years, many firms have established *direct purchase plans*, which allow individual investors to purchase stock directly from the firm. Many of these plans grew out of DRIPs, which were expanded to allow participants to purchase shares in excess of the dividend amount. In direct purchase plans, investors usually pay nominal or no brokerage fees, and many plans offer convenient features such as fractional share purchases, automatic purchases by bank debit, and quarterly statements.

Although employee purchase plans, DRIPs, and direct purchase plans are an excellent way for employees and individual investors to purchase stock, they typically do not raise large sums of new capital for the business, so other methods must be used when equity needs are great.

1. What is a rights offering?
2. What is a private placement and what are its primary advantages over a public offering?
3. Briefly, what are employee stock purchase plans?
4. What is a dividend reinvestment plan (DRIP)?
5. What is a direct purchase plan?

### **Self-Test Questions**

### **The Market for Common Stock**

Some corporations are so small that their common stock is not actively traded; rather, they are owned by only a few people who usually are the managers. Such firms are said to be *privately held*, or *closely held*, and the stock is said to be a *closely held stock*.

The stocks of most small, publicly owned firms, as well as some large firms, are not listed on any exchange and hence are said to be *unlisted*. Such stocks trade in the *over-the-counter (OTC)* market. However, most large, publicly owned firms apply for listing on an exchange. These stocks are said to be *listed*. As a general rule, firms are first listed on a regional exchange, such as the Pacific Exchange; then they move up to the American (AMEX); and finally, if they grow large enough, to the “Big Board”—the New York Stock Exchange (NYSE).

For example, American Healthcare Management, a King of Prussia, Pennsylvania-based firm that owns or manages 16 hospitals in nine states, was recently listed on the NYSE. The firm, which had previously traded on the AMEX, believed that listing on the NYSE would increase the trading of its shares and make it more visible to the investment community, which presumably will have a positive impact on the price of its stock. More than

5,000 stocks are traded in the OTC market versus about 3,000 on the NYSE. But because of the larger size of its listed firms, the NYSE has, until recently, dominated the OTC market in terms of market value and the number of shares traded. However, the recent surge in trading among the stocks of Internet and other “new economy” firms has caused trading in the OTC market to surge to the point where it now has higher volume, both in number of share and dollar terms, than does the NYSE.

Institutional investors, such as pension funds, insurance firms, and mutual funds, own about 60 percent of all common stocks. However, the institutions buy and sell relatively actively, so they account for about 75 percent of all transactions. Thus, the institutions have the greatest influence on the prices of individual stocks.

Stock market transactions can be classified into three distinct categories:

1. **The new issue market.** A small firm typically is owned by its management and a handful of private investors. At some point, if the firm is to grow further, its stock must be sold to the general public, which is defined as *going public*. The market for stock that is in the process of going public is often called the *new issue market*, and the issue is called an *initial public offering (IPO)*. To illustrate the concept, in 2005, Genomic Health, Inc., which conducts research related to disease prediction and therapy response, raised \$60 million in an IPO by selling 5 million shares at \$12 per share.
2. **The primary market.** In 2005, Health Care REIT, Inc., a real estate investment trust that invests solely in properties used for the provision of healthcare services, sold 3 million shares of new common stock, thereby raising over \$100 million of new equity financing. Because the shares sold were newly created, the issue was defined as a *primary market* offering, but because the firm was already publicly held, the offering was not an IPO. Corporations prefer to obtain equity by retaining earnings because of the issuance costs and market pressure associated with the sale of new common stock. Still, if a firm requires more equity funds than can be generated from retained earnings, a stock sale may be required.
3. **The secondary market.** If the owner of 100 shares of HCA sells his or her stock, the trade is said to have occurred in the *secondary market*. Thus, the market for *outstanding*, or used, shares is defined as the secondary market. Over 750 million shares of HCA were bought and sold on the NYSE in 2005, but the firm did not receive a dime from these transactions.

## Self-Test Questions

1. What is an initial public offering (IPO)?
2. What is the difference between selling HCA shares in the primary market and selling the firm’s shares in the secondary market?



## The Decision to Go Public

Most businesses start as proprietorships or partnerships, and then if they are successful and grow, they find it useful to convert to a corporation. Initially, the stock of most corporations is owned by the business's founders, key employees, and often a few investors—usually *venture capitalists*—who may or may not be actively involved in management.<sup>6</sup> However, if growth continues, at some point most firms go public. The advantages and disadvantages of public stock ownership are discussed next.

### Advantages of Going Public

- **Permits founder diversification.** As a firm grows and becomes more valuable, its founders often have most of their wealth tied up in their ownership position. By selling some of their stock during the IPO, or sometime thereafter, the founders can better diversify their holdings, thereby reducing the riskiness of their personal portfolios.
- **Increases liquidity.** The stock of a closely held firm is very illiquid: It has no ready market. If one of the owners wants to sell some shares to raise cash, he or she finds that it is difficult to find a buyer, and even if one can be found, there is no established price on which to base the sale. Going public creates the liquidity that solves these problems.
- **Facilitates raising new corporate cash.** If a privately held firm needs to raise new equity, it must either get it from the current owners, who may not want to put additional capital into the business, or shop around for other investors. However, often the firm finds it difficult to get outsiders to contribute equity capital to a closely held business because they are at the mercy of the founders who have a controlling interest. To illustrate the concept, consider that the founders, who typically are the managers, can vote themselves excessive compensation packages, have private self-serving dealings with the business, and even withhold the business's financial information from outside investors. There are few positions as vulnerable as being an outside stockholder in a closely held firm. Going public, which requires both public disclosure and regulation by the SEC, greatly reduces these problems and hence makes it much easier for the business to raise equity capital.
- **Establishes a value for the business.** There are several reasons why it is useful for the marketplace to establish the equity value of a business. For one thing, when the owner of a closely held business dies, tax appraisers must set a value on the ownership position. If the value is too high, the estate is treated unfairly, but if the value is too low, the taxpayers lose. A firm that is publicly held has an established value. Similarly, if a firm gives incentive stock options to key employees, they cannot estimate a value for those options unless the stock is publicly traded.



### *Disadvantages of Going Public*

- **Cost of reporting.** A publicly owned firm must file quarterly and annual reports with the SEC and various state agencies. Such reports are costly to produce, especially for smaller firms that do not have the internal resources to prepare them. For example, it is estimated that the annual cost of complying only with the Sarbanes-Oxley Act (2002), which specifies corporate financial reporting duties and responsibilities, can easily top \$10 million.
- **Disclosure.** In most situations, management of large firms would prefer to keep operating and financial data private rather than have them available to the firm's competitors. Similarly, the owners of smaller firms may not want to disclose their net worth, and because a publicly owned firm must disclose the number of shares owned by its officers, directors, and major stockholders, it is easy for anyone to estimate the net worth of the insiders—or at least that portion due to ownership of the business. To illustrate, Select Medical Corporation, which operates more than 800 specialty hospitals and clinics, chose to *go private* in 2004. The shares held by the public were purchased by management and private investors and the company became (again) privately held. The reason given for this action was that it is “easier to operate” as a private company.
- **Self-dealings.** The owners/managers of closely held firms have many opportunities for various types of questionable but legal self-dealings, including the payment of above-market salaries; nepotism; personal transactions with the business, such as lease arrangements; overgranting of stock options and warrants; and other fringe benefits that go far beyond what the marketplace sets as reasonable. Such self-dealings become harder to sustain when a firm becomes public and ultimately creates a board of directors that exercises true oversight.
- **Inactive market/low price.** If the corporation is very small, its shares will not be frequently traded, its stock will not really be liquid, and its market price often is a poor measure of the stock's true value. In addition, security analysts will not follow the stock. If this situation persists, much of the benefit associated with going public is not actually realized.
- **Control.** In many businesses, the most dramatic increase in shareholder wealth occurs when a proxy fight or hostile takeover takes place. In addition, these acts motivate managers to pursue stockholder wealth maximization with some zeal. Conversely, such acts often result in removal of the managers at the acquired firm. If the managers maintain a controlling interest, their jobs are secure. In most cases, going public ultimately leads to loss of control by the founding owners/managers.

## Conclusions on Going Public

There are no hard and fast rules regarding when, or even if, a closely held firm should go public. This decision is different for each business and should be made on the basis of the unique circumstances surrounding the business and its stockholders. If a firm does decide to go public, either by selling new common stock to raise capital or by selling stock held by insiders, the key issue is setting the price at which the shares will be offered. The current owners want the price to be as high as possible because the higher the price, the smaller the proportion of the firm that they will have to relinquish to obtain a specified dollar amount of equity financing. On the other hand, potential buyers want the price set as low as possible. We will discuss the process of setting the price on an IPO in a later section.

1. What are the primary advantages of going public?
2. What are the disadvantages of going public?

## Self-Test Questions

## The Decision to List

The decision to go public is truly a milestone in a firm's life—it marks a major change in the relationship between the business and its owners. The decision to *list* the stock on an exchange rather than have it traded in the OTC market, on the other hand, is not a significant event in the life of a business. The firm will have to file a few new reports and abide by the rules of the exchange, the brokers who handle sales of the stock will have to use a different process, and the stock's price will be quoted under an exchange listing rather than in the OTC section.

To have its stock listed, a firm must meet the exchange's minimum requirements regarding size, number of shareholders, and number of shares held by outsiders, which is called *float*. These requirements become more stringent as a firm moves from the regional exchanges to the AMEX to the NYSE. Float is important to an exchange because shares held by insiders trade much less frequently than do shares held by outsiders. If the float is small, there will be limited trading, and the exchange will gain little from the listing. Also, the firm must agree to disclose certain information to help the exchange track trading patterns in an effort to minimize the likelihood that the stock is being manipulated.<sup>7</sup> If the minimum requirements are met, the firm merely applies to the exchange, pays a relatively small fee, and is then listed on that exchange.

Many people believe that listing is beneficial both to the firm and its stockholders. Listed firms receive a certain amount of free advertising and publicity, and their listed status may enhance their prestige and reputation. These factors, as well as the additional safeguards against manipulation, may have a positive impact on sales and stock price. However, in recent years,

improvements in telecommunications and digital processing of trades have lowered transaction costs to the point where differences between trading on the exchanges and on the OTC market are now inconsequential. In fact, the OTC market now has more stocks listed and a larger dollar volume of trades than does the NYSE. As a result, some very large firms, including MCI, Intel, and Apple, which almost certainly would have been listed on the NYSE in times past, have elected to remain in the OTC market.

### Self-Test Question

1. What are some of the considerations involved in the decision to list a stock?

## Advantages and Disadvantages of Common Stock Financing

In this section, we briefly discuss the advantages and disadvantages of financing with common stock.

### *Advantages of Common Stock*

- **No fixed charges.** Common stock does not obligate the business to fixed charges. If the business does not generate sufficient earnings, it does not have to pay dividends on its common stock. Conversely, if the firm used debt financing, it must make the promised interest and principal payments regardless of the earnings level.
- **No maturity date.** Common stock has no maturity date; it is permanent capital that does not have to be “paid back.”
- **Creates additional debt capacity.** Because equity financing strengthens the position of creditors, common stock financing increases access to the debt markets and lowers the cost of debt.
- **May be easier to sell.** Common stock can, at times, be sold more easily than debt, especially when the firm is small and growing rapidly, which almost by definition makes it risky. It appeals to some investors because (1) it offers a higher expected rate of return than does preferred stock or debt, (2) it provides a better hedge against inflation than do fixed return securities, and (3) it has tax advantages over preferred stock and debt investments.<sup>8</sup>

### *Disadvantages of Common Stock*

- **Dilutes control.** The sale of common stock normally gives voting rights to new investors, which dilutes the control of current owners. For this reason, equity financing often is avoided by small firms whose owner/managers may be unwilling to share control with outsiders.

However, as we discussed in a previous section, a special class of common stock can be used that does not confer voting rights.

- **Dilutes value.** Debt financing has a fixed cost, and hence creditors do not share in the success of a business beyond what is promised in the debt agreement. New common stock, however, “dilutes the equity” in the sense that there are more claims on the residual earnings of the business.
- **Issuance costs.** As discussed in the next section, the costs associated with a new stock issue are higher than the costs associated with a similar-sized preferred stock or debt issue.
- **Negative signaling.** The sale of new common stock may be perceived by investors as a negative signal, which would put downward pressure on the stock price. The reason for such an interpretation is the assumption that managers know more about future prospects for the firm than do outside shareholders. Furthermore, it is in the firm’s best interest to issue new common stock when it is overvalued in the marketplace. Thus, a new stock issue, especially one by mature firms, can be interpreted as a signal that managers believe the stock to be overvalued.

1. What are the advantages and disadvantages associated with common stock financing?

### Self-Test Question

## Securities Regulation and the Investment Banking Process

In this section, we describe the regulation of securities markets, the process by which securities are issued, and the role that investment bankers play in the issuance process.

### Regulation of Securities Markets

Sales of new securities, and also sales in the secondary markets, are regulated by the *Securities and Exchange Commission (SEC)* and, to a lesser extent, by each of the 50 states. Here are the primary elements of SEC regulation:

- The SEC has jurisdiction over all **interstate** offerings of new securities to the public in amounts of \$1.5 million or more.
- Newly issued securities must be registered with the SEC at least 20 days before they are publicly offered. The *registration statement* provides financial, legal, and technical information about the firm to the SEC, and the *prospectus* summarizes this information for investors. SEC lawyers and accountants analyze both the registration statement and the prospectus; if the information is inadequate or misleading, the SEC will delay or stop the public offering.

- After the registration has become effective, new securities may be offered, but any sales solicitation must be accompanied by the prospectus. Preliminary, or “*red herring*,” *prospectuses* may be distributed to potential buyers during the 20-day waiting period, but no sales may be finalized during this time. A red herring prospectus contains all the key information that will appear in the final prospectus except the price, which is generally set after the market closes the day before the new securities are actually sold to the public.
- If the registration statement or prospectus contains misrepresentations or omissions of material facts, any purchaser who suffers a loss may sue for damages. Severe penalties may be imposed on the issuer or its officers, directors, accountants, engineers, appraisers, underwriters, and all others who participated in the preparation of the registration statement or prospectus.
- The SEC also regulates all national stock exchanges. Firms whose securities are listed on an exchange must file annual reports similar to the registration statement with both the SEC and the exchange.
- The SEC has control over corporate *insiders*. Officers, directors, and major stockholders must file monthly reports of changes in their holdings of the stock of the corporation.
- The SEC has the power to prohibit manipulation by such devices as *pools* (large amounts of money used to buy or sell stocks to artificially affect prices) or *wash sales* (sales between members of the same group to record artificial transaction prices).
- The SEC has control over the form of the proxy statement and the way the firm uses it to solicit votes.

Control over the use of credit to buy securities (primarily common stock) is exercised by the Federal Reserve Board through *margin requirements*, which specify the maximum percentage of the purchase price that can be financed by brokerage borrowings. The current margin requirement is 50 percent, so stock investors can borrow up to half of the cost of a stock purchase from his or her broker. (Of course, the entire amount on account with the broker could be borrowed from another source, so margin requirements only control broker-supplied debt capital.) If the stock price of a stock bought on margin falls, then the margin money (50 percent of the original value) becomes more than half the current value and the investor is forced to put up additional personal funds. Such a demand for more personal money is known as a *margin call*. The amount of additional funds required depends on the *maintenance margin*, which is set by the broker supplying the loan. When a large proportion of trades are on margin and the stock market begins a retreat, the volume of margin calls can be substantial. Because most investors who buy on margin do not have a large reserve of personal funds, they are

forced to sell some stock to meet margin calls, which, in turn, can accelerate the market decline.

States also have some control over the issuance of new securities within their boundaries. This control is usually exercised by a “corporation commissioner” or someone with a similar title. State laws relating to security sales are called *blue sky laws* because they were put into effect to keep unscrupulous promoters from selling securities that offered the “blue sky” but that actually had little or no assets or cash flows behind them.

The securities industry itself realizes the importance of stable markets, sound brokerage firms, and the absence of price manipulation. Therefore, the various exchanges work closely with the SEC to police transactions and to maintain the integrity and credibility of the system. Similarly, the *National Association of Securities Dealers (NASD)* cooperates to police trading in the OTC market. These industry groups also cooperate with regulatory authorities to set net worth and other standards for securities firms, to develop insurance programs to protect the customers of brokerage houses, and the like.

In general, government regulation of securities trading, as well as industry self-regulation, is designed to ensure (1) that investors receive information that is as accurate as possible, (2) that no one artificially manipulates the market price of a given security, and (3) that corporate insiders do not take advantage of their position to profit in their firms’ securities at the expense of others. Neither the SEC, the state regulators, nor the industry itself can prevent investors from making foolish decisions or from having bad luck, but they can, and do, help investors obtain the best data possible for making sound investment decisions.

### **The Investment Banking Process**

The investment banking process takes place in two stages.

At Stage I, the firm itself makes some initial, preliminary decisions, including the following:

#### **Stage I Decisions**

- **Dollars to be raised.** How much new capital is needed?
- **Type of securities used.** Should common stock, bonds, some other security, or a combination of securities be used? Furthermore, if common stock is to be issued, should it be done as a rights offering, by a direct sale to the general public, or by a private placement? If the sale will be by a public offering, the next two decisions must be made.
- **Competitive bid versus negotiated deal.** Should the firm simply offer a block of its securities for sale to the highest bidding investment banker, or should it negotiate a deal with an investment banker? These two procedures are called *competitive bids* and *negotiated deals*, respectively. Only about 100 of the largest firms, whose securities are already well

known to the investment banking community, are in a position to use the competitive bidding process. The investment banks must do a large amount of investigative work to bid on an issue unless they are already quite familiar with the firm, and such costs would be too high to make it worthwhile unless the banker were sure of getting the deal. Therefore, except for the largest firms, offerings of stocks or bonds are generally on a negotiated basis.

- **Selection of an investment banker.** Most deals are negotiated, so the firm must select an investment banker. This choice can be an important decision for a firm that is going public. On the other hand, an older firm that has already “been to market” will have an established relationship with an investment banker. However, it is easy to change bankers if the firm is dissatisfied. Different investment banking houses are better suited for different firms. The older, larger “establishment houses,” such as Morgan Stanley, deal mainly with large, established firms. Other investment banking houses specialize in smaller firms or new issues, technology firms, or some other niche of the equity markets. To get some idea of the major players in the investment banking business, see Table 6.2, which lists the top ten underwriters of healthcare debt for 2005.

**Stage II Decisions** Stage II decisions, which are made jointly by the firm and its selected investment banker, include the following:

- **Reevaluating the initial decisions.** The firm and its banker will reevaluate the initial decisions regarding the size of the issue and the type of securities to use. For example, the firm may have decided initially to raise \$50 million by selling common stock, but the investment banker may convince management that under current market conditions the firm

**TABLE 6.2**

Top Ten Underwriters of Healthcare Debt for 2005 (Through August 2005)

<i>Underwriter</i>	<i>Dollar Amount of Securities Managed (billions of dollars)</i>	<i>Market Share (%)</i>
J.P. Morgan	\$3.45	18.1%
Merrill Lynch & Co.	2.25	12.3
Citigroup	2.19	11.9
Morgan Stanley	1.93	10.6
Banc of America Securities	1.52	8.3
Deutsche Bank	1.37	7.5
UBS	1.15	6.3
Lehman Brothers	0.95	5.2
Goldman Sachs & Co.	0.67	3.7
CIBC World Markets	0.53	2.9

Source: *Modern Healthcare*, October 3, 2005.

would be better off to limit the stock issue to \$25 million and to raise the other \$25 million as debt.

- **Contractual basis of sale.** The firm and its investment banker must decide whether the banker will work on a *best efforts* basis or will *underwrite* the issue. In a best efforts sale, the banker does not guarantee that the securities will be sold or that the firm will get the cash it needs; it only guarantees that it will put forth its best efforts to sell the issue. On an underwritten issue, the firm does get a guarantee because the banker agrees to buy the entire issue and then resell the stock to its customers. Bankers bear significant risk in underwritten offerings because if the price of the security falls between the time the security is purchased from the issuer and the time of resale to the public, the investment banker must bear the loss.
- **Banker's compensation and other expenses.** The investment banker's compensation must be negotiated. Also, the firm must estimate the other issuance expenses it will incur in connection with the issue, such as lawyers' fees, accountants' costs, and printing and engraving expenses. In an underwritten issue, the banker will buy the issue from the firm at a discount below the price at which the securities are to be offered to the public; this "spread" is set to cover the banker's costs and to provide a profit. In a best efforts sale, fees to the investment banker are normally set as some percentage of the dollar volume sold.

Table 6.3 gives an indication of the issuance costs associated with public issues of bonds and common stock. As the table shows, costs as a percentage of the proceeds are higher for stocks than for bonds, and costs

<i>Size of Issue (millions of dollars)</i>	<i>Common Stock</i>	<i>Bonds</i>
2–9.99	13.28%	4.39%
10–19.9	8.72	2.76
20–39.99	6.93	2.42
40–59.99	5.87	2.38
60–79.99	5.18	2.34
80–99.99	4.73	2.16
100–199.99	4.22	2.31
200–499.99	3.47	2.19
500 and up	3.15	1.64

**TABLE 6.3**  
Issuance Costs as  
a Percentage of  
Gross Proceeds

*Notes:*

- Issuance costs tend to rise somewhat when interest rates are cyclically high, which indicates that money is in relatively tight supply; when this happens, investment bankers will have a relatively hard time placing issues with investors. Thus, the figures shown in this table represent averages, as the costs actually vary somewhat over time.
  - The issuance costs listed for common stocks are for new stock offerings by publicly owned firms. Issuance costs on IPOs are significantly higher, ranging from about 32 percent for small issues to about 15 percent on large issues.
- Source:* Inmoo Lee, Scott Lochhead, Jay Ritter, and Quanshui Zhao, "The Costs of Raising Capital," *The Journal of Financial Research*, Spring 1996.



are higher for small than for large issues. The relationship between size of issue and issuance cost is primarily a result of the existence of fixed costs, which are certain costs that must be incurred regardless of the size of the issue, so the percentage cost is quite high for small issues.

- **Setting the offering price.** If the firm is already publicly owned, the offering price will be based on the existing market price of its stock or the yield on its bonds. Typically, the investment banker buys the securities at a prescribed number of points below the closing price on the last day of registration. Usually, such agreements have *escape clauses* that provide for the contract to be voided if the price of the security drops below some preset amount. The purpose of such clauses is to allow the issuing firm to withdraw the issue if the price sinks to a point that the needed amount of money would not be raised.

The investment banker will have an easier job if the issue is priced relatively low, but the issuer of the securities naturally wants as high a price as possible. Some conflict of interest on price, therefore, arises between the investment banker and the issuer. If the issuer is financially sophisticated and makes comparisons with similar security issues, the investment banker will be forced to price close to the market.

If the firm is going public, there is no established price for the stock, and hence the investment banker will have to estimate the equilibrium price at which the stock will sell after it is issued. If the offering price is set below the true equilibrium price, as with most IPOs, the stock price will rise sharply on the first day of trading. For example, Healthcon's IPO was priced at \$8, but the stock closed at \$31 on the first day of trading. When this rise happens, the firm and the existing stockholders give away too many shares to raise the new capital, and there is a wealth transfer from existing stockholders to the IPO buyers. Conversely, if the stock price falls on the first day of trading, there is a wealth transfer from the new buyers to the old shareholders. Thus, it is important that the equilibrium price estimate be as good as possible.<sup>9</sup>

### **Selling Procedures**

Once the firm and its investment banker have decided how much money to raise, the types of securities to issue, and the basis for pricing the issue, they will prepare and file a registration statement and a prospectus. It generally takes about 20 days for the issue to be approved by the SEC. The final price of the stock, or the interest rate on a bond issue, is set at the close of business on the day the issue clears the SEC, and the securities are offered to the public the following day.

Investors are required to pay for securities within ten days, and the investment banker must pay the issuing firm within four days of the official

commencement of the offering. Typically, the banker sells the securities within a day or two after the offering begins, but on occasion, the banker miscalculates, sets the offering price too high, and thus is unable to move the issue. At other times, the market declines during the offering period, forcing the banker to reduce the price of the stock or bonds. In either instance, on an underwritten offering, the firm receives the dollar amount that was agreed on, so the banker must absorb any losses incurred.

Because they are exposed to large potential losses, investment bankers typically do not handle the purchase and distribution of issues single-handedly unless the issue is a very small one. If the sum of money involved is large, investment bankers form *underwriting syndicates* in an effort to minimize the risk each banker carries. The banking house that sets up the deal is called the *lead*, or *managing, underwriter*. In addition to the underwriting syndicate, on larger offerings still more investment bankers are included in a *selling group*, which handles the distribution of securities to individual investors. The selling group includes all members of the underwriting syndicate, plus additional dealers who take relatively small percentages of the total issue from the members of the underwriting syndicate. Thus, the underwriters act as wholesalers, while members of the selling group act as retailers. The number of houses in a selling group depends partly on the size of the issue, but also on the number and types of buyers. For example, the selling group that handled a recent \$92 million municipal bond issue for Adventist Health System/Sunbelt consisted of three members, while the one that sold \$1 billion in junk (B-rated) bonds for National Medical Enterprises consisted of eight members.<sup>10</sup>

A new selling procedure has recently emerged that does not require an underwriting syndicate. In an *unsyndicated stock offering*, the managing underwriter, acting alone, sells the issue entirely to one or more institutional investors. This type of offering can be thought of as a private placement through an investment banker. (As discussed previously, it is possible to do a private placement without using an investment banker at all.) The motivating force behind this type of offering is, of course, money. The fees that issuers pay on a syndicated offering can run about 1 percentage point higher than on an unsyndicated offering. Furthermore, although total fees are lower on an unsyndicated offering, the lead (and only) underwriter usually ends up with more because it does not have to share the fees with an underwriting syndicate.

Once an issue is sold, the job of the investment banker may not be over. In the case of an IPO, the investment banker is obligated to maintain a market in the stock to establish its liquidity. This means that the banker must hold an inventory of shares and stand ready to buy and sell the stock if no matching orders materialize for the trades initiated in the secondary market. This action by investment bankers keeps its corporate customers happy and hence leads to future IPO business.

## Shelf Registrations

The selling procedures described to this point apply to most security sales. However, under SEC Rule 415, larger firms that issue securities frequently may file a master registration statement with the SEC and then file only a short-form update prior to each offering. Under this rule, it is possible to make the decision today and sell the securities tomorrow. The “quick” procedure is called a *shelf registration* because the firm puts its new securities “on the shelf” when it does the master registration and can take them “off the shelf” and sell them to investors when it believes that conditions are “right.” Businesses with less than \$150 million market value in float—stock held by outside investors—cannot use shelf registrations. The reason for this limitation is to protect investors who may not be able to get adequate financial data about a smaller firm in the short time between the announcement of the offering and the actual sale. Shelf registrations are advantageous to the issuer because overall costs are lower, and the firm has more control over the timing of the issue.

### Self-Test Questions

1. What are the key features of securities markets regulation?
2. What types of decisions must be made by the issuer and its investment banker?
3. What is the difference between an underwritten and a best efforts issue?
4. Are there any conflicts that might arise between the issuer and the investment banker when setting the offering price on a stock issue?
5. What is a shelf registration?

## Equity in Not-for-Profit Firms

Investor-owned businesses have two sources of equity financing: (1) retained earnings and (2) new stock sales. Not-for-profit businesses can, and do, retain earnings, but they do not have access to the equity markets; that is, they cannot sell stock to raise equity capital. Not-for-profit businesses can, however, raise equity capital through *government grants* and *charitable contributions*. Federal, state, and local governments are concerned about the provision of healthcare services to the general population. Therefore, these entities often make grants to not-for-profit providers to help offset the costs of services rendered to patients who cannot pay for those services. Sometimes these grants are nonspecific, but often providers are required to offer specific services, such as neonatal intensive care to needy infants.

As for charitable contributions, individuals, as well as firms, are motivated to contribute to health services organizations for a variety of reasons, including concern for the well-being of others, the recognition that often accompanies large contributions, and tax deductibility. Because only contributions to not-for-profit firms are tax deductible, this source of funding is, for

all practical purposes, not available to investor-owned health services organizations. Although charitable contributions are not a substitute for profit retentions, charitable contributions can be a significant source of fund capital. For example, the Association for Health Care Philanthropy reported that total gifts to not-for-profit hospitals in recent years have averaged over \$5 billion per year, of which about half represented immediate cash contributions. However, recently many healthcare philanthropy experts have opined that it will be more difficult to obtain contributions in the future than it has been in the past. The reasons given include intense competition for contribution dollars and public concern over whether not-for-profit hospitals are truly meeting their charitable missions.

Most not-for-profit hospitals received their initial, start-up equity capital from religious, educational, or governmental entities, and today some hospitals continue to receive funding from these sources. However, since the 1970s, these sources have provided a much smaller proportion of hospital funding, forcing not-for-profit hospitals to rely more on retained earnings and charitable contributions. Furthermore, federal programs such as the Hill-Burton Act, which provided large amounts of funds for hospital expansion following World War II, have been discontinued, and state and local governments, which are also facing significant financial pressures, are finding it more and more difficult to fund grants to healthcare providers.

Finally, as we discussed in Chapter 1, there is a growing trend among legislative bodies and tax authorities to force not-for-profit hospitals to “earn” their favorable tax treatment by providing a certain amount of charity care to indigent patients. Even more severe, some cities have pressured not-for-profit hospitals to make “voluntary” payments to the city to make up for the lost property-tax revenue. All of these trends tend to reduce the ability of not-for-profit health services organizations to raise equity capital by grants and contributions; hence, the result is increased reliance on making money “the old-fashioned way”—by earning it.

On the surface, it appears that investor-owned firms have a significant advantage in raising equity capital. In theory, new common stock can be issued at any time and in any amount. Conversely, charitable contributions are much less certain. The planning, solicitation, and collection periods can take years, and pledges are not always collected, so funds that were counted on may not materialize. Also, the proceeds of new stock sales may be used for any purpose, but charitable contributions may be *restricted*, in which case they can be used only for a designated purpose.

However, managers of investor-owned firms do not have complete freedom to raise capital in the equity markets. If market conditions are poor and the stock is selling at a low price, then a new stock issue can be harmful to the firm’s current stockholders. Additionally, a new stock issue can be viewed by investors as a signal by management that the firm’s stock is overvalued, so new stock issues tend to have a negative impact on the firm’s stock price. The

bottom line here is that investor-owned businesses, especially those in fast-growing industries and markets, do have a financing advantage over not-for-profit businesses. However, the advantage is not so great as to create market dominance. If the advantage were significant, it is likely that we would find many less not-for-profit businesses in the healthcare sector than currently exist.

## Self-Test Questions

1. What are the sources of equity (fund capital) to not-for-profit businesses?
2. Do investor-owned businesses have a significant financing advantage over not-for-profit businesses?

## Key Concepts

This chapter contains a wealth of material on equity financing and how securities are brought to market. Here are its key concepts:

- The most important *common stockholder* rights are a claim on the firm's residual earnings, control, and the preemptive right.
- New common stock may be sold by for-profit corporations in six ways: (1) on a pro rata basis to existing stockholders through a *rights offering*; (2) through investment bankers to the general public in a *public offering*; (3) to a single buyer, or a small number of buyers, in a *private placement*; (4) to employees through an *employee stock purchase plan*; (5) to shareholders through a *dividend reinvestment plan*; and (6) to individual investors by *direct purchase*.
- A *closely held corporation* is one that is owned by a few individuals who typically are the firm's managers.
- A *publicly owned corporation* is one that is owned by a relatively large number of individuals who are not actively involved in its management.
- Securities markets are regulated at the national level by the *Securities and Exchange Commission (SEC)* and at the state level by state agencies, which are often called *corporation commissions*.
- An *investment banker* assists in the issuing of securities by helping the business determine the size of the issue and the type of securities to be used; by establishing the selling price; by selling the issue; and in some cases, by maintaining an aftermarket for the securities.
- Not-for-profit firms do not have access to the equity markets. However, *charitable contributions*, which are tax deductible to the donor, and *governmental grants* constitute unique equity sources for not-for-profit firms.

This concludes our discussion of the institutional features associated with debt and equity financing. However, two chapters remain in the capital

acquisition section. In the next chapter, we illustrate how securities are valued and how businesses make debt-redemption decisions.

## Chapter Models and Problems

Because this chapter is primarily descriptive, it has no accompanying spreadsheet models or problem set. However, Chapter 7 has both a model and problems that focus on common stock valuation.

## Selected References

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- Smith, Dean G., John R. C. Wheeler, and Jan P. Clement. 1995. "Fundraising, Government Grants and Donations to Non-Profit Hospital Charities." *Health Services Management Research* (August): 198–208.
- Sykes, C. Scott, Jr. 1991. "The Role of Equity Financing in Today's Health Care Environment." *Topics in Health Care Financing* (Fall): 1–4.
- Wallace, Cindy. 1985. "Not-For-Profits Competing for Capital by Selling Stock in Alternative Ventures." *Modern Healthcare* (August 16): 32–38.

## Selected Websites

There are a multitude of websites that pertain to this chapter.

- To learn more about stock exchanges, see the NYSE site at [www.nyse.com](http://www.nyse.com). Here, you can research listing requirements as well as learn how the NYSE works.
- To learn more about the OTC market, see the NASDAQ site at [www.nasdaq.com](http://www.nasdaq.com).
- To learn about regulation, see the SEC site at [www.sec.gov](http://www.sec.gov). In addition to providing a great deal of information about the SEC, the site also features recent firm filings. Click on the Quick EDGAR Tutorial line in the left column of the page.

- To learn more about dividend reinvestment plans, see the DRIP investor site at [www.dripinvestor.com](http://www.dripinvestor.com).
- To learn more about investment banking, see any of the websites of the investment bankers listed in Table 6.2. For example, see the Morgan Stanley site at [www.morganstanley.com](http://www.morganstanley.com). Then, click on Institutional Services.

## Selected Case

There are no cases available that focus on equity financing or investment banking. However, the following case in *Cases in Healthcare Finance* can be assigned to help students learn equity valuation (covered in Chapter 7):

- Case 15: Potomac Healthcare (B), which focuses on the mechanics of equity valuation.

## Notes

1. Proprietorships and partnerships raise equity capital through owner contributions rather than by the sale of stock. However, the focus of this chapter is on larger for-profit businesses, which typically are organized as corporations and, of course, not-for-profit organizations must be incorporated.
2. For more information on other types of preferred stock, particularly convertible preferred, see Eugene F. Brigham and Michael C. Ehrhardt, *Financial Management: Theory and Practice* (Forth Worth, TX: Thomson/South-Western, 2005), Chapter 21.
3. The folk wisdom among corporate managers is that “like diamonds, dividends are forever.” The reason is that a dividend cut, or worse yet an omission, will trigger a sell-off that will substantially lower the firm’s stock price and place management in a precarious position. Thus, dividends typically are cut only under extreme circumstances and after all other options have been exhausted.
4. For much more information about corporate dividend policy as well as other distributions, see Chapter 19 (Distributions to Owners: Bonuses, Dividends, and Repurchases), which can be accessed on this book’s companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).
5. In the typical voting procedure, a stockholder who owns 1,000 shares can cast 1,000 votes for each director whose seat is contested. An alternative voting procedure, called *cumulative voting*, is used at some firms. Here, the 1,000-share stockholder would get 3,000 votes if three seats were being contested, and he or she can cast all of them for one director. Cumulative voting helps small groups of shareholders to get a voice on the board.
6. *Venture capitalists* are individuals and firms that supply capital to small, start-up businesses that do not have the track record necessary to obtain capital from banks or public markets. This type of financing is referred to as *first-round* financing. The capital may be in the form of debt or equity, but debt investments usually are accompanied by stock options or some other “equity kicker” that gives the venture capitalist an ownership position in the business. Although

many venture capital investments never pan out, those that do typically create huge returns when the venture capitalists “cash out” after the successful firm has gone public.

7. It is illegal for anyone to manipulate the price of a stock. During the 1920s, and earlier, syndicates would be formed for the sole purpose of buying and selling stocks among one another at prearranged prices so that the public would believe that the stock was worth more or less than its true value. The exchanges, with the encouragement and support of the SEC, utilize sophisticated computer programs to help spot any trading irregularities that suggest manipulation. Additionally, various disclosures, including transactions by insiders, are required.
8. If a stock is held for more than one year, any profit is classified as a long-term capital gain and hence taxed at a lower rate than is ordinary income. Furthermore, taxes are not paid until the stock is sold.
9. IPOs are almost always underpriced, and, in some cases, the underpricing is huge. Various theories have been put forth to explain this phenomenon. The best explanation seems to be that (1) both the current stockholders and the investment bankers want to create excitement about the firm, and a big price run-up does that; (2) a small percentage of the stock generally is offered to the public, so current stockholders give away less than it first appears; and (3) IPO firms generally plan to have follow-on stock issues in the near future, and the best way to ensure the success of future issues is to have a successful IPO.
10. Large security issues are announced in the *Wall Street Journal*, and other publications, by advertisements placed by the underwriters called *tombstones*. Check several recent issues of the *Journal* to see if there are any healthcare issues advertised.





# SECURITIES VALUATION, MARKET EFFICIENCY, AND DEBT REFUNDING

## Learning Objectives

After studying this chapter, readers should be able to:

- Describe how securities in general are valued.
- Value debt securities as well as calculate their yields to maturity.
- Value stocks as well as calculate their expected rates of return.
- Explain the concept of market efficiency and its implications for investors and managers.
- Conduct a debt refunding analysis.

## Introduction

Now that you understand the basic features of both debt and equity securities, the next step is to learn how investors value these securities. Your reaction at this point might be: “Why should I have to worry about security valuation when what I really want to learn about is healthcare financial management?” Security valuation concepts are important to healthcare managers for many reasons. Here are just a few:

- The lifeblood of any business is capital. In fact, the most common reason for small business failures is insufficient capital. Therefore, it is vital that healthcare managers understand how investors make investment allocation decisions.
- For investor-owned businesses, stock price maximization is an important, if not primary goal, so healthcare managers of for-profit businesses must know how investors value the firm’s securities to understand how managerial actions affect stock price.
- For healthcare managers to make financially sound investment decisions regarding real assets (plant and equipment), it is necessary to estimate the business’s cost of capital, and security valuation is a necessary skill in this process. We will discuss the cost of capital in Chapter 9.

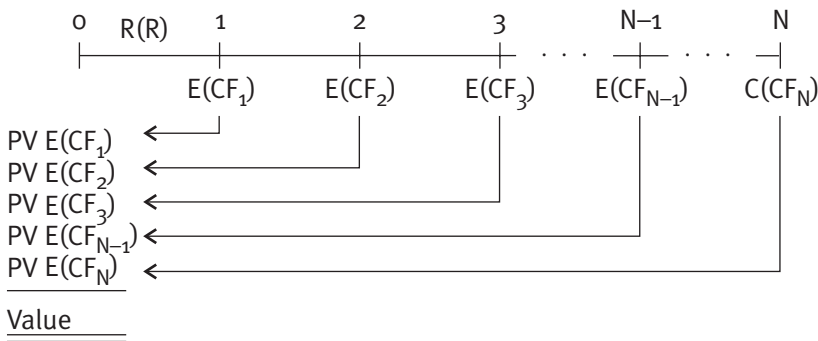
- All healthcare managers must grapple with the decision of how much debt, as opposed to equity, financing the business should use. An understanding of stock and bond valuation is critical to this decision, so the concepts presented in this chapter will be used again in Chapter 10.
- Real assets, such as hospital beds and diagnostic equipment, are valued in the same general way as securities. Thus, security valuation provides healthcare managers with an excellent foundation to learn real asset valuation, which is the heart of capital investment decision making within businesses. Thus, the general concepts present in this chapter are crucial to a good understanding of Chapters 11 and 12.

## The General Valuation Model

In most situations, individuals and institutions buy assets (make investments) for one reason: to receive the cash flows that the asset is expected to produce. Because the values of investment opportunities stem from streams of expected cash flows, most investments are valued by the same four-step process:

1. **Estimate the expected cash flow stream.** Estimating the cash flow stream involves estimating both the expected cash flows and the periods in which they are expected to occur. For some types of investments, such as bonds, the estimation process is quite easy—the interest and principal repayment stream is fixed by contract. For other types of investments, such as a new service line, the estimation process can be very difficult.
2. **Assess the riskiness of the cash flow stream.** As with estimating the cash flows, in some situations, such as an investment in Treasury securities, it will be fairly easy to assess the riskiness of the estimated cash flow stream. In other situations it may be quite difficult.
3. **Set the required rate of return.** Once the riskiness is assessed, the opportunity cost principle is applied to set the required rate of return. By investing in one asset, the funds are no longer available to invest in alternative assets of similar risk. Thus, the required rate of return on the cash flow stream is established on the basis of the risk assessment and the returns available on alternative investments of similar risk.
4. **Discount the expected cash flows and sum the present values.** Each cash flow is now discounted at the asset's required rate of return (opportunity cost rate), and the present values are summed to find the value of the asset.

The following time line formalizes the general valuation process:



Here,  $E(CF_t)$  is the expected cash flow in each Period  $t$ ;  $R(R)$  is the periodic required rate of return (i.e., the opportunity cost rate) on the investment; and  $N$  is the number of periods for which cash flows are expected. The periods can be months, quarters, semiannual periods, or years, depending on the frequency of the cash flows expected from the investment.

The general valuation model can be applied to both financial assets (securities), such as stocks and bonds, and real (physical) assets, such as buildings, equipment, and even whole businesses. The key to its use is that it must be possible to estimate the cash flows expected from the investment with some confidence. Each asset type requires a somewhat different application of the general valuation model, but the basic approach remains the same. In this chapter, the general valuation model is applied to three types of securities: (1) bonds, (2) preferred stock, and (3) common stock. In the chapters that follow, the model will be applied to real assets and to entire businesses.

1. What is the general valuation model?
2. Under what conditions can it be used?

## Self-Test Questions

## Debt Valuation

Unless there are some unusual features, debt securities are valued by applying the general valuation model without much modification. We will use bonds to illustrate debt valuation, but the techniques discussed in the following sections are applicable to most types of debt and preferred stock.

### Definitions

To begin our discussion of bond (debt) valuation, it is useful to review some basic bond concepts:

- **Par value.** The *par*, or *face*, *value* is the stated value of the bond. It is often set at \$1,000 or \$5,000. The par value generally represents the amount of money the business borrows (per bond) and promises to repay at some future date.

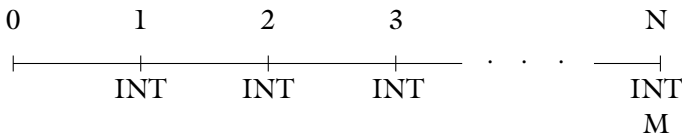
- **Maturity date.** Bonds generally have a specified *maturity date* on which the par value will be repaid. For example, Big Sky Healthcare, a for-profit hospital system, issued \$50 million worth of \$1,000 par value bonds on January 1, 2006. The bonds will mature on December 31, 2020, so they had a 15-year *maturity* at the time they were issued. The effective maturity of a bond declines each year after it was issued. Thus, at the beginning of 2007, Big Sky's bonds will have a 14-year maturity, and so on.
- **Coupon rate.** A bond requires the issuer to pay a specific amount of interest each year or, more typically, each six months. The rate of interest is called the *coupon interest rate*, or just *coupon rate*. The rate may be variable, in which case it is tied to some index, such as 2 percentage points above the prime rate. More commonly, the rate will be fixed over the life (maturity) of the bond. For example, Big Sky's bonds have a 10 percent coupon rate, so each \$1,000 par value bond pays  $0.10 \times \$1,000 = \$100$  in interest each year. The dollar amount of annual interest, in this case \$100, is called the *coupon payment*.<sup>1</sup>
- **New issues versus outstanding bonds.** A bond's value is determined by its coupon payment—the higher the coupon payment, other things held constant, the higher its value. At the time a bond is issued, its coupon rate is generally set at a level that will cause the bond to sell at its par value. In other words, the coupon rate is set to match investors' required rate of return on the bond (i.e., the *going rate*). A bond that has just been issued is called a *new issue*. After the bond has been on the market for a while, about a month, it is classified as an *outstanding bond*, or a *seasoned issue*. New issues sell close to par, but because a bond's coupon payment is generally fixed, changing economic conditions, and hence interest rates, will cause a seasoned bond to sell for more or less than its par value.
- **Debt service requirements.** Firms that issue bonds are concerned with their total debt service requirements, which include both interest expense and repayment of principal. For Big Sky, the debt service requirement is  $0.10 \times \$50 \text{ million} = \$5 \text{ million}$  per year until maturity. In 2020, the firm's debt service requirement will be \$5 million in interest plus \$50 million in principal repayment, for a total of \$55 million. In Big Sky's case, only interest is paid until maturity, so the entire principal amount must be repaid at that time. As we discussed in Chapter 5, many municipal bonds are serial issues structured so that the debt service requirements are relatively constant over time. In this situation, the issuer pays back a portion of the principal during each year.

### The Basic Bond Valuation Model



Bonds call for the payment of a specific amount of interest for a specific number of years and for the repayment of par on the bond's maturity date.

Thus, a bond represents an annuity plus a lump sum, and its value is found as the present value of this cash flow stream:



$$\text{Value} = \frac{\text{INT}}{[1 + R(R)]^1} + \frac{\text{INT}}{[1 + R(R)]^2} + \cdots + \frac{\text{INT} + M}{[1 + R(R)]^N}.$$

Here,

INT = dollars of interest paid each year = Coupon rate  $\times$  Par value.

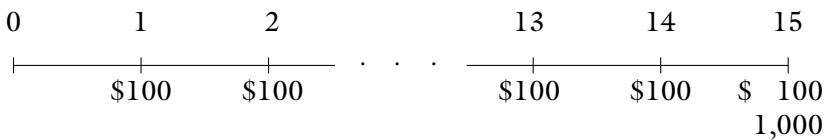
M = par, or maturity, value.

R(R) = required rate of return on the bond, which, in general, depends on the returns available on alternative investments of similar risk.

For bonds, these returns depend on the real risk-free rate, inflation expectations, and the riskiness of the security.

N = number of years until maturity. N declines each year after the bond is issued.

Here are the cash flows from Big Sky's bonds on a time line:



If the bonds had just been issued, and the coupon rate was set at the going interest rate for bonds of this risk, then  $R(R) = 10\%$ . Because the value of the bond is merely the present value of its cash flows, discounted to Time 0 at a 10 percent discount rate, the value of the bond at issue was \$1,000:

Present value of a 15-year, \$100 payment annuity	
at 10 percent	= \$ 760.61
Present value of a \$1,000 lump sum discounted	
15 years	= <u>239.39</u>
Value of bond	= <u>\$1,000.00</u>

The value of the bond can be found using a spreadsheet as follows:

	A	B	C	D
1				
2	10.0%	Rate	Interest rate	
3				
4	\$ 100	Value 1	Year 1 coupon	
5	\$ 100	Value 1	Year 2 coupon	
6	\$ 100	Value 1	Year 3 coupon	
7	\$ 100	Value 1	Year 4 coupon	
8	\$ 100	Value 1	Year 5 coupon	
9	\$ 100	Value 1	Year 6 coupon	
10	\$ 100	Value 1	Year 7 coupon	
11	\$ 100	Value 1	Year 8 coupon	
12	\$ 100	Value 1	Year 9 coupon	
13	\$ 100	Value 1	Year 10 coupon	
14	\$ 100	Value 1	Year 11 coupon	
15	\$ 100	Value 1	Year 12 coupon	
16	\$ 100	Value 1	Year 13 coupon	
17	\$ 100	Value 1	Year 14 coupon	
18	\$ 1,100	Value 1	Year 15 coupon + Principal	
19				
20	\$ 1,000.00	=NPV(A2,A4:A18) (entered into Cell A20)		

Note that we used the NPV function to value the bond. Also, note that Cell A18 contains 1,100 as the entry, which reflects the \$100 interest payment in Year 15 plus the \$1,000 return of principal.

If  $R(R)$  remained constant at 10 percent over time, what would be the value of the bond one year after it was issued? Now, the term to maturity is only 14 years—that is,  $N = 14$ . As seen below, the bond's value remains at \$1,000:

	A	B	C	D
1				
2	10.0%	Rate	Interest rate	
3				
4	\$ 100			
5	\$ 100	Value 1	Year 1 coupon	
6	\$ 100	Value 1	Year 2 coupon	
7	\$ 100	Value 1	Year 3 coupon	
8	\$ 100	Value 1	Year 4 coupon	
9	\$ 100	Value 1	Year 5 coupon	
10	\$ 100	Value 1	Year 6 coupon	
11	\$ 100	Value 1	Year 7 coupon	
12	\$ 100	Value 1	Year 8 coupon	
13	\$ 100	Value 1	Year 9 coupon	
14	\$ 100	Value 1	Year 10 coupon	
15	\$ 100	Value 1	Year 11 coupon	
16	\$ 100	Value 1	Year 12 coupon	
17	\$ 100	Value 1	Year 13 coupon	
18	\$ 1,100	Value 1	Year 14 coupon + Principal	
19				
20	\$ 1,000.00	=NPV(A2,A5:A18) (entered into Cell A20)		

Note that the spreadsheet has the same inputs as when the bond had 15 years to maturity; however, the range listed in the NPV function was changed from A4:A18 to A5:A18 to reflect only 14 years to maturity.

Suppose that interest rates in the economy fell after the Big Sky bonds were issued and, as a result,  $R(R)$  decreased from 10 percent to 5 percent. The coupon rate and par value are fixed by contract, so they remain unaffected by changes in interest rates, but now the discount rate is 5 percent rather than 10 percent. At the end of the first year, with 14 years remaining, the value of the bond would be \$1,494.93:

	A	B	C	D
1				
2	5.0%	Rate	Interest rate	
3				
4	\$ 100			
5	\$ 100	Value 1	Year 1 coupon	
6	\$ 100	Value 1	Year 2 coupon	
7	\$ 100	Value 1	Year 3 coupon	
8	\$ 100	Value 1	Year 4 coupon	
9	\$ 100	Value 1	Year 5 coupon	
10	\$ 100	Value 1	Year 6 coupon	
11	\$ 100	Value 1	Year 7 coupon	
12	\$ 100	Value 1	Year 8 coupon	
13	\$ 100	Value 1	Year 9 coupon	
14	\$ 100	Value 1	Year 10 coupon	
15	\$ 100	Value 1	Year 11 coupon	
16	\$ 100	Value 1	Year 12 coupon	
17	\$ 100	Value 1	Year 13 coupon	
18	\$ 1,100	Value 1	Year 14 coupon + Principal	
19				
20	\$ 1,494.93	=NPV(A2,A5:A18) (entered into Cell A20)		

Here, we changed only the required rate of return in Cell A2. The arithmetic of the bond value increase should be clear: lower discount rates lead to higher present values, but what is the logic behind it? The fact that  $R(R)$  has fallen to 5 percent means that if an individual had \$1,000 to invest, he or she could buy new bonds like Big Sky's—every day some 10 to 20 firms sell new bonds—except that these new bonds would only pay \$50 in interest each year. Naturally, he or she would favor \$100 over \$50 and would be willing to pay more than \$1,000 for Big Sky's bonds. All investors would recognize this rationale; as a result, the Big Sky bonds would be bid up in price to \$1,494.93, at which point they would provide the same rate of return as new bonds of similar risk, 5 percent.

Assuming that interest rates stay constant at 5 percent over the next 14 years, what would happen to the value of a Big Sky bond? It would fall gradually from \$1,494.93 at present to \$1,000 at maturity, when the firm will redeem each bond for \$1,000. This point can be illustrated by calculating



the value of the bond one year later, when it has only 13 years remaining to maturity:

	A	B	C	D
1				
2	5.0%	Rate	Interest rate	
3				
4	\$ 100			
5	\$ 100			
6	\$ 100	Value 1	Year 1 coupon	
7	\$ 100	Value 1	Year 2 coupon	
8	\$ 100	Value 1	Year 3 coupon	
9	\$ 100	Value 1	Year 4 coupon	
10	\$ 100	Value 1	Year 5 coupon	
11	\$ 100	Value 1	Year 6 coupon	
12	\$ 100	Value 1	Year 7 coupon	
13	\$ 100	Value 1	Year 8 coupon	
14	\$ 100	Value 1	Year 9 coupon	
15	\$ 100	Value 1	Year 10 coupon	
16	\$ 100	Value 1	Year 11 coupon	
17	\$ 100	Value 1	Year 12 coupon	
18	\$ 1,100	Value 1	Year 13 coupon + Principal	
19				
20	\$ 1,469.68	=NPV(A2,A6:A18) (entered into Cell A20)		

Now, we changed the range to A6:A18 to reflect only 13 years to maturity. The resulting value of the bond is \$1,469.68.

If an individual purchased the bond at a price of \$1,494.93 and then sold it one year later with interest rates still at 5 percent, he or she would have a capital loss of  $\$1,494.93 - \$1,469.68 = \$25.25$ . The rate of return on the bond over the year consists of an *interest*, or *current*, *yield* plus a *capital gains yield*:

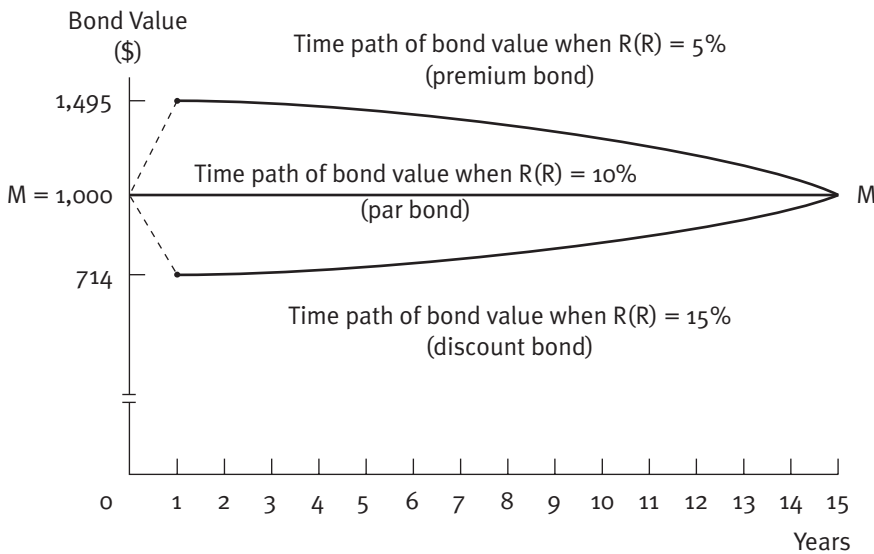
$$\begin{aligned} \text{Current yield} &= \$100/\$1,494.93 = 0.0669 = 6.69\% \\ \text{Capital gains yield} &= -\$25.25/\$1,494.93 = -0.0169 = \underline{-1.69\%} \\ \text{Rate of return, or} & \\ \text{total yield} &= \$74.75/\$1,494.93 = 0.0500 = \underline{5.00\%} \end{aligned}$$

Had interest rates risen from 10 to 15 percent during the first year after issue rather than fallen, the value of Big Sky's bonds would have declined to \$713.78 at the end of the first year. If interest rates held constant at 15 percent, the bond would have a value of \$720.84 at the end of the second year, so the total yield to investors would be:

$$\begin{aligned} \text{Current yield} &= \$100/\$713.78 = 0.1401 = 14.01\% \\ \text{Capital gains yield} &= \$7.06/\$713.78 = 0.0099 = \underline{0.99\%} \\ \text{Rate of return, or} & \\ \text{total yield} &= \$107.06/\$713.78 = 0.1500 = \underline{15.00\%} \end{aligned}$$

Figure 7.1 graphs the values of the Big Sky bond over time, assuming that interest rates will remain constant at 10 percent, fall to 5 percent and then remain at that level, and rise to 15 percent and remain constant at that level. The figure illustrates the following important points:

- Whenever the required rate of return on a bond equals its coupon rate, the bond will sell at its par value.
- When interest rates, and hence required rates of return, fall after a bond is issued, the bond’s value rises above its par value and the bond sells at a *premium*.
- When interest rates, and hence required rates of return, rise after a bond is



**FIGURE 7.1**  
Time Path of the Value of a 15-Year, 10% Coupon, \$1,000 Par Value Bond When Interest Rates Are 5%, 10%, and 15%

Year	Bond Value at		
	$R(R) = 5\%$	$R(R) = 10\%$	$R(R) = 15\%$
0	—	\$1,000.00	—
1	\$1,494.93	1,000.00	\$ 713.78
2	1,469.68	1,000.00	720.84
3	1,443.16	1,000.00	728.97
.	.	.	.
.	.	.	.
.	.	.	.
13	1,092.97	1,000.00	918.71
14	1,047.62	1,000.00	956.52
15	1,000.00	1,000.00	1,000.00

issued, the bond's value falls below its par value and the bond sells at a *discount*.

- Bond prices on outstanding issues and interest rates are **inversely** related. Increasing rates lead to falling prices, and decreasing rates lead to increasing prices.
- The price of a bond will always approach its par value as its maturity date approaches, provided the issuer does not default on the bond.

Note, however, that interest rates do **not** remain constant over time, so, in reality, a bond's price fluctuates both as interest rates in the economy fluctuate and as the bond's term to maturity decreases. Still, regardless of interest rate movements, a bond's value will approach its par value as the maturity date gets closer and closer.

### Zero Coupon Bonds

Some bonds, called *zero coupon bonds*, pay no interest at all during the life of the bond, so an investor's cash flows consist solely of the return of par value at maturity. Because there are no interest payments, when the bond is issued its value is much less than par value, so the bond originally sells at a discount. Thus, zero coupon bonds also are called *original issue discount bonds*.

Zero coupon bonds are valued in the same way as regular (coupon) bonds, recognizing that there are no coupon payments to contribute to the bond's value. To illustrate this concept, assume that Big Sky's 15-year bond issue discussed in the previous section was a zero coupon bond. Assuming a 10 percent required rate of return, the bond's value would be \$239.39:

	A	B	C	D
1				
2	10.0%	Rate	Interest rate	
3				
4	\$ -	Value 1	Year 1 coupon	
5	\$ -	Value 1	Year 2 coupon	
6	\$ -	Value 1	Year 3 coupon	
7	\$ -	Value 1	Year 4 coupon	
8	\$ -	Value 1	Year 5 coupon	
9	\$ -	Value 1	Year 6 coupon	
10	\$ -	Value 1	Year 7 coupon	
11	\$ -	Value 1	Year 8 coupon	
12	\$ -	Value 1	Year 9 coupon	
13	\$ -	Value 1	Year 10 coupon	
14	\$ -	Value 1	Year 11 coupon	
15	\$ -	Value 1	Year 12 coupon	
16	\$ -	Value 1	Year 13 coupon	
17	\$ -	Value 1	Year 14 coupon	
18	\$ 1,000	Value 1	Year 15 coupon + Principal	
19				
20	\$239.39	=NPV(A2,A4:A18) (entered into Cell A20)		

Note that we zeroed out all cash flows except the principal payment at maturity. (Because Cells A4 through A18 were formatted as Accounting values, zeroes are displayed as dashes.)

Zero coupon bonds have some advantages as well as disadvantages when compared to coupon bonds. The primary advantage to issuers is that no payments have to be made to bondholders until the maturity date. As we will discuss in a later section, the primary advantage to buyers is that there are no coupon payments to reinvest.

### Yield to Maturity



Up to this point, a bond's required rate of return and cash flows have been used to determine its value. In reality, investors' required rates of return on securities are not observable, but security prices can be easily determined—at least on those securities that are actively traded—by looking in the local newspaper or the *Wall Street Journal*. Suppose that the Big Sky bond had 14 years remaining to maturity, and the bond was selling at a price of \$1,494.93. What percentage rate of return, or *yield to maturity* (*YTM*), would be earned if the bond was bought at this price, held to maturity, and no default occurred? To find the answer, 5 percent, use a spreadsheet as follows:

	A	B	C	D
1				
2	10.0%	Rate	Interest rate	
3				
4	\$ (1,494.93)	Values	Bond price	
5	\$ 100	Values	Year 1 coupon	
6	\$ 100	Values	Year 2 coupon	
7	\$ 100	Values	Year 3 coupon	
8	\$ 100	Values	Year 4 coupon	
9	\$ 100	Values	Year 5 coupon	
10	\$ 100	Values	Year 6 coupon	
11	\$ 100	Values	Year 7 coupon	
12	\$ 100	Values	Year 8 coupon	
13	\$ 100	Values	Year 9 coupon	
14	\$ 100	Values	Year 10 coupon	
15	\$ 100	Values	Year 11 coupon	
16	\$ 100	Values	Year 12 coupon	
17	\$ 100	Values	Year 13 coupon	
18	\$ 1,100	Values	Year 14 coupon + Principal	
19				
20	5.0%	=IRR(A4:A18:A2) (entered into Cell A20)		

Note that the IRR function is used to calculate yield to maturity. The YTM can be thought of as the expected rate of return on the bond.<sup>2</sup> It is similar to the total rate of return discussed in the previous section. For a bond that sells at par, the YTM consists entirely of an interest yield, but if the bond

sells at a discount or premium, the YTM consists of the current yield plus a positive or negative capital gains yield.

### Yield to Call



Bonds that are callable have both a YTM and a *yield to call (YTC)*. The YTC is similar to the YTM, except that it assumes that the bond will be called. Thus, the YTC is calculated like the YTM, except that N reflects the number of years until the bond will be called as opposed to years to maturity, and M reflects the call price rather than the maturity value.

For example, suppose the Big Sky bond had ten years of call protection when it was issued. There are now nine years to date of first call, and the bond is selling at a price of \$1,494.93. Furthermore, there is a \$100 call premium that must be paid if the issue is called at the earliest possible date. What YTC would be earned if the bond were bought at this price and held to first call, at which time it was redeemed for \$1,000 + \$100 = \$1,100? The answer is 4.2 percent:

	A	B	C	D
1				
2	5.0%	Rate	Interest rate	
3				
4	\$ (1,494.93)	Values	Bond price	
5	\$ 100	Values	Year 1 coupon	
6	\$ 100	Values	Year 2 coupon	
7	\$ 100	Values	Year 3 coupon	
8	\$ 100	Values	Year 4 coupon	
9	\$ 100	Values	Year 5 coupon	
10	\$ 100	Values	Year 6 coupon	
11	\$ 100	Values	Year 7 coupon	
12	\$ 100	Values	Year 8 coupon	
13	\$ 1,200	Values	Year 9 coupon + Prin. + CP	
14				
15	4.20%	=IRR(A4:A13:A2) (entered into Cell A15)		

Note that Cell A13 contains 1,200: the par value of the bond (\$1,000) plus the \$100 call premium plus the \$100 coupon payment for Year 9.

The question now facing potential investors of this bond is should they expect to earn its 5.0 percent YTM or its 4.2 percent YTC. Of course, the answer depends on whether or not the bond will be called. There is no way of knowing with certainty today when, or even if, the bond will be called. But we know that the bond is selling at a large premium now, and if interest rates do not change much over the next nine years, the bond is likely to be selling for more than \$1,100 when first callable. If indeed that is the situation, it is likely that the bond will be called, and hence the YTC is probably a better estimate of the expected rate of return than is the YTM. On the other hand, if the bond is currently selling at a discount, and interest rates are expected to be relatively constant over the next nine years, it is likely that the bond would

not be called and the YTM would be the appropriate measure of the return on the bond. Unfortunately, no one knows today what interest rates will be nine years in the future.

### Bond Values with Semiannual Coupons



Virtually all bonds issued in the United States actually pay interest semiannually, or every six months. To apply the preceding valuation concepts to semiannual bonds, the bond valuation procedures must be modified as follows:

- Divide the annual interest payment, INT, by two to determine the dollar amount paid **each six months**.
- Multiply the number of years to maturity, N, by two to determine the number of **semiannual interest periods**.
- Divide the annual required rate of return, R(R), by two to determine the **semiannual required rate of return**.

To illustrate the use of the semiannual bond valuation model, assume that the Big Sky bonds pay \$50 every six months rather than \$100 annually. Thus, each interest payment is only half as large, but there are twice as many of them. When the going rate of interest is 5 percent annually, which translates to 2.5 percent semiannually, the value of Big Sky's bonds with 14 years (28 semiannual periods) left to maturity is \$1,499.12:

	A	B	C	D
1				
2	28	Nper	Number of periods	
3	\$ 50.00	Pmt	Payment (coupon amount)	
4	\$ 1,000.00	Fv	Future value (principal)	
5	2.5%	Rate	Interest rate	
6				
7				
8	\$ 1,499.12	=–PV(A5,A2,A4) (entered into Cell A8)		
9				
10				

Note several points regarding this spreadsheet calculation. First, we could have used the NPV function as we did in the previous bond valuation examples. However, this would require a range with 28 cell entries (coupon payments), so we elected to use the PV function to avoid all these entries. Second, to use the PV function for bond valuation, function wizard entries include both Pmt and Fv as bonds have both coupon payments and a maturity (principal) payment. Finally, we placed a minus sign in front of the function name (PV) so that the value would be displayed as a positive number.

Similarly, if the bond was actually selling for \$1,400 with 14 years to maturity, its YTM would be 5.80 percent:

	A	B	C	D
1				
2	28	Nper	Number of periods	
3	\$ (1,400.00)	Pv	Present value (bond price)	
4	\$ 50.00	Pmt	Payment (coupon amount)	
5	\$ 1,000.00	Fv	Future value (principal)	
6				
7				
8	2.90%	=RATE(A2,A4,A3,A5) (entered into Cell A8)		
9				
10				

Here we used the RATE function to calculate the YTM. Note that the value shown in Cell A8, 2.90 percent, is the **periodic (semiannual) YTM**, so it is necessary to multiply it by two to get the annual YTM. The effective annual YTM on the bond is somewhat greater than the 5.80 percent that was calculated.<sup>3</sup> However, it is convention in the bond markets to quote all rates on a stated (annual) basis, so the procedures outlined in this section are correct when bonds—all of which have semiannual coupons—are being compared. However, when the returns on securities that have different periodic payments are being compared, all rates of return should be expressed as effective annual rates.

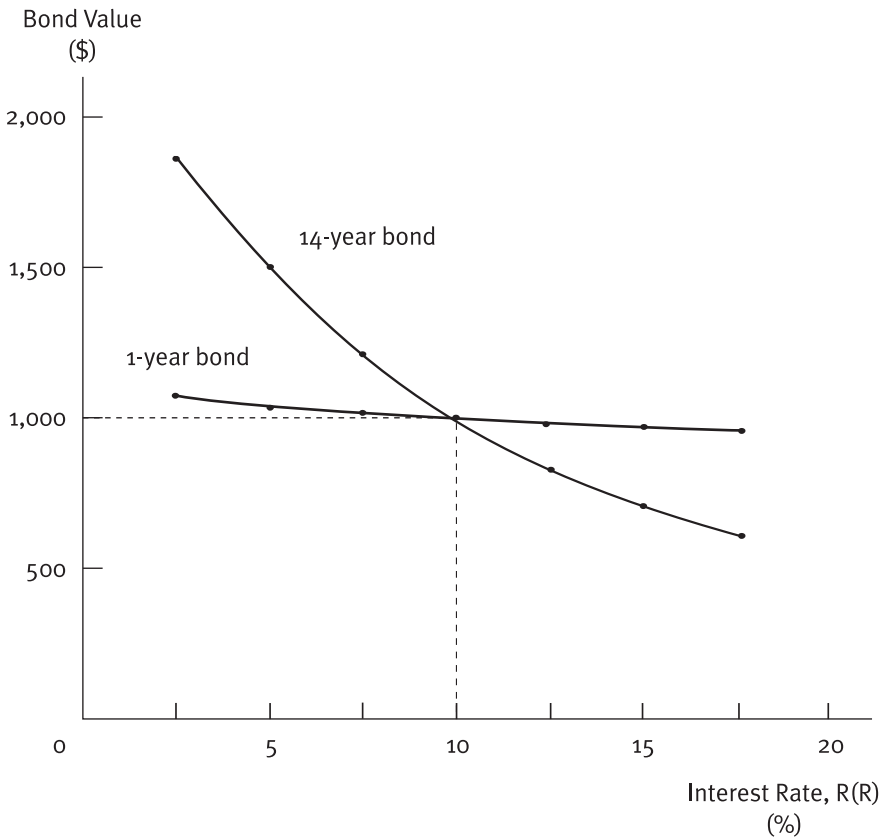
### Interest Rate Risk



Interest rates change over time, which causes two types of investment risk that fall under the general classification of *interest rate risk*. First, an increase in interest rates leads to a decline in the values of outstanding bonds. Because interest rates can rise, bondholders face the risk of losses on their holdings. This risk is called *price risk*. Second, many bondholders buy bonds to build funds for future use. These bondholders reinvest the interest and principal cash flows as they are received. If interest rates fall, bondholders will earn a lower rate on the reinvested cash flows, which will have a negative impact on the future value of their holdings. This risk is called *reinvestment rate risk*.

To illustrate price risk, suppose you bought some of Big Sky's 10 percent bonds when they were issued at a price of \$1,000. As illustrated earlier, if interest rates rise, the value of the bonds will fall. An investor's exposure to price risk depends on the maturity of the bonds. Figure 7.2, which shows the values of one-year and 14-year bonds at several different market interest rates, illustrates price risk. Notice how much more sensitive the value of the 14-year bond is to changes in interest rates. For bonds with similar coupons, the longer the maturity of the bond, the greater its price change in response to a given change in interest rates. Thus, bonds with longer maturities are exposed to more price risk.<sup>4</sup>

Although a one-year bond exposes the buyer to less price risk than a 14-year bond, the one-year bond carries with it more reinvestment rate risk; that is, if the holding period is more than one year, investing in a one-year



**FIGURE 7.2**  
Value of Long- and Short-Term 10% Annual Coupon Rate Bonds at Different Market Interest Rates

Current Market Interest Rate, $R(R)$	Bond Value	
	1-Year Bond	14-Year Bond
2.5%	\$1,073.17	\$1,876.82
5.0	1,047.62	1,494.93
7.5	1,023.26	1,212.23
10.0	1,000.00	1,000.00
12.5	977.78	838.45
15.0	956.52	713.78
17.5	936.17	616.25

bond means that the principal and interest will have to be reinvested at the end of the first year. If interest rates fall, the return earned during the second year will be less than the return earned during the first year. Reinvestment rate risk is the second dimension of interest rate risk.

Clearly, bond investors face both price risk and reinvestment rate risk as a result of interest rate fluctuations over time. Which risk is most meaningful to



a particular investor depends on the circumstances; but in general, interest rate risk, including both price and reinvestment rate risk, is reduced by matching the maturity of the bond with the anticipated *investment horizon*. For example, suppose Hilldale Community Hospital received a \$5 million contribution that it plans to use in five years to build a new neonatal care center. By investing the contribution in five-year bonds, the hospital would minimize its interest rate risk because it would be matching its investment horizon. Price risk would be minimized because the bond will mature in five years, and hence Hilldale will receive par value regardless of the level of interest rates at that time. Reinvestment rate risk is also minimized because only the interest on the bond would have to be reinvested, which is a less risky situation than if both principal and interest had to be reinvested. If Hilldale invested in a zero coupon bond, reinvestment rate risk would be eliminated.

Interest rate risk is but one of many financial risks facing healthcare businesses. Fortunately, there are various techniques that can be used to mitigate such risks. We will discuss financial risk management in some detail in Chapter 18.

### Self-Test Questions

1. How are bonds valued?
2. What is a zero coupon bond?
3. What is meant by a bond's yield to maturity (YTM)? By its yield to call (YTC)?
4. Differentiate between price risk and reinvestment rate risk.

### Preferred Stock Valuation



Most preferred stocks entitle their owners to regular, fixed dividend payments. If the stock is **perpetual preferred**—payments are expected to last forever—then the stock can be valued using the simple formula for valuing a perpetuity:

$$E(P_p) = \frac{D_p}{R(R_p)}$$

Here,  $E(P_p)$  is the value (expected price) of the preferred stock,  $D_p$  is the preferred dividend, and  $R(R_p)$  is the required rate of return on the preferred stock. For example, Regent Healthcare's perpetual preferred dividend is \$10 per year. If interest rates rose since the stock was issued, and the required rate of return is now 12 percent, the value of the stock would be \$83.33:

$$E(P_p) = \frac{\$10}{0.12} = \$83.33.$$

The required rate of return on the issue would be determined in the same manner as for debt, as we discussed in Chapter 5.

In reality, preferred dividends typically are paid quarterly, so the holder of Regent's preferred stock actually receives a quarterly dividend of  $\$10/4 =$

\$2.50. The value of the preferred stock can be calculated on the basis of this quarterly dividend if we recognize that the quarterly required rate of return would be  $12\%/4 = 3\%$ :

$$E(P_p) = \frac{\$2.50}{0.03} = \$83.33.$$

In theory, investors would now look at the current stock price. If it is greater than \$83.33, the preferred stock should not be purchased, and if it is less than \$83.33, the stock is attractive.

Although calculating the value of a preferred stock is a reasonable approach to making the investment decision, most investors make preferred stock investment decisions on the basis of expected rate of return. This approach is similar to that used by debt investors, who make decisions on the basis of yield to maturity. The expected rate of return on preferred stock,  $E(R_p)$  can be determined easily by rearranging the valuation equation:

$$E(R_p) = \frac{D_p}{P_p}.$$

For example, the expected rate of return on Regent's preferred stock, if it is currently selling for \$85, is 11.8 percent:

$$E(R_p) = \frac{\$10}{\$85} = 0.118 = 11.8\%.$$

Using the quarterly dividend of \$2.50 and a price of \$85 gives a quarterly expected rate of return of 2.94 percent. This expected rate of return is then multiplied by four to give a stated (annual) rate of 11.8 percent.<sup>5</sup> If an investor has a required rate of return on the stock of less than 11.8, it should be purchased. Conversely, if the required rate of return is greater than 11.8 percent, the stock should not be bought.

Although there are some perpetual preferred issues that remain outstanding forever (perpetuities), virtually all preferred stock issued today has either a sinking fund or a call provision that limits the stock's maturity. When the maturity is limited, preferred stock is valued using the debt valuation techniques described previously.

1. What is a perpetual preferred stock and how is it valued?
2. How are nonperpetual preferred stocks valued?

## Self-Test Questions

## Common Stock Valuation

For many reasons, the valuation of common stocks is a difficult and perplexing process. To begin, the type of model used depends on the characteristics of the firm being valued. In general, there are three distinct types of firms:

1. Start-up firms generally pay no dividends because all earnings must be reinvested in the business to fund growth. To make matters worse, start-up firms often take years to make a profit, so there is no track record of positive earnings to use as the basis for a cash flow forecast. Under such conditions, the general valuation model cannot be applied because the value of such firms stems from potential opportunities rather than from existing product or service lines. Even if most of the opportunities do not materialize, one or two can turn into blockbusters and hence create a highly successful firm. With such firms, option pricing techniques, which we briefly introduce in Chapter 18, at least in theory, can be used to value the stock. In reality, valuations on these firms are not much better than a shot in the dark, and hence stock prices are based more on qualitative factors, unfortunately including emotions, than on anything else. The end result is that stock prices of such firms are typically highly volatile.
2. As a firm passes through its initial start-up phase, it often reaches a point where it has more or less predictable positive earnings but still requires reinvestment of these earnings, so no dividends are paid. In such cases, it is possible to value the entire firm, as well as the stock of the firm, on the basis of the expected earnings stream. In such a valuation, the expected earnings stream is discounted, or *capitalized*, to find the current value of the firm. Then, the value of the debt is stripped off to estimate the value of the common stock.
3. More mature firms generally pay a relatively predictable dividend, and hence the future dividend stream can be forecasted with reasonable confidence. In such cases, the common stock can be valued on the basis of the present value of the expected dividend stream. We illustrate this approach in the following sections.

### Definitions

Common stocks with a predictable dividend stream can be valued using the general valuation model applied to the expected dividends. Before we present the model, here are some definitions that will be needed:

- $E(D_t)$  = Dividend the stockholder **expects** to receive at the end of Year  $t$ .  $D_0$  is the most recent dividend, which has already been paid and is known with certainty;  $E(D_1)$  is the first dividend expected and for valuation purposes is assumed to be paid **at the end** of one year;  $E(D_2)$  is the dividend expected at the end of two years; and so forth.  $E(D_1)$  represents the **first** cash flow a new purchaser of the stock will receive.  $D_0$ , the dividend that has just been paid, is known with certainty, but all future dividends are expected values, so the estimate of any  $E(D_t)$  may differ among investors.<sup>6</sup>

- $P_0$  = Actual *market price* of the stock today.
- $E(P_t)$  = Expected price of the stock at the end of each Year  $t$ .  $E(P_0)$  is the *value* of the stock today, as seen by a particular investor based on his or her estimate of the stock's expected dividend stream and riskiness;  $E(P_1)$  is the price expected at the end of one year; and so on. Thus, whereas  $P_0$  is fixed and is identical for all investors,  $E(P_0)$  will differ among investors depending on each investor's assessment of the stock's riskiness and dividend stream.  $E(P_0)$ , each investor's estimate of the value today, can be above or below  $P_0$ , the current stock price, but an investor would buy the stock only if his or her estimate of  $E(P_0)$  were equal to or greater than  $P_0$ .
- $E(g_t)$  = Expected growth rate in dividends in each future Year  $t$ . Different investors may use different  $E(g_t)$ s to evaluate a firm's stock. In reality,  $E(g_t)$  is normally different for each Year  $t$ . However, the valuation process will be simplified by assuming that  $E(g_t)$  is constant across time.
- $R(R_s)$  = Required rate of return on the stock, considering both its riskiness and the returns available on other investments.
- $E(R_s)$  = Expected rate of return on the stock.  $E(R_s)$  can be above or below  $R(R_s)$ , but an investor would buy the stock only if his or her  $E(R_s)$  were equal to or greater than  $R(R_s)$ . Note that  $E(R_s)$  is an **expectation**. A return of  $E(R_s) = 15\%$  may be expected if HCA stock were purchased today. If either conditions in the market or prospects at HCA take a turn for the worse, however, the realized return may be much lower than that expected, perhaps even negative.
- $E(D_1)/P_0$  = Expected *dividend yield* on a stock during the first year. If a stock is expected to pay a dividend of \$1 during the next 12 months, and if its current price is \$10, then its expected dividend yield is  $\$1 / \$10 = 0.10 = 10\%$ .
- $[E(P_1) - P_0]/P_0$  = Expected *capital gains yield* on the stock during the first year. If the stock sells for \$10 today and if it is expected to rise to \$10.50 at the end of the year, then the expected capital gain is  $E(P_1) - P_0 = \$10.50 - \$10.00 = \$0.50$  and the expected capital gains **yield** is  $[E(P_1) - P_0]/P_0 = \$0.50/\$10 = 0.050 = 5\%$ .

### Expected Dividends as the Basis for Stock Values

In the preceding discussion of debt valuation, the value of a bond was found by adding the present value of the interest payments over the life of the bond to the present value of the bond's maturity, or par, value. In essence, a bond's value is the present value of the cash flows expected from the bond. Stock prices using the dividend valuation model are likewise determined as the present value of a stream of cash flows, and the basic dividend valuation equation is similar to the bond valuation equation. What are the cash flows that dividend-paying stocks provide to their holders? First, consider an investor

who buys a stock with the intention of holding it in his or her family forever. In this situation, all the investor and his or her heirs will receive is a stream of dividends, and the value of the stock today is calculated as the present value of an infinite stream of dividends.

Consider the more typical case in which an investor expects to hold the stock for a finite period and then sell it. What would be the value of the stock in this case? The value of the stock is again the present value of the expected dividend stream. To see this, recognize that for any individual investor, expected cash flows consist of expected dividends plus the expected price of the stock when it is sold. However, the sale price received by the current investor will depend on the dividends some future investor expects to receive. Therefore, for all present and future investors in total, expected cash flows must be based on expected future dividends. To put it another way, unless a business is liquidated or sold to another concern, the cash flows it provides to its stockholders consist only of a stream of dividends; therefore, the value of a share of its stock must be the present value of that expected dividend stream.

The validity of this concept can also be confirmed by asking the following: Suppose that an investor buys a stock and expects to hold it for one year. He or she will receive dividends during the year plus the value  $E(P_1)$  when selling out at the end of the year, but what will determine the value of  $E(P_1)$ ? It will be determined as the present value of the dividends during Year 2 plus the stock price at the end of that year, which in turn will be determined as the present value of another set of future dividends and an even more distant stock price. This process can be continued ad infinitum, and the ultimate result is that the value of a stock is the present value of its expected dividend stream, regardless of the holding period of the investor who performs the analysis. Occasionally, stock shares could have additional value, such as the value of a controlling interest when an investor buys 51 percent of a firm's outstanding stock, or the added value brought about by a takeover bid. However, in this model, the sole value inherent in stock ownership stems from the dividends expected to be paid by the firm to its shareholders.

Investors periodically lose sight of the long-run nature of stocks as investments and forget that to sell a stock at a profit, they must find a buyer who will pay the higher price. Suppose that a stock's value is analyzed on the basis of expected future dividends and the conclusion is that the stock's market price exceeded a reasonable value. If an investor buys the stock anyway, he or she would be following the "bigger fool" theory of investment: The investor may be a fool to buy the stock at its excessive price, but he or she believes that when ready to sell an even bigger fool can be found.

The concept of the value of a stock being the present value of the expected dividend stream holds, regardless of the pattern of growth. It is not even necessary to project the stream for more than say, 50 years. Because of the

time value of money, dividends beyond that point contribute an insignificant amount to a stock's value today. Needless to say, it is generally not possible to have much confidence in dividend values projected over a 50-year period, so stock valuation using the dividend valuation model must be viewed as an approximation.

### Constant Growth Stock Valuation

Often, the projected stream of dividends follows a systematic pattern; hence, it is possible to develop a simplified (i.e., easier to evaluate) version of the dividend valuation model. This section discusses the most common simplifying assumption: *constant growth*.

Although the dividends of only a few firms actually grow at a constant rate, the assumption of constant growth is often made because it makes the forecasting of individual dividends over a long time period unnecessary. Furthermore, many mature businesses come close to meeting constant growth assumptions. For a constant growth firm, the expected dividend growth rate is constant for all years, so  $E(g_1) = E(g_2) = E(g_3)$  and so on, which implies that  $E(g_t)$  becomes merely  $E(g)$ . Under this assumption, the dividend in any future Year  $t$  may be forecasted as  $E(D_t) = D_0 \times [1 + E(g)]^t$ , where  $D_0$  is the last dividend paid, and hence is known with certainty, and  $E(g)$  is the constant expected rate of dividend growth. Alternatively, each year's dividend is  $E(g)$  percent greater than the previous dividend, so  $E(D_t) = E(D_{t-1}) \times [1 + E(g)]$ .

To illustrate the concept, consider the following example. If Minnesota Health Systems (MHS), Inc., just paid a dividend of \$1.82 (i.e.,  $D_0 = \$1.82$ ), and if investors expect a 10 percent constant dividend growth rate, the dividend expected in one year will be  $E(D_1) = \$1.82 \times 1.10 = \$2.00$ ;  $E(D_2)$  will be  $\$1.82 \times (1.10)^2 = \$2.20$  and the dividend expected in five years will be  $E(D_5) = D_0 \times [1 + E(g)]^5 = \$1.82 \times (1.10)^5 = \$2.93$ . This method of estimating future dividends can be used to estimate MHS's expected future cash flow stream (i.e., the dividends) for some time into the future, say, 50 years. Then, the present values of this stream can be summed to find the value of MHS's stock.

However, when  $E(g)$  is assumed to be constant, a stock can be valued using a simplified model called the *constant growth model*:

$$E(P_0) = \frac{D_0 \times [1 + E(g)]}{R(R_s) - E(g)} = \frac{E(D_1)}{R(R_s) - E(g)}$$

where  $R(R_s)$  is the required rate of return on the stock. If  $D_0 = \$1.82$ ,  $E(g) = 10\%$ , and  $R(R_s) = 16\%$  for MHS, the value of its stock would be \$33.33:

$$E(P_{\text{MHS}}) = \frac{\$1.82 \times 1.10}{0.16 - 0.10} = \frac{\$2.00}{0.06} = \$33.33.$$

**The Value of a  
Constant  
Growth Stock**



	A	B	C	D
1				
2	\$ 1.82	$D_0$	Last dividend payment	
3	10.0%	$E(g)$	Expected growth rate	
4	16.0%	$R(R_s)$	Required rate of return	
5				
6				
7				
8	\$ 33.37	$=A2*(1+A3)/A4-A3$ (entered into Cell A8)		
9				
10				

Note a small rounding difference between the hand-calculated answer (where the first expected dividend was rounded to \$2.00) and the spreadsheet solution.

A necessary condition for the derivation of the constant growth model is that the required rate of return on the stock is greater than the constant dividend growth rate—that is,  $R(R_s)$  is greater than  $E(g)$ . If the constant growth model is used when  $R(R_s)$  is not greater than  $E(g)$ , the results will be meaningless. However, to qualify as a constant growth stock, dividends must be expected to grow at the constant growth rate forever, or at least for a very long time. Stocks can have  $E(g)$  greater than  $R(R_s)$  for short periods, but  $E(g)$  cannot exceed  $R(R_s)$  over the long run because a company's growth rates are limited by general economic growth. Although the constant growth model is applied here to stock valuation, note that it can be used in any situation in which cash flows are growing at a constant rate.

How does an investor determine his or her required rate of return on a particular stock,  $R(R_s)$ ? One way is to use the Security Market Line (SML) of the Capital Asset Pricing Model, which we discussed in Chapter 4. Assume that MHS's market beta, as reported by a financial advisory service, is 1.6. Assume also that the risk-free interest rate (the rate on long-term Treasury bonds) is 5 percent and the required rate of return on the market is 12 percent. According to the SML, the required rate of return on MHS's stock is 16.0 percent:

$$\begin{aligned}
 R(R_{\text{MHS}}) &= R_F + [R(R_M) - R_F] \times b_{\text{MHS}} \\
 &= 5\% + (12\% - 5\%) \times 1.6 \\
 &= 5\% + (7\% \times 1.6) \\
 &= 5\% + 11.2\% = 16.2 \approx 16\%.
 \end{aligned}$$

Remember, in the SML,  $R_F$  is the risk-free rate;  $R(R_M)$  is the required rate of return on the market, or the required rate of return on a  $b = 1.0$  stock; and  $b_{\text{MHS}}$  is MHS's market beta.

	A	B	C	D
1				
2	1.6	b	Beta coefficient	
3	5.0%	RF	Risk-free rate	
4	12.0%	R(R <sub>M</sub> )	Required return on market	
5				
6				
7				
8	16.2%	=A3+(A4-A3)*A2 (entered into Cell A8)		
9				
10				

Growth in dividends occurs primarily as a result of growth in earnings per share (EPS). Earnings growth, in turn, results from a number of factors, including the inflation rate in the economy and the amount of earnings the firm retains and reinvests. Regarding inflation, if output in units is stable and if both sales prices and input costs increase at the inflation rate, EPS also will grow at the inflation rate. EPS will also grow as a result of the reinvestment, or plowback, of earnings. If the firm’s earnings are not all paid out as dividends (i.e., if a fraction of earnings is retained), the dollars of investment behind each share will rise over time, which should lead to growth in productive assets and hence growth in earnings and dividends.

When using the constant growth model, the most critical input is E(g)—the expected constant growth rate in dividends. Investors can make their own E(g) estimates on the basis of historical dividend growth, but E(g) estimates are also available from brokerage and investment advisory firms.

The constant growth model can be rearranged to solve for E(R<sub>s</sub>), the *expected rate of return*. In the model’s normal form, R(R<sub>s</sub>) is the required rate of return; but when the model is transformed, the expected rate of return, E(R<sub>s</sub>), is found. This transformation requires that the required rate of return equal the expected rate of return, or R(R<sub>s</sub>) = E(R<sub>s</sub>). This equality holds if the stock is in equilibrium, which is a condition that will be discussed later in the chapter. After solving the constant growth model for E(R<sub>s</sub>), this expression is obtained:

$$E(R_s) = \frac{D_0 \times [1 + E(g)]}{P_0} + E(g) = \frac{E(D_1)}{P_0} + E(g).$$

If an investor buys MHS’s stock today for P<sub>0</sub> = \$33.33 and expects the stock to pay a dividend E(D<sub>1</sub>) = \$2.00 one year from now and for dividends to grow at a constant rate E(g) = 10% in the future, the expected rate of return on that stock is 16 percent:

$$E(R_{MHS}) = \frac{\$2.00}{\$33.33} + 10\% = 6\% + 10\% = 16\%.$$

In this form, E(R<sub>s</sub>), the expected total return on the stock, consists of

**Expected Rate of Return on a Constant Growth Stock**





an expected dividend yield,  $E(D_1)/P_0 = 6.0\%$ , plus an expected growth rate or capital gains yield,  $E(g) = 10\%$ .

	A	B	C	D
1				
2	\$ 33.33	$P_0$	Stock price	
3	\$ 2.00	$D_1$	Next expected dividend	
4	10.0%	$E(g)$	Expected growth rate	
5				
6				
7				
8	16.0%	=A3/A2+A4 (entered into Cell A8)		
9				
10				

Suppose this analysis had been conducted on January 1, 2007, so  $P_0 = \$33.33$  is MHS's January 1, 2007 stock price and  $E(D_1) = \$2.00$  is the dividend expected at the end of 2007. What is the value of  $E(P_1)$ , the firm's expected stock price at the end of 2007 (the beginning of 2008)? The constant growth model would again be applied, but this time the 2008 dividend,  $E(D_2) = E(D_1) \times [1 + E(g)] = \$2.00 \times 1.10 = \$2.20$ , would be used:

$$E(P_1) = \frac{E(D_2)}{R(R_{MHS}) - E(g)} = \frac{\$2.20}{0.06} = \$36.67.$$

Notice that  $E(P_1) = \$36.67$  is 10 percent greater than  $P_0 = \$33.33$ :  $\$33.33 \times 1.10 = \$36.67$ . Thus, a capital gain of  $\$36.67 - \$33.33 = \$3.34$  would be expected during 2007, which produces a capital gains yield of 10 percent:

$$\text{Capital gains yield} = \frac{\text{Capital gain}}{\text{Beginning price}} = \frac{\$3.34}{\$33.33} = 0.100 = 10\%.$$

If the analysis were extended, in each future year the expected capital gains yield would always equal  $E(g)$  because the stock price would grow at the 10 percent constant dividend growth rate. The expected dividend yield in 2008 (Year 2) can be found as follows:

$$\text{Dividend yield} = \frac{E(D_2)}{E(P_1)} = \frac{\$2.20}{\$36.67} = 0.060 = 6\%.$$

The dividend yield for 2009 (Year 3) can also be calculated, and again it would be 6 percent. Thus, for a constant growth stock, the following conditions must hold:

- The dividend is expected to grow forever, or at least for a long time, at a constant rate,  $E(g)$ .
- The stock price is expected to grow at this same rate.

- The expected dividend yield is a constant.
- The expected capital gains yield is also a constant and is equal to  $E(g)$ .
- The expected rate of return in any Year  $t$ , which is equal to the expected dividend yield plus the expected capital gains yield (growth rate), is expressed by this equation:  $E(R_t) = [E(D_{t+1}) / E(P_t)] + E(g)$ .

The term *expected* should be clarified—it means expected in a statistical sense. Thus, if MHS's dividend growth rate is expected to remain constant at 10 percent, this means that the growth rate in each year can be represented by a probability distribution with an expected value of 10 percent, and not that the growth rate is expected to be exactly 10 percent in each future year. In this sense, the constant growth assumption is reasonable for many large, mature businesses.

### Nonconstant Growth Stock Valuation



Some firms exhibit constant dividend growth, or at least growth close enough to apply the constant growth model. However, many businesses do not. For example, some businesses that have not yet fully matured but have a solid dividend record may be growing much faster today than they will over the long term. However, at some point in time, as the business matures, the growth will fall to some steady-state rate. Also, some dividend-paying firms may temporarily suspend the dividends because of a temporary downturn, but they may have every intention of picking up the dividends when conditions improve. If a business is not expected to exhibit more or less constant growth in dividends in the future, the constant growth model cannot be used.

To find the value of a nonconstant growth stock, assuming that the growth rate will eventually stabilize to some steady-state rate, we proceed as follows:

- Estimate the stock's dividend stream on a year-by-year basis, stopping with the first dividend in the constant growth phase.
- Find the present value of the dividends during the period of nonconstant growth.
- Find the expected price of the stock at the end of the nonconstant growth period, at which point it has become a constant growth stock, and discount this price back to the present.
- Add the dividend and price components to find the value of the stock.

To illustrate the process for valuing nonconstant growth stocks, suppose the following facts exist:

$R(R_s) = \text{stockholders' required rate of return} = 16\%$ .

$N = \text{years of nonconstant growth} = 3$ .

$E(g_n)$  = rate of growth in dividends during the nonconstant growth period = 30%. (Note that the growth rate during the nonconstant growth period could vary from year to year.)

$E(g_c)$  = steady-state (constant) growth rate after the nonconstant period = 10%.

$D_0$  = last dividend paid = \$1.82.

The valuation process, which is tedious but not difficult, is explained in the steps below:

1. Find the expected dividends during the nonconstant growth phase (Years 1, 2, and 3 in this case) plus the first dividend of the steady-state constant growth phase (Year 4) by multiplying each dividend by one plus the growth rate expected in the coming year:

$$D_0 = \$1.82.$$

$$D_1 = D_0 \times 1.30 = \$1.82 \times 1.30 = \$2.366.$$

$$D_2 = D_1 \times 1.30 = \$2.366 \times 1.30 = \$3.076.$$

$$D_3 = D_2 \times 1.30 = \$3.076 \times 1.30 = \$3.999.$$

$$D_4 = D_3 \times 1.10 = \$3.999 \times 1.10 = \$4.399.$$

2. Find the present values of the dividends that occur during the nonconstant growth phase, remembering that  $D_0$  just occurred, so it does not contribute to the stock's value:

$$PV D_1 = \$2.366 / (1.16)^1 = \$2.040.$$

$$PV D_2 = \$3.076 / (1.16)^2 = \$2.286.$$

$$PV D_3 = \$3.999 / (1.16)^3 = \$2.562.$$

3. The stock price expected at the end of Year 3 (the beginning of Year 4) can be found using the constant growth model because dividends are expected to grow at a constant rate of 10 percent in Year 4 and beyond. Note that this price captures the value of all the dividends beyond Year 3. Calculate the stock price at the end of Year 3, and then discount this value to Year 0:

$$E(P_3) = \frac{D_4}{R(R_s) - E(g)} = \frac{\$4.399}{0.16 - 0.10} = \$73.317.$$

$$PV E(P_3) = \$73.32 / (1.16)^3 = \$46.971.$$

4. Add the present values to find the value of the stock today:

$$\begin{aligned} E(P_0) &= \$2.040 + \$2.286 + \$2.562 + \$46.971 \\ &= \$53.859 \approx \$53.86. \end{aligned}$$

	A	B	C	D
1				
2	30.0%	$E(g_n)$	Nonconstant growth rate	
3	10.0%	$E(g_c)$	Constant growth rate	
4	16.0%	$R(R_s)$	Required rate of return	
5	\$ 1.82	$D_0$	Last dividend payment	
6				
7	\$ 2.366	$=A5*(1+A2)$ (entered into Cell A7)		
8	\$ 3.076	$=A7*(1+A2)$ (entered into Cell A8)		
9	\$ 3.999	$=A8*(1+A2)$ (entered into Cell A9)		
10	\$ 4.398	$=A9*(1+A3)$ (entered into Cell A10)		
11	\$ 73.307	$=A10/(A4-A3)$ (entered into Cell A11)		
12				
13	\$ 53.85	$=NPV(A4,A7:A9)+PV(A4,3,-A11)$ (entered into Cell A13)		

Here, we calculated the future dividend stream in Cells A7 through A10 and the future stock price in Cell A11. Then, in Cell A13, we calculated the present values of the dividend stream and future stock price and added them together. (Note a small rounding difference between the calculator and spreadsheet solutions.)

Although this illustration shows *supernormal growth*, in which the dividends are currently growing at a higher rate than the steady-state rate, the procedures illustrated here can be used with any pattern of nonconstant growth. The key to the use of this model is that the dividend stream must, at some not-too-distant point in time, return to constant growth.

1. What are three potential methods for valuing common stocks, and when does each apply?
2. Write out and explain the dividend valuation model for a constant growth stock in both the valuation and expected rate of return forms.
3. What are the assumptions of the constant growth model?
4. What are the key features of constant growth regarding dividend yield and capital gains yield?
5. Explain the key features of the nonconstant growth model.

## Self-Test Questions

## Security Market Equilibrium

Investors will want to buy a security if its expected rate of return exceeds its required rate of return or, put another way, when its value exceeds its current price. Conversely, investors will want to sell a security when its required rate of return exceeds its expected rate of return (i.e., when its current price exceeds its value). When more investors want to buy a security than to sell it, its price is bid up. When more investors want to sell a security than to buy it, its price falls. In *equilibrium*, these two conditions must hold:

1. The expected rate of return on a security must equal its required rate of return to the marginal investor. This means that no investor who owns

the stock believes that its expected rate of return is less than its required rate of return, and no investor who does not own the stock believes that its expected rate of return is greater than its required rate of return.

2. The market price of a security must equal its value to the marginal investor.

If these conditions do not hold, trading will occur until they do. Of course, security prices are not constant. A security's price can swing wildly as new information becomes available to the market that changes investors' expectations concerning the security's cash flow stream, or risk, or when the general level of returns (i.e., interest rates) change. However, evidence suggests that securities prices, especially of securities that are actively traded, such as those issued by the U.S. Treasury or by large firms, adjust rapidly to disequilibrium situations. Thus, most people believe that the bonds of the U.S. Treasury and the bonds and stocks of major corporations are generally in equilibrium. The key to the rapid movement of security prices toward equilibrium is informational efficiency, which is discussed in the next section.

## Self-Test Questions

1. What is meant by security market equilibrium?
2. What securities are most likely to be in equilibrium?

## Informational Efficiency

A securities market—say, the market for long-term U.S. Treasury bonds—is *informationally efficient* if (1) all information relevant to the values of the securities traded can be obtained easily and at low cost and (2) the market contains many buyers and sellers who act rationally on this information. If these conditions hold, current market prices will have embedded in them all information of possible relevance; hence, future price movements will be based solely on **new** information as it becomes known.

The *Efficient Markets Hypothesis (EMH)*, which has three forms, formalizes the theory of informational efficiency:

1. The *weak form* of the EMH holds that all information contained in **past price movements** is fully reflected in current market prices. Therefore, information about recent trends in a security's price, or a bond's yield, is of no value in choosing which securities will “outperform” other securities.
2. The *semistrong form* of the EMH holds that current market prices reflect all **publicly available information**. Therefore, it makes no sense to spend hours and hours analyzing economic data and financial reports because whatever information you might find, good or bad, has already been absorbed by the market and imbedded in current prices.

3. The *strong form* of the EMH holds that current market prices reflect **all relevant information**, whether publicly available or privately held. If this form holds, then even investors with “inside information,” such as corporate officers, would find it impossible to earn abnormal returns—that is, returns in excess of that justified by the riskiness of the investment.

The EMH, in any of its three forms, is a hypothesis rather than a proven law, so it is not necessarily true. However, hundreds of empirical tests have been conducted to try to prove, or disprove, the EMH, and the results are relatively consistent. Most tests support the weak and semistrong forms of the EMH for well-developed markets, such as the U.S. markets for large firms' stocks and bond issues and for Treasury securities. Supporters of these forms of the EMH note that there are some 100,000 or so full-time, highly trained, professional analysts and traders operating in these markets. Furthermore, many of these analysts and traders work for businesses such as Citibank, Fidelity Investments, Merrill Lynch, Prudential, and the like that have billions of dollars available to take advantage of undervalued securities. Finally, as a result of disclosure requirements and electronic information networks, new information about these heavily followed securities is almost instantaneously available. Therefore, security prices in these markets adjust almost immediately as new developments occur, and hence prices reflect all publicly available information.

Virtually no one, however, believes that the strong form of the EMH holds. Studies of legal purchases and sales by people with inside information indicate that insiders can make abnormal profits by trading on that information. It is even more apparent that insiders can make abnormal profits if they trade illegally on specific information that has not been disclosed to the public, such as a takeover bid, a research and development breakthrough, and the like.

The EMH has important implications both for individual investment decisions and for business financing decisions. Because security prices appear to generally reflect all public information, most actively followed and traded securities are in equilibrium and fairly valued. Being in equilibrium, however, does not mean that new information cannot cause a security's price to soar or to plummet, but it does mean that most securities are neither undervalued nor overvalued. Therefore, over the long run, an investor with no inside information can only expect to earn a return on a security that compensates him or her for the amount of risk assumed. In the short run—for example, a year—an investor can only expect to earn a return that is the same as the average for securities of equal risk. In other words, investors should not expect to “beat the market” after adjusting for risk. Also, because the EMH applies to most bond markets, bond prices and hence interest rates reflect all current public information. Consistently forecasting future interest rates is impossible because interest rates change in response to new information, and this information can either lower or raise rates.

For managers, the EMH indicates that managerial decisions generally should not be based on perceptions about the market's ability to properly price the firm's securities or on perceptions about which way interest rates will go. In other words, managers should not try to time security issues to try to catch stock prices while they are high or interest rates while they are low. However, in some situations, managers may have information about their own firms that is unknown to the public. This condition is called *asymmetric information*, which can affect managerial decisions. For example, suppose a drug manufacturer has made a breakthrough in AIDS research but wants to maintain as much secrecy as possible about the new drug. During final development and testing, the firm might want to delay any new securities offerings because securities can probably be sold under more favorable terms once the announcement is made. Managers can, and should, act on inside information for the benefit of their firms, but inside information cannot legally be used for personal profit.

Are markets really efficient? If markets were not efficient, the better managers of stock and bond mutual funds and pension plans would be able to consistently outperform the broad averages over long periods of time. In fact, very few managers can consistently better the broad averages, and during most years, mutual fund managers, on average, underperform the market. In any year, some mutual fund managers will outperform the market and others will underperform the market—this is known with certainty. But for an investor to beat the market by investing in mutual funds, he or she must identify the successful managers beforehand, which seems very difficult, if not impossible, to do.

In spite of the evidence, many theorists, and even more Wall Street experts, believe that pockets of inefficiency do exist. In some cases, entire markets may be inefficient. For example, the markets for the securities issued by small firms may be inefficient because there are neither enough analysts ferreting out information on these companies nor sufficient numbers of investors trading these securities. Many people also believe that individual securities traded in efficient markets are occasionally priced inefficiently, or that investor emotions can drive prices too high during raging bull markets (such as the one seen in the 1990s) or too low during whimpering bear markets. Indeed, if investors are driven more by greed and emotion than by rational assessments of security values, it may be that markets are not really as efficient as claimed by supporters of the EMH.

In closing our discussion of market efficiency, let's talk a little bit about what it means to "beat the market." First, consider the short run—say, one year. You may hold a portfolio of stocks that realizes a 20 percent return in a given year. Is that a very good return? Yes: on average, over the past 80 or so years, a diversified investment in stocks averaged an annual return of roughly 11 percent. However, the 20 percent return does mean that you beat the market in that year. To actually beat the market, your return must be higher

than the average return on similar portfolios of stocks (portfolios that have the same risk as yours). If the average return on a similar-risk portfolio for that year was 25 percent, you actually did worse than the relevant benchmark (the return on similar-risk holdings). Of course, if the return on similar-risk holdings was 25 percent, some portfolios did better than average and other did worse, including yours. But, if market efficiency holds, those that did better in one year will not be able to consistently beat the relevant benchmark.

What about the long run? Over the long run—say, 10 or more years—beating the market means a return in excess of that commensurate with the riskiness undertaken. For stocks, this means an average annual return of roughly 11 percent (based on historical performance).

We really do not know whether it is possible to beat the market by skill or whether it is just a matter of luck. Nevertheless, it is wise for both investors and managers to consider the implications of market efficiency when making investment and financing decisions. If investors want to believe that they can beat the market, fine, but they should at least recognize that there is a lot of evidence that tells us that most people who try will ultimately fail.

1. What two conditions must hold for markets to be efficient?
2. Briefly, what is the Efficient Markets Hypothesis (EMH)?
3. What are the implications of the EMH for investors and managers?
4. What is meant by the phrase “beat the market”?

## Self-Test Questions

### The Risk/Return Trade-off

Most financial decisions involve alternative courses of action. For example, should a hospital invest its excess funds in Treasury bonds that yield 4 percent or in HCA bonds that yield 6 percent? Should a group practice buy a replacement piece of equipment now or wait until next year? Should a joint venture outpatient diagnostic center purchase a small, limited-use MRI system or a large, and more expensive, multipurpose system?

Generally, the alternative courses of action will have different expected rates of return, and one may be tempted to automatically accept the alternative with the higher expected return. However, this approach to financial decision making would be incorrect. In efficient markets, those alternatives that offer higher returns will also entail higher risk. The correct question to ask when making financial decisions is not which alternative has the higher expected rate of return, but which alternative has the higher return **after adjusting for risk**. In other words, which alternative has the higher return over and above the return commensurate with that alternative’s riskiness?

To illustrate the *risk/return trade-off*, suppose HCA stock has an expected rate of return of 12 percent, while its bonds yield 6 percent. Does this mean that investors should flock to buy the firm’s stock and ignore the



bonds? Of course not. The higher expected rate of return on the stock merely reflects the fact that the stock is riskier than the bonds. Those investors who are not willing to assume much risk will buy HCA's bonds, while those that are less risk averse will buy the stock. From the perspective of HCA's managers, financing with stock is less risky than using debt, so the firm is willing to pay the higher cost of equity to limit the firm's risk exposure.

In spite of the hypothesized efficiency of major securities markets, the markets for products and services (i.e., the markets for real assets such as MRI systems and services such as inpatient healthcare) are usually not efficient; hence, returns are not necessarily related to risk. Thus, hospitals, group practices, and other healthcare businesses can make real-asset investments and achieve returns in excess of those required by the riskiness of the investment. Furthermore, the market for *innovation* (i.e., the market for ideas) is not efficient. Thus, it is possible for people like Bill Gates, the founder of Microsoft, to become multibillionaires at a relatively young age. However, when excess returns are found in the product, service, or idea markets, new entrants quickly join the innovators, and competition over time will usually force rates of return down to efficient market levels. The result is that later entrants can only expect returns that are commensurate with the risks involved.

## Self-Test Questions

1. Explain the meaning of the term risk/return trade-off.
2. In what markets does this trade-off hold?

## Debt Refunding



If a debt issue is callable, and if interest rates drop, the issuer may elect to lower its interest expense by issuing new debt and using the proceeds to call (retire) the existing issue. Such an action is called a *refunding*. There are costs involved in refunding, but there is also one major benefit: the issuer reduces the dollar amount of interest payments that it must make in the future. Thus, a refunding analysis is a classical application of discounted cash flow cost/benefit analysis—the issuer should refund the bond if the present value of the refunding savings exceeds the present value of the costs of refunding.<sup>7</sup>

The easiest way to examine the refunding decision is through an example. Suppose Minnesota Health Systems (MHS), Inc., an investor-owned corporation, has a \$60 million bond issue outstanding that has a 15 percent annual coupon and 20 years remaining to maturity.<sup>8</sup> This 30-year issue, which was sold ten years ago, had flotation costs of \$3 million that MHS has been amortizing on a straight-line basis over the 30-year original life of the issue. (*Flotation costs*, which were discussed in Chapter 6, are the printing, accounting, legal, and investment banker expenses associated with new securities issues.) The bond has a call provision with a ten-year call deferral, so the bond can now be called, but a 10 percent call premium is required. MHS's invest-

ment bankers have assured the firm that it can sell a new \$60–\$70 million issue of 20-year annual coupon bonds at an interest rate of 12 percent. Flotation costs on a new issue would amount to \$4 million. MHS’s marginal federal-plus-state tax rate is 40 percent. Should MHS refund the \$60 million of 15 percent bonds?

The following steps outline the decision process; the steps are summarized in worksheet form in Table 7.1.

- **Calculate the investment outlay required to refund the issue.**

- a. *Call premium on the old issue.*

Before tax:  $0.10 \times \$60,000,000 = \$6,000,000$ .

After tax:  $\$6,000,000 \times (1 - T) = \$6,000,000 \times 0.60 = \$3,600,000$ .

Although MHS must spend \$6 million on the call premium, this is a tax-deductible expense in the year the call is made.

Because the firm is in the 40 percent marginal tax bracket, it saves  $0.40 \times \$6,000,000 = \$2,400,000$  in taxes, for an after-tax cost of only \$3,600,000. This amount is shown as a cost, or outflow, on Line 1 of Table 7.1.

- b. *Flotation costs on the new issue.* Flotation costs on the new issue are \$4 million, as shown on Line 2 of the worksheet. For tax purposes, flotation costs must be amortized, or spread, over the 20-year life of the new bond and then used to reduce taxable income in each year. The amortization cash flows will be discussed later.

- c. *Flotation costs on the old issue.* The flotation costs on the old issue were amortized and deducted from taxable income, just as we will do on the new issue flotation costs. However, if the refunding takes place, tax laws permit MHS to immediately expense that portion of the old issue flotation costs that have not yet been expensed. Because ten years have passed since the old 30-year bond was originally issued, only one-third of the \$3 million flotation costs have been expensed for tax purposes, leaving two-thirds, or \$2 million, unexpensed. This immediate deduction from taxable income would create a  $0.40 \times \$2,000,000 = \$800,000$  tax savings, or inflow, which is shown on Line 3.

- d. *Total after-tax investment outlay.* The total investment outlay required at Time 0 to refund the bond issue is \$6,800,000, which is shown on Line 4.

- **Determine the net effect of flotation cost amortization.**

- a. *New issue flotation cost amortization.* With total flotation costs of \$4 million on the new issue, the annual taxable income deduction is  $\$4,000,000/20 = \$200,000$ . Because MHS is in the 40 percent tax bracket, it has a tax savings of  $0.40 \times \$200,000 = \$80,000$  a year for 20 years. In a refunding analysis, all cash flows must be discounted at the after-tax cost of new debt, which is  $12\% \times (1 - T) = 12\% \times 0.6 = 7.2\%$ .

TABLE 7.1

Bond Refunding  
Worksheet

	<i>Amount Before Tax</i>	<i>Amount After Tax</i>	<i>Present Value at 7.2%</i>
<i>Investment Outlay at t = 0</i>			
1. Call premium on the old issue	(\$6,000,000)	(\$3,600,000)	(\$3,600,000)
2. Flotation costs on new issue	(4,000,000)	(4,000,000)	(4,000,000)
3. Tax savings on old issue flotation costs	2,000,000	800,000	<u>800,000</u>
4. Net investment outlay			<u>(\$6,800,000)</u>
<i>Annual Flotation Cost Tax Effects</i>			
5. Benefit from new issue flotation costs	\$200,000	\$80,000	\$834,505
6. Lost benefit on old issue flotation costs	(100,000)	(40,000)	<u>(417,252)</u>
7. Present value of amortization tax effects			<u>\$417,253</u>
<i>Savings Due to Refunding</i>			
8. Interest payment on old issue	\$9,000,000	\$5,400,000	
9. Interest payment on new issue	7,200,000	<u>4,320,000</u>	
10. Net interest savings		<u>\$1,080,000</u>	<u>\$11,265,817</u>
<i>NPV of Refunding Decision</i>			
11. NPV			<u>\$4,883,070</u>

The present value of the new issue flotation cost tax savings, when discounted at 7.2 percent, is \$834,505, which is shown as a savings, or inflow, on Line 5. As in all cases, the primary consideration in choosing a discount rate is the riskiness of the cash flow stream. In a bond refunding, the cash flows are relatively safe because they are fixed by contract, so a relatively low discount rate should be chosen. What market rate reflects relatively low risk? The answer is the rate of return required on MHS's bonds, so it is chosen as the basis for the discount rate used in the refunding analysis.

- b. *Old issue flotation cost amortization.* If the refunding takes place, MHS loses the opportunity to continue to expense the old flotation costs over time, so the  $\$2,000,000/20 = \$100,000$  reduction in annual taxable income is lost. Thus, MHS loses the annual tax savings of  $0.40 \times \$100,000 = \$40,000$  for the next 20 years. The present value of these lost savings, which is an opportunity cost of refunding, is \$417,252, which is shown on Line 6. Note that because of the

refunding, the remaining old flotation costs provide an immediate tax savings, shown on Line 3, rather than annual savings, shown on Line 6. Thus, the  $\$800,000 - \$417,252 = \$382,748$  net savings simply reflect the difference between the present value of tax benefits to be received in the future without the refunding versus the immediate benefit if the refunding takes place.

- c. *Total amortization effect.* The net effect of the amortization of flotation costs on the old and new debt issues is  $\$417,253$  on a present value basis. This amount is shown on Line 7.
- **Calculate the annual interest savings.**
    - a. *Interest expense on old issue.* The annual after-tax interest on the old issue is  $\$5,400,000$ , which is shown on Line 8:  
 $0.15 \times \$60,000,000 \times 0.60 = \$5,400,000$ .
    - b. *Interest expense on new issue.* The annual after-tax interest on the new issue is  $\$4,320,000$ , which is shown on Line 9:  
 $0.12 \times \$60,000,000 \times 0.60 = \$4,320,000$ .
    - c. *Annual interest savings.* The annual interest savings is  $\$1,080,000$ , which is shown on Line 10:  
 $\$5,400,000 - \$4,320,000 = \$1,080,000$ .
    - d. *Present value of annual savings.* The present value of  $\$1,080,00$  per year for 20 years, when discounted at 7.2 percent, is  $\$11,265,817$ . This amount is also shown on Line 10.
  - **Calculate the net present value (NPV) of the refunding.**

Net investment outlay	(\$ 6,800,000)
Amortization tax effects	417,253
Interest savings	<u>11,265,817</u>
NPV of refunding	<u>\$ 4,883,070</u>

Because the NPV of the refunding is positive, the present value of the inflows exceeds the present value of the outflows. Thus, it would be profitable for MHS to refund the old bond issue.

Several other points should be noted. First, because the refunding is advantageous to MHS, it must be disadvantageous to bondholders; they must give up their 15 percent bonds and reinvest the proceeds in securities that have a lower interest rate. This points out the danger of a call provision to bondholders, and it also explains why bonds without a call provision have lower interest rates than callable bonds. Second, although it is not emphasized in the example, we assumed that the firm raises the investment required to undertake the refunding operation (the  $\$6,800,000$  shown on Line 4) as debt. Typically, businesses raise the investment outlay by increasing the amount of the new issue, which is easily done because the new issue has a lower interest rate, and hence additional principal can be taken on. In this example, MHS might sell  $\$67$  million of new bonds. Third, we set up the example so that the new issue had the same maturity as the remaining life of the old issue. Often,

the old bonds have only a relatively short term to maturity—say, five to ten years—while the new bonds have a longer maturity—say, 25 to 30 years. In this situation, a replacement chain analysis is required. Fourth, not-for-profit firms conduct refunding analyses in exactly the same way as that presented in Table 7.1. The only difference is that the tax rate is zero, and hence there are no direct tax effects to consider in the analysis.

Finally, although the analysis shows that the refunding would be profitable now, it might be even more profitable if MHS waits and refunds later. If interest rates fall further, then it might pay to delay the refunding. The mechanics of calculating the NPV of refunding is relatively simple, but the decision on when to refund is not simple at all because it requires a forecast of future interest rates. Thus, the *refund now versus refund later* decision is more a matter of judgment than of quantitative analysis.

To illustrate the timing decision, assume that MHS's managers forecast that long-term interest rates have a 50 percent probability of remaining at their present level of 12 percent over the next year. However, there is a 25 percent probability that rates could fall to 10 percent, and a 25 percent probability that rates could rise to 14 percent. The refunding analysis could then be repeated, as previously, but assuming it would take place one year from now when the old bonds have only 19 years to maturity. (We assume also that the new issue would have a 19-year maturity.) We performed the analysis and found the NPV distribution one year from now given in Table 7.2.

Note that if rates rose to 14 percent next year, the NPV of refunding would be negative, so MHS would not refund the issue and the realized NPV at a 14 percent interest rate would be \$0. Thus, the expected NPV of refunding next year is \$5,738,041, versus \$4,883,070 if refunding takes place now:

$$(0.25 \times \$13,737,916) + (0.50 \times \$4,607,124) + (0.25 \times \$0) = \$5,738,041.$$

Even though the expected NPV of refunding in one year is higher, MHS's managers would probably decide to refund today. First, when \$5,738,041 is discounted back one year to today at some rate—say, a 10 percent rate—the NPV of refunding in one year drops to \$5,216,401. More important, the NPV of refunding in one year is only an expected NPV because it depends on future interest rates, while the NPV of refunding today is known with some certainty. MHS's managers would opt to delay the refunding only if

**TABLE 7.2**

Interest Rate  
and Bond  
Refunding  
Forecast

<i>Probability</i>	<i>Interest Rate</i>	<i>NPV of Refunding One Year from Now</i>
25%	10%	\$13,737,916
50	12	4,607,124
25	14	(3,067,344)

the expected NPV today from refunding later is sufficiently above the refund-now NPV to compensate for the risks involved.

Clearly, the decision to refund now versus refund later is complicated by the fact that there would be numerous opportunities to refund in the future, rather than just a single opportunity one year from now. Furthermore, the decision must be based on a large set of interest rate forecasts, which is a daunting task in itself. Fortunately, managers who make bond refunding decisions are advised by sophisticated investment bankers, who can now use the values of derivative securities to estimate the value of a bond's embedded call option. If the call option is worth more than the NPV of refunding today, the issue should not be immediately refunded. Rather, the issuer should either delay the refunding to take advantage of the information obtained from the derivative market or actually create a derivative transaction to lock in the value of the call option.<sup>9</sup>

## Key Concepts

This chapter provides an overview of security valuation, including debt refunding. Here are its key concepts:

- Bonds call for the payment of a specific amount of *interest* for a specific number of years, and for the *repayment of par* on the bond's maturity date. Like most assets, a bond's value is simply the present value of the expected cash flow stream.
- The annual rate of return on a bond consists of an *interest*, or *current*, *yield* plus a *capital gains yield*. Assuming constant interest rates, if the bond is selling at a *discount*, the capital gains yield is positive; if the bond is selling at a *premium*, the capital gains yield is negative.
- A bond's *yield to maturity (YTM)* is the rate of return earned on a bond if it is held to maturity and no default occurs. The YTM for a bond that sells at par consists entirely of an interest yield, but if the bond sells at a discount or premium, the YTM consists of the current yield plus a positive or negative capital gains yield.
- Bondholders face *price risk* because bond values change when interest rates change. In general, the longer the maturity of the bonds, the greater the price risk.
- Bondholders face *reinvestment rate risk* when the investment horizon exceeds the maturity of the bond issue.
- The *value* of a share of stock using the dividend valuation model is found by *discounting* the stream of *expected dividends* by the stock's required rate of return.
- The value of a stock whose dividends are expected to grow at a constant rate for many years is found by applying the *constant growth model*:

$$E(P_0) = \frac{D_0 \times [1 + E(g)]}{R(R_s) - E(g)} = \frac{E(D_1)}{R(R_s) - E(g)}.$$

- The *expected rate of return* on a stock consists of an *expected dividend yield* plus an *expected capital gains yield*. For a constant growth stock, both the expected dividend yield and the expected capital gains yield are constant over time, and the expected rate of return can be found using this equation:

$$E(R_s) = \frac{D_0 \times [1 + E(g)]}{P_0} + E(g) = \frac{E(D_1)}{P_0} + E(g).$$

- The *Efficient Markets Hypothesis (EMH)* holds that (1) stocks are always in equilibrium and fairly valued, (2) it is impossible for an investor to consistently beat the market, and (3) managers should not try to forecast future interest rates or time security issues.
- In efficient markets, alternatives that offer higher returns must also have higher risk; this is called the *risk/return trade-off*. The implication is that investments must be evaluated on the basis of both risk and return.
- If a debt issue is callable, and if interest rates drop, the issuer may elect to lower its interest expense by issuing new debt and using the proceeds to call (retire) the existing issue. Such an action is called a *refunding*.
- A refunding analysis is a classic application of discounted cash flow cost/benefit analysis—the issuer should refund the bond if the present value of the refunding savings exceeds the present value of the costs of refunding.

This concludes our discussion of the traditional forms of financing—debt and equity—and how these securities are valued. In the next chapter, we discuss an alternative to traditional financing: lease financing.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in bond and stock valuation.

In addition, the chapter has seven problems in spreadsheet format that focus on bond valuation and nine problems that focus on stock valuation.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

## Selected References

Investment textbooks cover the valuation of securities in detail. For example, see Reilly, Frank K., and Edgar A. Norton. 2006. *Investments*. Fort Worth, TX: Thomson/South-Western.

The seminal modern work on stock valuation is Williams, John Burr. 1938. *The Theory of Investment Value*. Cambridge, MA: Harvard University Press.

For more information on bond refunding, see Jordahl, Eric, and Kevin T. Ponton. 2003. “Synthetic Refunding: A Financial Tool for a Low Interest-Rate Environment.” *Healthcare Financial Management* (May): 50–52.

## Selected Websites

The websites that pertain to this chapter generally involve data that are used in security valuation.

- To obtain analyst growth forecasts for use in the constant growth stock valuation model, see the Zacks site at [www.zacks.com](http://www.zacks.com). Here, use the boxes on the left side of the bar to enter a “ticker” symbol—say, HCA. Finally, click on “go!”. Earnings estimates are on the bottom of the HCA page.
- To obtain stock betas, refer to the selected websites section of Chapter 4.

## Selected Cases

There are two cases in *Cases in Healthcare Finance* that are applicable to this chapter:

- Case 14: Potomac Healthcare (A), which focuses on bond valuation.
  - Case 15: Potomac Healthcare (B), which covers stock valuation.
- Case A: Waverly Enterprises, which focuses on the bond refunding decision, is available online only.

## Notes

1. The term *coupon* goes back to the time when all bonds were *bearer bonds*. Such bonds had small coupons attached, one for each interest payment. To collect an interest payment, bondholders would remove (i.e., “clip”) a coupon and send it to the issuer, or take it to a bank, where it would be exchanged for the dollar payment. Today, all bonds are *registered bonds*, and the issuer (through an *agent*) automatically sends interest payments to the registered owner.
2. If the probability of default on the bond is anything other than zero, the expected rate of return on the bond is less than the YTM. Also, the calculation of YTM assumes that the coupon payments are reinvested at the YTM rate. Thus, if over the life of the bond, interest rates are above the YTM, the realized rate of return will be higher than the YTM. Similarly, if interest rates over time are less than the YTM, the realized return will be less than the YTM.
3. The effective annual YTM is  $(1.029)^2 - 1.0 = 1.0588 - 1.0 = 0.0588 = 5.88\%$ , as compared to the stated rate of 5.80%.
4. In reality, price risk is more related to a debt security’s *duration* than to its maturity. Duration, which can be thought of as the average maturity of a debt issue, including both interest and principal payments, is discussed in Chapter 18.
5. The effective annual rate, which includes the effect of quarterly compounding, is 12.3 percent.
6. Stocks generally pay dividends quarterly, so, theoretically, we should evaluate them on a quarterly basis. However, in stock valuation, most analysts work on



an annual basis because the data generally are not precise enough to warrant the refinement of a quarterly model. In recent years, a few companies have started paying annual (as opposed to quarterly) dividends. The rationale is that the administrative expenses associated with dividend payments are reduced significantly.

7. Note that refunding analyses are also used with preferred stock issues that are callable (redeemable).
8. We are using annual coupon bonds to simplify the mathematics of the illustration. The same techniques, with minor modification, would be applied to semiannual coupon bonds.
9. We introduce options and how they can be used in financial risk management in Chapter 18.

## LEASE FINANCING

### Learning Objectives

After studying this chapter, readers should be able to:

- Describe the different types of leases.
- Explain how lease financing affects both financial statements and taxes.
- Conduct a basic lease analysis from the perspectives of both the lessee and the lessor.
- Discuss the factors that create value in lease transactions.

### Introduction

Businesses generally own fixed assets, but it is the use of the buildings and equipment that is important to the business, not their ownership. One way to obtain the use of assets is to raise debt or equity capital, and then use this capital to buy the assets. An alternative way to obtain the use of assets is to lease them. Prior to the 1950s, leasing was generally associated with real estate—land and buildings. Today, however, it is possible to lease almost any kind of asset, and leasing is used extensively in the health services industry. In fact, in 2005 alone, healthcare providers leased over \$7 billion worth of equipment, which amounted to about 40 percent of all equipment used in the industry. About half of all provider leasing is for diagnostic imaging devices, with a typical lease term of about 5 years. In addition to diagnostic equipment, there has been increasing use of leasing to fund information technology, which is consuming a larger and larger proportion of capital expenditures within healthcare businesses.<sup>1</sup>

### Lease Parties and Types

There are two parties to any lease transaction. The user of a leased asset is called the *lessee*, while the owner of the property, usually the manufacturer or a leasing company, is called the *lessor*. (The term “lessee” is pronounced “less-ee,” not “lease-ee,” and “lessor” is pronounced “less-or.”)

Historically, leases have been classified into one of three categories: (1) operating leases, (2) financial leases, and (3) combination leases. In this section, we will discuss these informal classifications. In later sections, we will

discuss more formal classifications used by accountants and by the Internal Revenue Service (IRS).

### **Operating Leases**

*Operating leases*, sometimes called *service leases*, generally provide for both financing and maintenance in addition to use of the asset. IBM was one of the pioneers of operating lease contracts, and computers and office copying machines, together with automobiles, trucks, and medical diagnostic equipment, are the primary types of assets involved in operating leases. Ordinarily, operating leases require the lessor to maintain and service the leased equipment, and the cost of the maintenance is built into the lease payments.

Another important characteristic of operating leases is the fact that they are not fully amortized. In other words, the payments required under the lease contract are not sufficient for the lessor to recover the full cost of the equipment. However, the lease contract is written for a period considerably less than the expected economic life of the leased asset, and the lessor expects to recover all costs eventually by lease renewal payments, by releasing the equipment to other lessees, or by sale of the equipment.

A final feature of operating leases is that they frequently contain a *cancellation clause* that gives the lessee the right to cancel the lease and to return the equipment before the expiration of the basic lease agreement. This is an important consideration to the lessee because it means that the equipment can be returned if it is rendered obsolete by technological advances or if it is no longer needed because of a decline in the lessee's business.

Note that lease (rental) payments on operating leases can be structured in two different ways. Under *conventional* terms, fixed payments are made to the lessor periodically, usually monthly. With this type of payment, the cost to the lessee is known with certainty. Under *per procedure* terms, a fixed amount is paid each time the equipment is used. In essence, a per procedure lease converts a fixed cost for the equipment, which is independent of volume, into a variable cost, which is directly related to volume. We will have more to say about per procedure leases later in the chapter.

### **Financial Leases**

*Financial leases*, which are also called *capital leases*, are differentiated from operating leases in that (1) they typically do not provide for maintenance service; (2) they typically are not cancelable; (3) they are generally for a period that approximates the economic life of the asset; and hence (4) they are fully amortized—that is, the lessor receives rental payments equal to the full cost of the leased asset plus a return on the funds employed.

In a typical financial lease, the lessee selects the specific item it requires, and then it negotiates the price and delivery terms with the manufacturer. The lessee then arranges to have a leasing firm (lessor) buy the equipment from

the manufacturer, and the lessee simultaneously executes a lease agreement with the lessor. The lessee is generally given an option to renew the lease at a reduced rate upon expiration of the initial lease agreement. However, under a “pure” financial lease, the initial lease cannot be cancelled. Also, the lessee generally pays the insurance premiums and any property taxes due on the leased property.

The terms of the lease call for full amortization of the lessor’s investment plus a rate of return on the unamortized balance, which is close to the percentage rate the lessee would have paid on a secured term loan. For example, if a radiology group practice would have to pay 10 percent for a term loan to buy an x-ray machine, then a rate of about 10 percent would be built into the lease contract by the lessor. The parallel to borrowing is obvious in a financial lease. Under a secured loan arrangement, the lender would normally receive a series of equal payments just sufficient to amortize the loan and to provide a specified rate of return on the outstanding loan balance. Under a financial lease, the lease payments are set up exactly the same way—the payments are just sufficient to return the full purchase price to the lessor, plus a stated return on the lessor’s investment.

A *sale and leaseback* is a special type of financial lease, often used with real estate, which can be arranged by a user that currently owns some asset. Here, the user sells the asset to another party and simultaneously executes an agreement to lease the property back for a stated period under specific terms. In a sale and leaseback, the lessee receives an immediate cash payment in exchange for a future series of lease payments that must be made to rent the use of the asset sold.

### Combination Leases

Although the distinction between operating and financial leases has historical significance, today many lessors offer leases under a wide variety of terms. Therefore, in practice, leases often do not fit exactly into the operating lease or financial lease category but rather combine some features of each. To illustrate the concept, note that many of today’s financial leases contain cancellation clauses, which historically have been associated only with operating leases. However, when used in financial leases these clauses generally include prepayment provisions whereby the lessee must make penalty payments sufficient to enable the lessor to recover some or all of the remaining lease payments.

1. What is the difference between an operating lease and a financial lease?
2. What is a sale and leaseback?
3. What is a combination lease?
4. How do prepayment terms differ from conventional terms?

### Self-Test Questions

## Tax Effects

For both investor-owned and not-for-profit healthcare businesses, tax effects can play an important role in the lease-versus-buy decision.

### *Investor-Owned (Taxable) Businesses*

For investor-owned businesses, the full amount of lease payments is a tax-deductible expense for the lessee **provided that the IRS agrees that a particular contract is a genuine lease and not simply a loan that is called a lease**. This makes it important that a lease contract be written with terms that are acceptable to the IRS. A lease that complies with all of the IRS requirements for taxable businesses is called a *guideline*, or *tax-oriented*, lease. In a guideline lease, ownership tax benefits accrue to the lessor, but the lessee's lease payments are fully tax deductible. A lease that does not meet the tax guidelines is called a *non-tax-oriented lease*. For this type of lease, the lessee can only deduct the implied interest portion of each lease payment. However, the lessee is effectively the owner of the leased equipment; thus, the lessee can take the tax depreciation.

The main provisions of the tax guidelines are as follows:

- The lease term, including any extensions or renewals at a fixed rental rate, must not exceed 80 percent of the estimated useful life of the equipment at the commencement of the lease transaction. Thus, at the projected end of the lease, the property must have an estimated remaining life equal to at least 20 percent of its original life. Furthermore, the remaining useful life must not be less than one year. This requirement limits the maximum term of a guideline lease to 80 percent of the asset's useful life. Note that an asset's useful life is normally much longer than its tax depreciation class life.
- The equipment's estimated value (in constant dollars without adjustment for inflation) at the projected expiration of the lease must equal at least 20 percent of its value at the start of the lease. Note that the estimated value of the asset at the end of the lease is called the *residual value*. This requirement also has the effect of limiting the maximum lease term.
- Neither the lessee nor any related party can have the right to purchase the property from the lessor at a price less than its fair market value. However, the lessee can be given a fair market value purchase option.
- Neither the lessee nor any related party can pay or guarantee payment of any part of the price of the leased equipment. Simply put, the lessee cannot make any investment in the equipment, other than through the lease payments.
- The leased equipment must not be "limited use" property, which is equipment that can only be used by the lessee or a related party at the end of the lease.

The reason for the IRS's concern about lease terms is that, without restrictions, a business can set up a "lease" transaction that calls for very rapid lease payments, which would be deductible from taxable income. The effect would be to depreciate the equipment over a much shorter period than the IRS allows in its depreciation guidelines. For example, suppose that New England Laboratories, Inc., an investor-owned corporation that owns clinical laboratories in New Hampshire, Maine, Massachusetts, and Vermont, planned to acquire a \$2 million computer that has a three-year life for tax purposes. According to current tax laws (Modified Accelerated Cost Recovery System, or MACRS), the annual depreciation allowances would be \$660,000 in Year 1; \$900,000 in Year 2; \$300,000 in Year 3; and \$140,000 in Year 4. If New England Laboratories were in the 40 percent federal-plus-state tax bracket, the depreciation would provide a tax savings of  $0.40 \times \$660,000 = \$264,000$  in Year 1; \$360,000 in Year 2; \$120,000 in Year 3; and \$56,000 in Year 4, for a total savings of \$800,000. At a 6 percent discount rate, the present value of these tax savings would be \$757,441.

Now, suppose the firm could acquire the computer through a one-year lease arrangement with Bank of Boston for a payment of \$2 million, with a one-dollar purchase option. If the \$2 million payment were treated as a lease payment, it would be fully deductible, so it would provide a tax saving of  $0.40 \times \$2,000,000 = \$800,000$  versus a present value of only \$757,441 for the depreciation shelters associated with ownership. Thus, the lease payment and the depreciation would both provide the same total amount of tax savings—40 percent of \$2 million, or \$800,000—but the savings would come in faster, and hence have a higher present value, with the one-year lease. Therefore, if any type of contract can be called a lease and given tax treatment as a lease, then the timing of the tax shelters can be speeded up, compared with ownership depreciation tax shelters. This speed up would benefit businesses, but it would be costly to the government and hence to individual taxpayers. For this reason, the IRS has established the rules described above for defining a lease for tax purposes.

Even though leasing can be used only within limits to speed up the effective depreciation schedule, there are still times when very substantial tax benefits can be derived from a leasing arrangement. For example, if an investor-owned hospital has a very large construction program that has generated so much accelerated depreciation that it has no current tax liabilities, then depreciation shelters are not very useful. In this case, a leasing company set up by a very profitable business, like General Electric, can buy the equipment, receive the depreciation shelters, and then share these benefits with the hospital by charging lower lease payments.<sup>2</sup> This issue will be discussed in detail later in the chapter, but the point to be made now is that if businesses are to obtain tax benefits from leasing, the lease contract must be written in a manner that will qualify it as a true lease under IRS guidelines. Any questions

about the tax status of a lease contract must be resolved by the potential lessee prior to signing the contract.

### **Not-for-Profit (Tax-Exempt) Businesses**

Not-for-profit businesses also benefit from tax laws, but in a different way. Because not-for-profit firms do not obtain tax benefits from depreciation, the ownership of assets has no tax value. However, lessors, who are all taxable businesses, do benefit from ownership. In effect, when assets are owned by not-for-profit firms the depreciation tax benefit is lost; while when assets are leased, the tax benefit is realized but by the lessor rather than the lessee. This realized benefit, in turn, can be shared with the lessee in the form of lower rental payments. Note, however, that the cost of tax-exempt debt to not-for-profit firms can be lower than the after-tax cost of debt to taxable firms, so leasing is not automatically less costly to not-for-profit firms than borrowing in the tax-exempt markets and buying.

A special type of financial transaction has been created for not-for-profit businesses called a *tax-exempt lease*. Legally, such a “lease” is not really a lease, but these transactions have all of the general characteristics of leases. The major difference between a tax-exempt lease and a conventional lease is that the implied interest portion of the lease payment is not classified as taxable income to the lessor. Thus, a portion of the lease payment received by the lessor is exempt from federal income taxes. The rationale for this tax treatment is that the interest paid on most debt financing used by not-for-profit organizations is tax exempt to the lender, and a lessor is, in actuality, a lender. Tax-exempt leases provide a greater after-tax return to lessors than do conventional leases, so some of this “extra” return can be passed back to the lessee in the form of lower lease payments. Thus, the lessee’s payments on tax-exempt leases can be lower than when the asset is acquired by a not-for-profit business through a conventional lease.

### **Self-Test Questions**

1. What is the difference between a tax-oriented lease and a non-tax-oriented lease?
2. What are some provisions that would make a lease non-tax-oriented?
3. Why should the IRS care about lease provisions?
4. What is a tax-exempt lease?

### **Financial Statement Effects**



Under certain conditions, neither the leased asset nor the liabilities under the lease contract appear on the lessee’s balance sheet. For this reason, leasing is often called *off-balance-sheet financing*. This point is illustrated in Table 8.1 by the balance sheets of two hypothetical firms—B and L. Initially, the balance sheets of both firms are identical, and they both have debt (debt-to-assets)

**TABLE 8.1**  
Effects of  
Leasing on  
Balance Sheets

**Before Asset Increase:**

Firms B and L			
Current assets	\$ 50	Debt	\$ 50
Fixed assets	<u>50</u>	Equity	<u>50</u>
Total assets	<u>\$100</u>		<u>\$100</u>
Debt/assets ratio		50%	

**After Asset Increase:**

Firm B, Which Borrows and Buys				Firm L, Which Leases			
Current assets	\$ 50	Debt	\$150	Current assets	\$ 50	Debt	\$ 50
Fixed assets	<u>150</u>	Equity	<u>50</u>	Fixed assets	<u>50</u>	Equity	<u>50</u>
Total assets	<u>\$200</u>		<u>\$200</u>	Total assets	<u>\$100</u>		<u>\$100</u>
Debt/assets ratio		75%		Debt/assets ratio		50%	

ratios of 50 percent. Next, each firm decides to acquire a fixed asset that costs \$100. Firm B borrows \$100 and buys the asset, so both an asset and a liability go on its balance sheet and its debt ratio rises from 50 to 75 percent. Firm L leases the equipment. The lease may call for fixed charges as high or even higher than the loan, and the obligations assumed under the lease may have equal or even more potential to force the business into bankruptcy, but the firm's debt ratio remains at only 50 percent.

To correct this problem, accounting rules require firms that enter into certain leases to restate their balance sheets to report the leased asset as a fixed asset and the present value of the future lease payments as a liability. This process is called *capitalizing* the lease, and hence such a lease is called a *capital lease*. The net effect of capitalizing the lease is to cause Firms B and L to have similar balance sheets, both of which will, in essence, resemble the one shown for Firm B.<sup>3</sup>

A lease is classified as a capital lease, and thus is capitalized and shown directly on the balance sheet, if one or more of the following conditions exist:

- Under the terms of the lease, ownership of the property is effectively transferred from the lessor to the lessee.
- The lessee can purchase the property at less than its true market value when the lease expires.
- The lease runs for a period equal to or greater than 75 percent of the asset's life. Thus, if an asset has a ten-year life and the lease is written for eight years, the lease must be capitalized.
- The present value of the lease payments is equal to or greater than 90 percent of the initial value of the asset. The discount rate used to calculate the present value of the lease payments must be the lower of (1) the rate



used by the lessor to establish the lease payments, which is discussed later in the chapter; or (2) the rate of interest that the lessee would have to pay for new debt with a maturity equal to that of the lease. Note that any maintenance payments embedded in the lease payment must be stripped out prior to checking this condition.

The logic behind capitalization is as follows. If a firm signs a capital lease contract, its obligation to make lease payments is just as binding as if it had signed a loan agreement; the failure to make lease payments has the potential to bankrupt a firm, just as the failure to make principal and interest payments on a loan can result in bankruptcy. Therefore, under most circumstances, a capital lease has the same impact on a firm's financial condition as does a loan. This being the case, if a firm signs a capital lease agreement, it has the effect of raising the firm's effective debt ratio. Therefore, if the firm had previously established a target capital structure, and if there is no reason to think that the optimal capital structure has changed, then using lease financing requires additional equity support exactly like debt financing. Another way of saying the same thing is that leasing uses up *debt capacity*.

If disclosure of the lease in our Table 8.1 example were not made, then Firm L's investors could be deceived into thinking that its financial position is stronger than it really is. Thus, even before firms were required to place financial leases on the balance sheet, they were required to disclose the existence of long-term leases in footnotes to their financial statements. At that time, it was debated whether or not investors fully recognized the impact of leases and, in effect, see that Firms B and L were in essentially the same financial position. Some people argued that leases were not fully recognized, even by sophisticated investors. The question of whether investors were truly deceived was debated but never resolved. Those who believe strongly in efficient markets thought that investors were not deceived and that footnotes were sufficient, while those who questioned market efficiency thought that all leases should be capitalized. Current accounting requirements represent a compromise between these two positions, although one that is tilted heavily toward those who favor capitalization.

These rules, together with strong footnote disclosure rules for operating leases, are sufficient to ensure that no one will be fooled by lease financing. In effect, a financial lease for a particular asset has the same economic consequences for the business as a loan in which the asset is pledged as collateral. Thus, leases are regarded as debt for capital structure purposes, and they have roughly the same effects as debt on the financial condition of the firm.

However, there are some legal differences between loans and leases, mostly involving the rights of lessors versus lenders when a business in financial distress reorganizes or liquidates. In most financial distress situations, lessors fare better than lenders, so lessors may be more willing to deal with firms in poor financial condition than are lenders. At a minimum, lessors may be willing

to accept lower rates of return than lenders when dealing with financially distressed firms because their risks are lower.

In closing, note that the rules that accountants follow in making the decision as to whether or not to capitalize a lease are not identical to the rules that the IRS follows to decide whether or not the lease is a guideline lease. In most cases, however, leases that meet IRS guidelines are operating leases that will not be capitalized, while leases that do not meet IRS guidelines are financial leases that will be capitalized. Remember, however, that even operating (noncapitalized) leases must be disclosed in the footnotes to the firm's financial statements.

1. Why is lease financing sometimes called off-balance-sheet financing?
2. How are leases accounted for in a business's financial statements?

## Self-Test Questions

### Evaluation by the Lessee

Leases are evaluated by both the lessee and the lessor. The lessee must determine whether leasing an asset is less costly than obtaining equivalent alternative financing and buying the asset, and the lessor must decide what the lease payments must be to produce a rate of return consistent with the riskiness of the investment. This section focuses on the analysis by the lessee.

We should note that a degree of uncertainty exists regarding the theoretically correct way to evaluate lease-versus-purchase decisions, and some very complex decision models have been developed to aid in the analysis. However, the simple analysis given here, coupled with judgment, is sufficient to avoid situations where a lessee enters into a lease agreement that is clearly not in its best interests. In the typical case, the events leading to a lease arrangement follow this sequence:

- The business decides to acquire a particular building or piece of equipment; this decision is based on the standard capital budgeting procedures discussed in Chapters 11 and 12. The decision to acquire the asset is **not an issue** in the typical lease analysis; this decision was made previously as part of the capital budgeting process. In lease analysis, we are concerned simply with whether to obtain the use of the property by lease or by purchase (how to finance the acquisition).
- Once the business has decided to acquire the asset, the next question is how to finance its acquisition. A well-run business does not have excess cash lying around and, even if it does, there are opportunity costs associated with its use.
- Funds to purchase the asset can be obtained by borrowing, by retaining earnings, or, if the business is investor owned, by selling new equity. If the firm is not for profit, perhaps the funds can be raised by soliciting contributions for the project. Or some combination of these sources can

be used. Alternatively, the asset can be leased. As explained previously, the capitalization/disclosure provisions for leases mean that leasing has roughly the same impact on a firm's financial condition as debt financing (borrowing).

Because a lease is roughly comparable to a loan, the appropriate comparison when making lease decisions is the cost of lease financing versus the cost of debt financing. The comparison of lease financing to debt financing is valid **regardless of how the asset actually would be financed if it were not leased**. The asset may be purchased with available cash if not leased or financed by a new equity sale or a cash contribution. However, because leasing is a substitute for debt financing and hence uses up a business's debt capacity, the appropriate comparison would still be to debt financing.

To illustrate the basic elements of lease analysis, consider this simplified example. Nashville Radiology Group (the Group) requires the use of a piece of diagnostic equipment for two years that costs \$100, and the Group must choose between leasing and buying the machine. (The actual cost is \$100,000, but let's keep the numbers simple.) If the machine is purchased, the bank would lend the Group the needed \$100 at a rate of 10 percent on a two-year, simple interest loan. Thus, the Group would have to pay the bank \$10 in interest at the end of each year, plus return the \$100 in principal at the end of Year 2. For simplicity, assume that the Group can depreciate the entire cost of the machine over two years for tax purposes by the straight-line method if it were purchased, resulting in tax depreciation of \$50 in each year. Furthermore, the Group's tax rate is 40 percent. Thus, the depreciation expense produces a tax savings, or *tax shield*, of  $50 \times 0.40 = \$20$  in each year. Also for simplicity, assume that the machine's value at the end of two years (its residual value) is estimated to be \$0.

Alternatively, the Group can lease the asset under a guideline lease for two years for a payment of \$55 at the end of each year. The analysis for the lease-versus-buy decision consists of (1) estimating the cash flows associated with borrowing and buying the asset—that is, the flows associated with debt financing; (2) estimating the cash flows associated with leasing the asset; and (3) comparing the two financing methods to determine which has the lower cost. Here are the borrow-and-buy flows:

<u>Cash Flows if the Group Buys</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>
Equipment cost	(\$100)		
Loan amount	100		
Interest expense		(\$10)	(\$ 10)
Tax savings from interest		4	4
Principal repayment			( 100)
Tax savings from depreciation		20	20
Net cash flow	<u>\$ 0</u>	<u>\$14</u>	<u>(\$ 86)</u>

The net cash flow is zero in Year 0, positive in Year 1, and negative in Year 2. Because the operating cash flows (the revenues and operating costs) will be the same regardless of whether the machine is leased or purchased, they can be ignored. Cash flows that are not affected by the decision at hand are said to be *nonincremental* to the decision.

Here are the cash flows associated with the lease:

<u>Cash Flows if the Group Leases</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>
Lease payment		(\$55)	(\$55)
Tax savings from payment		22	22
Net cash flow	<u>\$0</u>	<u>(\$33)</u>	<u>(\$33)</u>

Note that the two sets of cash flows reflect the tax savings associated with interest expense, depreciation, and lease payments, as appropriate. If the lease had not met IRS guidelines, then ownership would effectively reside with the lessee, and the Group would depreciate the asset for tax purposes whether it was “leased” or purchased. Furthermore, only the implied interest portion of the lease payment would be tax deductible. Thus, the analysis for a nonguideline lease would consist of simply comparing the after-tax financing flows on the loan with the after-tax lease payment stream.

To compare the cost streams of buying and leasing, we must put them on a present value basis. As we explain later, the correct discount rate is the lessee’s after-tax cost of debt, which for the Group is  $10\% \times (1 - T) = 10\% \times (1 - 0.4) = 6.0\%$ . Applying this rate, we find the present value cost of buying to be \$63.33 and the present value cost of leasing to be \$60.50. Because leasing has the lower present value of costs, it is the less costly financing alternative, and the Group should lease the asset.

This simplified example shows the general approach used in lease analysis, and it also illustrates a concept that can simplify the cash flow estimation process. Look back at the loan-related cash flows if the Group buys the machine, which consist of the interest expense, tax savings from interest, and principal repayment. The after-tax loan-related flows are  $-\$6$  in Year 1 and  $-\$106$  in Year 2. When these flows are discounted to Year 0 at the 6.0 percent after-tax cost of debt, their present value is  $-\$100$ , which is the negative of the loan amount shown in Year 0. This equality results because we first used the cost of debt to estimate the future financing flows, and we then used this same rate to discount the flows back to Year 0, all on an after-tax basis. In effect, the loan amount positive cash flow and the loan cost negative cash flows cancel one another out. Here is the cash flow stream associated with buying the asset after the Year 0 loan amount and the related Year 1 and Year 2 flows have been removed:

<u>Cash Flows if the Group Buys</u>	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>
Cost of asset	(\$100)		
Tax savings from depreciation		\$20	\$20
Net cash flow	<u>(\$100)</u>	<u>\$20</u>	<u>\$20</u>

The present value cost of buying here is, of course, \$63.33, which is the same number we found earlier. The consistency between the two approaches will always occur regardless of the specific terms of the debt financing—as long as the discount rate is the after-tax cost of debt, the cash flows associated with the loan can be ignored.

To examine a more realistic example of lease analysis, consider the following lease-versus-buy decision facing the Nashville Radiology Group:

- The Group plans to acquire a new computer system that will automate the Group's clinical records as well as its accounting, billing, and collection process. The computer has an economic life of eight years and costs \$200,000, delivered and installed. However, the Group plans to lease the equipment for only four years because it believes that computer technology is changing rapidly, and it wants the opportunity to reevaluate the situation at that time.
- The Group can borrow the required \$200,000 from its bank at a before-tax cost of 10 percent.
- The computer's estimated scrap value is \$5,000 after eight years of use, but its estimated residual value when the lease expires after four years of use is \$20,000. Thus, if the Group buys the equipment, it would expect to receive \$20,000 before taxes when the equipment is sold in four years.
- The Group can lease the equipment for four years at a rental charge of \$57,000, payable at the beginning of each year, but the lessor will own the equipment upon the expiration of the lease. (The lease payment schedule is established by the potential lessor, as described in a later section, and the Group can accept it, reject it, or negotiate.)
- The lease contract stipulates that the lessor will maintain the computer at no additional charge to the Group. However, if the Group borrows and buys the computer, it will have to bear the cost of maintenance, which would be performed by the equipment manufacturer at a fixed contract rate of \$2,500 per year, payable at the beginning of each year.
- The computer falls in the MACRS five-year class life, the group's marginal tax rate is 40 percent, and the lease qualifies as a guideline lease under a special IRS ruling. (Refer to Chapter 1 to review tax depreciation if necessary.)

### Dollar Cost Analysis



Table 8.2 shows the steps involved in a complete dollar cost analysis. Again, our approach here is to compare the cost of owning (borrowing and buying)

the computer to the cost of leasing the computer. All else the same, the lower-cost alternative is preferable. Part I of the table is devoted to the costs of borrowing and buying. Here, Line 1 gives the equipment's cost and Line 2 shows the maintenance expense; both are cash costs or outflows. Note that whenever an analyst is setting up cash flows on a time line, one of the first decisions to be made is what time interval will be used—that is, months, quarters, years, or some other period. As a starting point, we generally assume that all cash flows occur at the end of each year. If, at some point later in the analysis, we conclude that another interval is better, we will change. Longer intervals, such as years, simplify the analysis but introduce some inaccuracies because all cash flows do not actually occur at year end. For example, tax benefits occur quarterly because businesses pay taxes on a quarterly basis. On the other hand, shorter intervals, such as months, often are used for lease analyses because lease payments typically occur monthly. For ease of illustration, we are using annual flows in this example.

Line 3 gives the maintenance tax savings, and because maintenance expense is tax deductible, the Group saves  $0.40 \times \$2,500 = \$1,000$  in taxes by virtue of paying the maintenance fee. Line 4 contains the depreciation tax savings, which is the depreciation expense times the tax rate. For example, the MACRS allowance for the first year is 20 percent, so the depreciation expense

	Year 0	Year 1	Year 2	Year 3	Year 4
<b>TABLE 8.2</b>					
Lessee's Dollar Cost Analysis					
<i>I. Cost of Owning (Borrowing and Buying)</i>					
1. Net purchase price	(\$200,000)				
2. Maintenance cost	(2,500)	(\$ 2,500)	(\$ 2,500)	(\$ 2,500)	
3. Maintenance tax savings	1,000	1,000	1,000	1,000	
4. Depreciation tax savings		16,000	25,600	15,200	\$ 9,600
5. Residual value					20,000
6. Residual value tax					5,600
7. Net cash flow	<u>(\$201,500)</u>	<u>\$14,500</u>	<u>\$24,100</u>	<u>\$13,700</u>	<u>\$35,200</u>
8. PV cost of owning =	<u>(\$126,987)</u>				
<i>II. Cost of Leasing</i>					
9. Lease payment	(\$ 57,000)	(\$57,000)	(\$57,000)	(\$57,000)	
10. Tax savings	22,800	22,800	22,800	22,800	
11. Net cash flow	<u>(\$ 34,200)</u>	<u>(\$34,200)</u>	<u>(\$34,200)</u>	<u>(\$34,200)</u>	<u>\$ 0</u>
12. PV cost of leasing =	<u>(\$125,617)</u>				
<i>III. Cost Comparison</i>					
13. Net advantage to leasing (NAL)					= PV cost of leasing – PV cost of owning = $-\$125,617 - (-\$126,987) = \underline{\underline{\$1,370}}$ .

*Notes:*

- a. The MACRS depreciation allowances are 0.20, 0.32, 0.19, and 0.12 in Years 1 through 4, respectively.  
 b. In practice, a lease analysis such as this would be done on a monthly basis using a spreadsheet program.

is  $0.20 \times \$200,000 = \$40,000$  and the depreciation tax savings is  $0.40 \times \$40,000 = \$16,000$ .

Lines 5 and 6 contain the residual value cash flows: the residual value is estimated to be \$20,000, but the tax book value after four years of depreciation is \$34,000. Thus, the Group is losing \$14,000 for tax purposes, which results in the  $0.4 \times \$14,000 = \$5,600$  tax savings shown as an inflow on Line 6. Line 7, which sums the component cash flows, contains the net cash flows associated with borrowing and buying.

Part II of Table 8.2 contains an analysis of the cost of leasing. The lease payments, shown on Line 9, are \$57,000 per year; this rate, which includes maintenance, was established by the prospective lessor and offered to the Group. If the Group accepts the lease, the full amount will be a deductible expense, so the tax savings, shown on Line 10, is  $0.40 \times \text{Lease payment} = 0.40 \times \$57,000 = \$22,800$ . The net cash flows associated with leasing are shown on Line 11.

The final step is to compare the net cost of owning with the net cost of leasing. However, we must first put the annual cash flows associated with owning and leasing on a common basis. This requires converting them to present values, which brings up the question of the proper rate at which to discount the net cash flows. We know that the riskier the cash flows, the higher will be the discount rate used to find the present value. This same principle was observed in our discussion of security valuation, and it applies to all discounted cash flow analyses, including lease analysis. Just how risky are the cash flows under consideration here? Most of them are relatively certain, at least when compared with the types of cash flow estimates associated with stock investments or with the Group's operating cash flows. For example, the loan payment schedule is set by contract, as is the lease payment schedule. The depreciation expenses are also established by law and not subject to change, and the annual maintenance fee is fixed by contract as well. The tax savings are somewhat uncertain, but they will be as projected as long as the Group's marginal tax rate remains at 40 percent. The residual value is the least certain of the cash flows, but, even here, the Group's management is fairly confident because there are a great deal of historical data available to help make the estimate.

Because the cash flows under the lease and under the borrow-and-purchase alternatives are both relatively certain, they should be discounted at a relatively low rate. What market-determined rate is readily available that reflects relatively low risk? Most analysts recommend that the firm's cost of debt financing be used, and this rate seems reasonable in our example. However, the Group's cost of debt, 10 percent, must be adjusted to reflect the tax deductibility of interest payments because this benefit of borrowing and buying is not accounted for in the cash flows. Thus, the Group's effective cost of debt becomes  $\text{Before-tax cost} \times (1 - \text{Tax rate}) = 10\% \times 0.6 = 6.0\%$ . Accordingly, the cash flows on Lines 7 and 11 are discounted at a 6.0 percent

rate. The resulting present values are \$126,987 for the cost of owning and \$125,617 for the cost of leasing, as shown on Lines 8 and 12. Leasing is the lower-cost financing alternative, so the Group should lease, rather than buy, the computer.

The cost comparison can be formalized by defining the *net advantage to leasing (NAL)* as follows:

$$\begin{aligned} \text{NAL} &= \text{PV cost of leasing} - \text{PV cost of owning} \\ &= -\$125,617 - (-\$126,987) = \$1,370. \end{aligned}$$

The positive NAL shows that leasing creates more value than buying, so the Group should lease the equipment. Indeed, the value of the Group is increased by \$1,370 if it leases, rather than buys, the computer.

### Percentage Cost Analysis



The Group's lease-versus-buy decision can also be analyzed by looking at the effective cost rate on the lease and comparing it to the effective cost rate on the loan. Signing a lease is similar to signing a loan contract—the firm has the use of equipment but must make a series of payments under either type of contract. We know the effective cost rate built into the loan: it is the 6.0 percent after-tax interest rate. If the after-tax cost rate in the lease is less than 6.0 percent, then there is an advantage to leasing.

Table 8.3 sets forth the cash flows needed to determine the percentage cost of the lease. Here is an explanation of the table:

- The first step is to calculate the leasing-versus-owning cash flows. To calculate, we merely subtract the owning cash flows, Line 7 in Table 8.2, from the leasing cash flows shown on Line 11. The differences are the incremental cash flows that relate to the Group if it leases, rather than buys, the computer.
- Note that Table 8.3 consolidates the analysis shown in Table 8.2 into a single set of net cash flows. At this point, we can discount the net (consolidated) cash flows shown on Line 3 by 6.0 percent to obtain the NAL, \$1,370. In Table 8.2, we discounted the owning and leasing cash flows separately and then subtracted their present values to obtain the

	Year 0	Year 1	Year 2	Year 3	Year 4	TABLE 8.3 Lessee's Percentage Cost Analysis
1. Leasing cash flow	(\$ 34,200)	(\$34,200)	(\$34,200)	(\$34,200)	\$ 0	
2. Less: Owning cash flow	(201,500)	14,500	24,100	13,700	35,200	
3. Leasing-versus-owning CF	<u>\$167,300</u>	<u>(\$48,700)</u>	<u>(\$58,300)</u>	<u>(\$47,900)</u>	<u>(\$35,200)</u>	

NAL = \$1,370.  
IRR = 5.6%.



NAL. In Table 8.3, we subtracted the cash flows first to obtain a single set of flows and then found their present value. The end result is the same.

- The consolidated cash flows provide a good insight into the economics of leasing. If the Group leases the computer, it avoids the Year 0 cash outlay required to buy the equipment, but it is then obligated to a series of cash outflows for four years. In marketing materials, leasing companies are quick to point out the fact that leasing avoids a large, up-front cash outlay (\$167,300 in this example). However, they are not so quick to mention that the “cost” to save this outlay is an obligation to make payments over the next four years. Leasing only makes sense financially (disregarding other factors) if the savings are worth the cost.
- By inputting the leasing-versus-owning cash flows listed in Table 8.3 into a spreadsheet and using the internal rate of return (IRR) function, we can find the cost rate inherent in the cash flow stream: it is 5.6 percent. This is the equivalent after-tax cost rate implied in the lease contract. Because this cost rate is less than the 6.0 percent after-tax cost of a regular loan, leasing is less expensive than borrowing and buying. Thus, the percentage cost analysis confirms the NAL analysis.

### *Some Additional Points*

So far, we have discussed the main features of a lessee’s analysis. However, before we move on to the lessor, note the following points:

- The dollar cost and percentage cost approaches will always lead to the same decision. Thus, one method is as good as the other from a decision standpoint.
- If the net residual value cash flow (residual value and tax effect) is considered to be riskier than the other cash flows in the analysis, it is possible to account for this differential risk by applying a higher discount rate to this flow, which results in a lower present value. Because the net residual value flow is an inflow in the cost of owning analysis, a lower present value leads to a higher present value cost of owning. Thus, increasing residual value risk decreases the attractiveness of owning an asset. To illustrate the concept, assume that the Group’s managers believe that the computer’s residual value is much riskier than the other flows in Table 8.2. Furthermore, they believe that 10.0 percent, rather than 6.0 percent, is the appropriate discount rate to apply to the residual value flows. When the Table 8.2 analysis is modified to reflect this risk, the present value cost of owning increases to \$129,780, while the NAL increases to \$4,163. The riskier the residual value, **all else the same**, the more favorable leasing becomes, because residual value risk is borne by the lessor.<sup>4</sup>
- As we will discuss in Chapter 11, net present value (NPV) is the dollar value of a project, assuming that it is financed using debt and equity

financing. In lease analysis, the NAL is the additional dollar value of a project attributable to leasing, as opposed to conventional (debt) financing. Thus, as an approximation of the value of a leased asset to the firm, the project's NPV can be increased by the amount of NAL:

$$\text{Adjusted NPV} = \text{NPV} + \text{NAL}.$$

The value added through leasing, in some cases, can turn unprofitable (negative NPV) projects into profitable (positive adjusted NPV) projects. Thus, projects (assets) that are marginally unprofitable when evaluated with conventional financing should be reevaluated using lease financing (if available) to see if alternative financing will make the project financially acceptable.

1. Explain how the cash flows are structured in conducting a dollar-based (NAL) analysis.
2. What discount rate should be used when lessees perform lease analyses?
3. What is the economic interpretation of the net advantage to leasing?
4. What is the economic interpretation of a lease's internal rate of return (IRR)?

## Self-Test Questions

## Evaluation by the Lessor



Thus far, we have considered lease analysis from the lessee's viewpoint. It is also useful to analyze the transaction as the lessor sees it: Is the lease a good investment for the party that *writes* the lease (i.e., the party that must put up the money to buy the asset)? The lessor will generally be a specialized leasing firm; a bank or bank affiliate; or a manufacturer, such as General Electric Medical Systems, that uses leasing as a marketing tool.

Any potential lessor needs to know the rate of return on the capital invested in the lease, and this information is also useful to the prospective lessee because lease terms on large leases are generally negotiated; so, the lessor and the lessee should know one another's position. The lessor's analysis involves (1) determining the net cash outlay, which is usually the invoice price of the leased equipment less any lease payments made in advance; (2) determining the periodic cash inflows, which consist of the lease payments minus both income taxes and any maintenance expenses the lessor must bear; (3) estimating the after-tax residual value of the property when the lease expires; and (4) determining whether the rate of return on the lease is adequate for the riskiness of the investment.

To illustrate the lessor's analysis, we assume the same facts for the Nashville Radiology Group lease as well as this situation. The potential lessor is Medicomp, Inc., a commercial leasing company that specializes in leasing

computers to healthcare providers. Medicomp's marginal federal-plus-state tax rate is 40 percent. To provide maintenance to the Group, Medicomp must contract with the computer manufacturer under the same terms available to the Group—that is, \$2,500 at the beginning of each year. Medicomp views computer lease arrangements as relatively low-risk investments. There is, however, some small chance of default on the lease, so Medicomp typically assumes that a lease investment is about as risky as buying AA-rated corporate bonds. Because four-year, AA-rated bonds are yielding 9 percent, Medicomp can earn an after-tax yield of  $9.0\% \times (1 - T) = 9.0\% \times 0.6 = 5.4\%$  on such investments. This is the after-tax return that Medicomp can obtain on alternative investments of similar risk (the opportunity cost rate).

The lease analysis from the lessor's standpoint is developed in Table 8.4. Here, we see that the cash flows to the lessor are similar to those for the lessee shown in Table 8.2. Line 1 contains the purchase price of the computer—\$200,000. Line 2 contains the maintenance costs, while Line 3 lists the tax savings attributable to these costs. Line 4 contains the depreciation tax savings, or tax shields, that accrue to the owner of the computer. On Line 5, we show the annual lease rental payment as an inflow, while the taxes that must be paid on the rental payments are shown on Line 6. Lines 7 and 8 contain the residual value and resulting taxes (tax savings in this case). Finally, the cash flows are summed on Line 9.

The value (NPV) of the lease to Medicomp is found by discounting the Line 9 cash flows at the firm's after-tax opportunity cost of capital, 5.4 percent, and then summing the resultant present values. (When using a spreadsheet for the analysis, use the NPV function.) For Medicomp, the NPV of the lease investment is \$815, which means that the firm is somewhat better off, on a present value basis, if it writes the lease rather than invests in comparable-risk AA-rated bonds. Conversely, if the NPV of the lease were negative, Medicomp would be better off investing in the bonds. Because we saw earlier that the

**TABLE 8.4**Lessor's  
Analysis

	<i>Year 0</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
1. Net purchase price	(\$200,000)				
2. Maintenance cost	(2,500)	(\$ 2,500)	(\$ 2,500)	(\$ 2,500)	
3. Maintenance tax savings	1,000	1,000	1,000	1,000	
4. Depreciation tax savings		16,000	25,600	15,200	\$ 9,600
5. Lease payment	57,000	57,000	57,000	57,000	
6. Tax on lease payment	(22,800)	(22,800)	(22,800)	(22,800)	
7. Residual value					20,000
8. Tax on residual value					5,600
9. Net cash flow	<u>(\$167,300)</u>	<u>\$48,700</u>	<u>\$58,300</u>	<u>\$47,900</u>	<u>\$35,200</u>
NPV = \$815.					
IRR = 5.6%.					

lease is also advantageous to the Group, the transaction is beneficial to both the lessee and lessor.

We can also calculate Medicomp's expected percentage rate of return on the lease by finding the IRR of the net cash flows shown on Line 9 of Table 8.4. Simply use a spreadsheet's IRR function to find the answer: 5.6 percent. Thus, the lease provides a 5.6 percent after-tax return to Medicomp, which exceeds the 5.4 percent after-tax return available on alternative investments of similar risk, AA-rated, four-year bonds. So, using either the dollar-rate-of-return (NPV) method or the percentage-rate-of-return (IRR) method gives us the same result: The lease appears to be a satisfactory investment for Medicomp.

Note, however, that the lease investment is actually slightly more risky than the alternative bond investment because the residual value cash flow is less certain than a principal repayment. Thus, Medicomp would probably require a rate of return somewhat above the 5.4 percent promised on the bond investment, and the higher the risk of the residual value, the higher the required return. Also, note that the lessor's NPV analysis can be extended by using a higher discount rate on the residual value cash flows than used on the other flows. This would lower the NPV and hence make the lease investment look less attractive vis-à-vis the bond investment.

1. What discount rate is used in a lessor's NPV analysis?
2. What is the economic interpretation of the lessor's NPV? The lessor's IRR?

## Self-Test Questions

### Lease Analysis Symmetry

Stop for a moment and compare the cash flows in Tables 8.3 and 8.4. Upon examination, we find that the cash flows to the lessee and lessor are symmetrical. They differ in sign, but their values are the same. This symmetry occurs because there are only two parties to a lease transaction, and our example assumed that the parties would pay the same amount for the computer, paid taxes at the same rate, forecasted the same residual value, and so on. Thus, a cash inflow to one party becomes a cash outflow to the other. Taken one step further, if the cost of debt to the lessee in our example had equaled the opportunity cost to the lessor, then the NPV to the lessor would be equal, but opposite in sign, to the lessee's NAL. Thus, if all of the input values had been the same to both lessee and lessor, the Medicomp's NPV would have been a **negative** \$1,370.

The conclusion of this simple observation is that when there is symmetry between the lessor and the lessee—same tax rates, costs, and so on—leasing is a *zero-sum game*.<sup>5</sup> If the lease is attractive to the lessee, the lease is unattractive to the lessor, and vice versa. However, conditions often are such that leasing can be of benefit to both parties. This situation arises because of

asymmetries, generally in taxes, estimated residual values, or the ability to bear residual value risk. We will explore this issue in detail in a later section.

### Self-Test Questions

1. What is “lease analysis symmetry”?
2. What impact does this symmetry have on the economic viability of leasing?

## Setting the Lease Payment

In the preceding sections, we evaluated the lease assuming that the lease payments had already been specified. However, as a general rule, especially in large leases, the parties will sit down and work out the terms of the lease, including the size of the lease payments. In situations where the lease terms are not negotiable, which is often the case for small leases, the lessor must still go through the same type of analysis, setting terms that provide a target rate of return, and then offering these terms to the potential lessee on a take-it-or-leave-it basis.

Competition in the leasing industry will force lessors to build market-related returns into their lease payment schedules. To illustrate all this, suppose Medicomp, after examining other alternative investment opportunities, decides that the 5.4 percent return on the Nashville Radiology Group lease is too low and that the lease should provide an after-tax return of 6.0 percent. What lease payment schedule would provide this return?

To answer this question, note again that Table 8.4 contains the lessor’s cash flow analysis. If the basic analysis is done on a spreadsheet, it is very easy to change the lease payment until the lease’s NPV = \$0 at a 6.0 percent discount rate or, equivalently, its IRR = 6.0 percent. We did this with our spreadsheet lease evaluation model, and we found that the lessor must set the lease payment at \$57,622 to obtain an expected after-tax rate of return of 6.0 percent. However, if this lease payment is not consistent with market rates, then the Group may be able to strike a better deal with another lessor.

### Self-Test Question

1. How do lessors set the lease payment amount?

## Leveraged Leases



In the early days of lease transactions, only two parties were involved: (1) the lessor, who put up the front money, and (2) the lessee, who used the asset. In recent years, however, a new type of lease—the *leveraged lease*—has come into widespread use. (In financial parlance, the term “leverage” means the use of debt financing.) Under a leveraged lease, the lessor arranges to borrow part of the required funds, generally giving the lender a lien on the property being leased, or a first mortgage if the lease is for real estate. (To qualify as a

guideline lease by the IRS, the lessor must have a minimum 20 percent equity interest in the lease, so the maximum amount of leverage that can be used is 80 percent of the purchase price.)

In a leveraged lease, the lessor still receives the tax benefits associated with depreciation. However, the lessor now has a riskier position because of its use of debt financing. Incidentally, whether or not a lease is leveraged is not important to the lessee; from the lessee's standpoint, the method of analyzing a proposed lease is unaffected by whether or not the lessor borrows part of the required capital.

The analysis in Table 8.4 can be easily modified if the lessor borrows part of the required \$200,000, making the transaction a leveraged lease. First, we would add a set of lines to Table 8.4 to show the financing cash flows. The interest component would represent another tax deduction, while the loan repayment would constitute an additional cash outlay. The "initial cost" would be reduced by the amount of the loan. With these changes made, a new NPV and IRR can be calculated and used to evaluate whether or not the lease represents a good investment.

To illustrate the concept, assume that Medicomp can borrow \$100,000 of the \$200,000 purchase price at a rate of 9 percent on a four-year, simple interest loan. Table 8.5 contains the lessor's leveraged lease analysis. Line 1 contains the unleveraged lease cash flows from Table 8.4, while the leveraging cash flows are shown on Lines 2 through 5. The net cash flows to Medicomp are shown on Line 6. The NPV of the leveraged lease is \$815, which is the same for the unleveraged lease.<sup>6</sup> Note, though, that the lessor has a net investment of only \$67,300 on the leveraged lease compared to a net investment of \$167,300 on the unleveraged lease. Therefore, the lessor can invest in a total of  $\$167,300 / \$67,300 = 2.5$  identical leveraged leases for the same \$167,300 investment required to finance a single unleveraged lease, producing a total net present value of  $2.5 \times \$815 = \$2,038$ . The effect of leverage on the lessor's return is also reflected in the leveraged lease's IRR. The IRR of the leveraged lease is 9.1 percent, which is substantially higher than the 5.6 percent after-tax return on the unleveraged lease.

**TABLE 8.5**  
Leveraged Lease  
Analysis

	Year 0	Year 1	Year 2	Year 3	Year 4
1. Unleveraged cash flow	(\$167,300)	\$48,700	\$58,300	\$47,900	\$35,200
2. Loan amount	100,000				
3. Interest		(9,000)	(9,000)	(9,000)	(9,000)
4. Interest tax savings		3,600	3,600	3,600	3,600
5. Principal repayment					(100,000)
6. Net cash flow	<u>(\$ 67,300)</u>	<u>\$43,300</u>	<u>\$52,900</u>	<u>\$42,500</u>	<u>(\$70,200)</u>
NPV = \$815.					
IRR = 9.1%.					

Typically, leveraged leases provide lessors with higher expected rates of return (IRRs) and higher NPVs per dollar of invested capital than unleveraged leases. However, such leases are also riskier for the same reason that any leveraged investment is riskier. Sophisticated lessors use simulations similar to those described in Chapter 12 to assess the riskiness associated with leveraged leases. Then, given the apparent riskiness of the lease investment, the lessor can decide whether the returns built into the contract are sufficient to compensate for the risks involved.

### Self-Test Questions

1. What is a leveraged lease?
2. How does leveraging affect the lessee's analysis?
3. What is the usual impact of lease leveraging on the lessor's expected rate of return and risk?

## Motivations for Leasing

We noted earlier that leasing is a zero-sum game unless there are differentials between the lessee and the lessor. In this section, we discuss some of the differentials that motivate lease agreements.

### Tax Differentials

Many leases are driven by tax differentials. Historically, the typical tax asymmetry arose between highly taxed lessors and lessees with very low tax rates. These low tax rates may be the result of low profitability or sufficient tax shields (primarily depreciation) to drive taxable income very low, even to zero. In such situations, the leased asset's depreciation tax benefits can be taken by the lessor, who then can share this value with the lessee. However, many other possible tax motivations exist, including tax differentials between not-for-profit providers and investor-owned lessors as well as the alternative minimum tax, which we discuss next.

Taxable corporations are permitted to use accelerated depreciation and other tax shelters to reduce taxable income, but then to use straight-line depreciation for stockholder reporting and hence to report higher profits to shareholders than to the IRS. Thus, under the normal procedure for determining federal income taxes, many very profitable businesses pay little or no federal income taxes. The *alternative minimum tax (AMT)*, which roughly amounts to 24 percent of profits as **reported to shareholders**, is designed to force profitable firms to pay at least some taxes.

Those firms that are exposed to heavy tax liabilities under the AMT naturally seek ways to reduce reported income. Leasing can be beneficial here—because firms can use a relatively short period for the lease and consequently have a high annual payment, resulting in lower reported profits and a lower AMT liability. Note that the lease payments do not have to qualify as a de-

ductible expense for regular tax purposes; all that is needed is that they reduce reported income shown on a firm's income statement.

Lessors have designed spreadsheet models to deal with AMT considerations, and they are generating a substantial amount of leasing business as a direct result of the AMT. Thus, one of the important motivations for leasing is tax differentials.

### **Ability to Bear Obsolescence (Residual Value) Risk**

Leasing is an attractive financing alternative for many high-tech items that are subject to rapid and unpredictable technological obsolescence. For example, assume that a small, rural hospital wants to acquire an MRI device. If it buys the MRI equipment, it is exposed to the risk of technological obsolescence. In a relatively short time, some new technology might be developed that makes the current system almost worthless, and this large economic depreciation can create a severe financial burden on the hospital. Because it does not use much equipment of this nature, the hospital would bear a great deal of risk if it buys the MRI device.

Conversely, a lessor that specializes in state-of-the-art medical equipment might be exposed to significantly less risk. By purchasing and then leasing many different high-tech items, the lessor benefits from portfolio diversification; over time, some items will lose more value than the lessor expected, but these losses will be offset by other items that retain more value than expected. Also, because lessors are especially familiar with the markets for used medical equipment, they can both estimate residual values better and negotiate better prices when the asset is resold than can a hospital. Because the lessor is better able to bear residual value risk than the hospital, the lessor can charge a premium for bearing this risk that is less than the premium inherent in ownership.

Some lessors also offer programs that guarantee that the leased asset is modified as necessary to keep it abreast of technological advancements. For an increased rental fee, lessors will provide upgrades to keep the leased equipment current regardless of the cost. To the extent that lessors are better able to forecast such upgrades; negotiate better terms from manufacturers; and, by greater diversification, control the risks involved with such upgrades, it may be cheaper for businesses to obtain state-of-the-art equipment by leasing than by buying.

### **Ability to Bear Utilization Risk**

A type of lease that is gaining popularity among healthcare providers is the *per procedure lease*. In this type of lease, instead of a fixed annual or monthly payment, the lessor charges the lessee a fixed amount for each procedure performed. For example, the lessor may charge the hospital \$300 for every scan performed using a leased MRI device. Or it may charge \$400 per scan for the first 50 scans in each month and \$200 for each scan above 50. Because



the hospital's reimbursement for MRI scans typically depends on the amount of utilization, and because the per procedure lease changes the hospital's costs for the MRI from a fixed payment to a variable payment, the hospital's risk is reduced.

However, the conversion of the payment to the lessor from a fixed amount to an uncertain stream increases the lessor's risk. In essence, the lessor is now bearing the utilization (operating) risk of the MRI. Although the passing of risk often produces no net benefit, a per procedure lease can be beneficial to both parties **if the lessor is better able to bear the utilization risk** than is the lessee. As before, if the lessor has written a large number of per procedure leases, then some of the leases will be more profitable than expected and some will be less profitable than expected, but if the lessor's expectations are unbiased, the aggregate return on all the leases will be quite close to that expected.

### ***Ability to Bear Project Life Risk***

Leasing can also be attractive when a business is uncertain about how long an asset will be needed. To illustrate the concept, consider the following example. Hospitals sometimes offer services that are dependent on a single staff member—for example, a physician who does liver transplants. To support the physician's practice, the hospital might have to invest millions of dollars in equipment that can be used only for this particular procedure. The hospital will charge for the use of the equipment, and if things go as expected, the investment will be profitable. However, if the physician dies or leaves the hospital staff, and if no other qualified physician can be recruited to fill the void, then the project must be terminated and the equipment becomes useless to the hospital. A lease with a cancellation clause would permit the hospital to simply return the equipment to the lessor. The lessor would charge a premium for the cancellation clause because such clauses increase the riskiness of the lease to the lessor. The increased lease cost would lower the expected profitability of the project, but it would provide the hospital with an option to abandon the equipment, and such an option can have a value that exceeds the incremental cost of the cancellation clause. The leasing company would be willing to write this option because it is in a better position to remarket the equipment, either by writing another lease or by selling it outright.

### ***Maintenance Services***

Some businesses find leasing attractive because the lessor is able to provide either better or less expensive maintenance services (or both). For example, MEDTRANS, Inc., a for-profit ambulance and medical transfer service that operates in Pennsylvania, recently leased 25 ambulances and transfer vans. The lease agreement, with a lessor that specializes in purchasing, maintaining, and then reselling automobiles and trucks, permitted the replacement of an aging fleet that MEDTRANS had built up over seven years. "We are pretty good

at providing emergency services and moving sick people from one facility to another, but we aren't very good at maintaining an automotive fleet," said MEDTRANS's CEO.

### **Lower Information Costs**

Leasing may be financially attractive for smaller businesses that have limited access to debt markets. For example, a small, recently formed physician group practice may need to finance one or more diagnostic devices such as an electrocardiogram machine. The group has no credit history, so it would be relatively difficult, and hence costly, for a bank to assess the group's credit risk. Some banks might think the loan is not even worth the effort. Others might be willing to make the loan, but only after building the high cost of credit assessment into the cost of the loan. On the other hand, some lessors specialize in leasing to group practices, so their analysts have assessed the financial worthiness of hundreds, or even thousands, of group practices. Thus, it would be relatively easy for them to make the credit judgment, and hence they might be more willing to provide the financing and charge lower rates than conventional lenders.

### **Lower Risk in Bankruptcy**

Finally, leasing may be less expensive than buying to firms that are poor credit risks. As discussed earlier, in the event of financial distress leading to reorganization or liquidation, lessors generally have more secure claims than do lenders. Thus, lessors may be willing to write leases to firms with poor financial characteristics that are less costly than loans offered by lenders, if such loans are even available.

There are other reasons that might motivate firms to lease an asset rather than buy it. Often, these reasons are difficult to quantify, so they cannot be easily incorporated into a numerical analysis. Nevertheless, a sound lease analysis must begin with a quantitative analysis, and then qualitative factors can be considered before making the final lease-or-buy decision.

1. What are some economic factors that motivate leasing; that is, what asymmetries might exist that make leasing beneficial to both lessors and lessees?
2. Would it ever make sense to lease an asset that has a negative NAL when evaluated by a conventional lease analysis? Explain your answer.

### **Self-Test Questions**

### **Additional Issues**

Before we close our discussion of leasing, here are some additional issues associated with leasing that warrant discussion.

### **Residual Value Levels**

It is important to note that the lessor owns the property upon expiration of a lease, so the lessor has claim to the asset's residual value. Superficially, it would appear that if residual values were expected to be large, owning would have an advantage over leasing. However, this apparent advantage is usually eliminated by market forces. If expected residual values are large, as they may be under inflation for certain types of equipment and also if real estate is involved, competition among leasing firms will force lease rental rates down to the point where potential residual values are fully recognized in the lease payment. Thus, the existence of large residual values is not likely to create a bias in favor of owning.

### **Credit Availability**

There are those who argue that leasing has an advantage for businesses that are seeking the maximum degree of financial leverage. First, it is sometimes argued that firms can obtain more money, and for longer periods, under a lease arrangement than under a loan secured by a specific piece of property. Second, because some leases do not appear on the balance sheet, lease financing has been said to give the business a stronger appearance in a *superficial* credit analysis, and thus it permits the firm to use more, or cheaper, debt financing than would otherwise be possible.

As discussed previously, there may be some truth to these claims for smaller businesses or for businesses facing financial distress. However, because businesses are required to capitalize financial leases and to report them on their balance sheets, and to disclose operating leases in the footnotes to the financial statements, this point is of questionable validity for any financially sound business large enough to have audited financial statements.

### **Liquidity Preservation**

Most of the promotional material prepared by lessors states that the biggest advantage of leasing is that it preserves liquidity; that is, by leasing, a business avoids using cash resources to make the initial outlay required to purchase the asset. Although the statement is true, it ignores the fact that the lessee becomes contractually obligated to make a series of payments to the lessor. The alternative to leasing—borrowing and buying—also avoids using current cash to buy the asset because the loan amount is used to make the purchase, and hence it also preserves liquidity. Under the borrow-and-buy scenario, the potential lessee again is obligated to make a series of payments, but this time to the lender. When one carefully considers the situation, it is obvious that leasing is advantageous only when it costs less than borrowing and buying.

### **Computer Models**

Lease analysis is particularly well suited for computer analysis. Both the lessee and lessor can create computer models for their analyses. Setting the analysis

up on a computer is especially useful when negotiations are under way. When investment banking houses, such as Merrill Lynch, are working out a leasing deal between a group of investors and a firm, the analysis is always computerized.

1. Does leasing lead to increased credit availability?
2. Do larger residual values favor owning over leasing? Explain.
3. What is your reaction to this statement: “Leasing is preferable to buying because it preserves the business’s liquidity”?

## Self-Test Questions

### Key Concepts

In this chapter, we discussed leasing decisions from the standpoints of both the lessee and lessor. Here are its key concepts:

- Lease agreements often are categorized as (1) *operating leases*; (2) *financial*, or *capital*, *leases*; and (3) *combination leases*.
- The IRS has specific guidelines that apply to lease arrangements. A lease that meets these guidelines is called a *guideline*, or *tax-oriented*, *lease* because the IRS permits the lessee to deduct the lease payments. A lease that does not meet IRS guidelines is called a *non-tax-oriented lease*. In such leases, ownership effectively resides with the lessee rather than the lessor.
- *FASB Statement 13* spells out the conditions under which a lease must be *capitalized* (shown directly on the balance sheet), as opposed to being shown only in the notes to the financial statements. Generally, leases that run for a period equal to or greater than 75 percent of the asset’s life must be capitalized.
- The lessee’s analysis consists of a comparison of the costs and benefits associated with leasing the asset and the costs and benefits associated with owning the asset. There are two analytical techniques that can be used: (1) the *dollar-cost (NAL) method* and (2) the *percentage-cost (IRR) method*.
- One of the key issues in the lessee’s analysis is the appropriate discount rate. Because the cash flows in a lease analysis are known with relative certainty, the appropriate discount rate is the *lessee’s after-tax cost of debt*. A higher discount rate may be used on the *residual value* if it is substantially riskier than the other flows.
- In a *lessor’s analysis*, the return on a lease investment is compared with the return available on alternative investments of similar risk.
- In a *leveraged lease*, the lessor borrows part of the funds required to buy the asset. Generally, the asset is pledged as collateral for the loan.

- Leasing is motivated by differentials between lessees and lessors. Some of the more common reasons for leasing are (1) *tax rate differentials*, (2) *alternative minimum taxes*, (3) *residual risk bearing*, and (4) *lack of access* to conventional debt markets.

This chapter concludes our discussion of capital acquisition. In the next chapter, we begin our coverage of cost of capital and capital structure decisions.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used to perform lease analyses.

In addition, the chapter has three problems in spreadsheet format that focus on lease analysis.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

- To obtain information about leasing from the Equipment Leasing Association (an association of equipment lessors), see [www.chooseleasing.org](http://www.chooseleasing.org).

- For one example of the website of a leasing company that specializes in physician practices, see [www.medicalpracticefinancing.com](http://www.medicalpracticefinancing.com).
- The following website contains a glossary of leasing terminology: [www.fcleasing.com](http://www.fcleasing.com). To get to the glossary, click first on Leasing 101 and then on Language of Leasing.
- Although not directly related to healthcare equipment leasing, the following website has a wealth of information on automobile leases: [www.leasesource.com](http://www.leasesource.com).

## Selected Case

There is one case in *Cases in Healthcare Finance* that is applicable to this chapter:

- Case 18: Seattle Cancer Center, which focuses on leasing decisions from the perspectives of both the lessee and lessor.

## Notes

1. For more information about the motivating forces and extent of leasing in the hospital industry, see Louis C. Gapenski and Barbara Langland-Orban, “Leasing Capital Assets and Durable Goods: Opinions and Practices in Florida Hospitals,” *Health Care Management Review*, Summer 1991, 73–81.
2. In fact, General Electric has a subsidiary, GE Capital Corporation, which is one of the largest lessors in the world. The subsidiary was originally set up to finance consumers’ purchases of GE’s durable goods, such as refrigerators and washing machines, but it has become a major player in the commercial loan and leasing markets.
3. Financial Accounting Standards Board (FASB) Statement 13, “Accounting for Leases,” spells out in detail both the conditions under which a lease must be capitalized and the procedures for capitalizing it. FASB is the primary organization that promulgates the rules that form the basis of generally accepted accounting principles (GAAP), which in turn guide the preparation of financial statements. Note that the FASB is currently reexamining its guidelines for lease accounting. The expectation is that the new rules, which will take several years to develop and implement, would require businesses to place a greater number of leases directly on the balance sheet, as opposed to in the footnotes.
4. However, all else will generally not be the same. Increasing residual value risk would cause the lessor to increase the lease payment, thereby making the lease less attractive to the lessee.
5. The zero-sum game feature of leasing can be useful in debugging lease analysis models. Whenever we build a new spreadsheet model that contains both lessee’s and lessor’s analyses, we test it by trying symmetrical input values for the lessee and lessor. If the lessee’s NAL and lessor’s NPV are not equal, but opposite in sign, there is something wrong with the model!
6. In this situation, leveraging had no impact on the lessor’s per lease NPV. This result occurred because the cost of the loan to the lessor—5.4 percent after taxes—equals the discount rate, and thus the leveraging cash flows are netted out on a present value basis.



## Cost of Capital and Capital Structure

In Part III, where capital acquisition is discussed, we note that there are two primary forms of capital (financing) used by businesses: debt and equity. We also note that the two types of capital have quite different characteristics—that is, they present businesses with financing choices that bring different risks and potential rewards.

In Part IV, we discuss two important topics related to the financing choices made by businesses. *Cost of capital*, which is covered in Chapter 9, involves measuring the costs associated with a business's financing. Providers of business capital do so with an expectation of earning a return on the funds provided; this expectation means that capital has a cost to businesses. With an estimate of this cost, managers can make better decisions regarding capital allocation (i.e., which assets should be acquired).

The second topic, *capital structure decisions*, is covered in Chapter 10. Businesses have a choice regarding how much debt versus equity capital should be used to finance the business's assets. This choice affects both the riskiness of the business and the cost of its financing, and hence its potential profitability. Chapter 10 discusses the factors that affect this decision.





## COST OF CAPITAL

### Learning Objectives

After studying this chapter, readers should be able to:

- Describe the general process for estimating a business's corporate (overall) cost of capital.
- Estimate the component costs of debt and equity as well as the corporate cost of capital for any healthcare business, including not-for-profit and small businesses.
- Describe the uncertainties inherent in the cost of capital estimation process.
- Explain the economic meaning of the corporate cost of capital and how it is used in capital investment decisions.

### Introduction

The cost of capital is an extremely important concept in healthcare financial management. All businesses, whether large or small or investor owned or not for profit, have to raise funds to buy the assets required to meet their strategic objectives. Hospitals, nursing homes, clinics, group practices, and so on all need buildings, equipment, and inventories to provide services. The funds to acquire these assets come in many shapes and forms, including contributions, profit retention, equity sales to stockholders, and debt capital supplied by creditors such as banks, bondholders, lessors, and suppliers. Most of the capital raised by organizations has a cost that is either explicit, such as the interest payments on debt, or implicit, such as the opportunity cost associated with equity capital. Because many business decisions require the cost of capital as an input, it is necessary for managers to both understand the cost of capital concept and know how to estimate the costs of capital for their own firms.

### Overview of the Cost of Capital Estimation Process

The ultimate goal of the cost of capital estimation process is to estimate the business's *corporate cost of capital*, which represents the blended, or average, cost of a business's financing mix. This cost, in turn, is used as the required rate of return on the business's capital investment opportunities. For example,

assume Bayside Healthcare has a corporate cost of capital estimate of 10.2 percent. If a new MRI investment is expected to return at least 10.2 percent, then it is financially attractive to the business. If the MRI is expected to return less than 10.2 percent, accepting it will have an adverse effect on the business's financial soundness. Here, we assume that the project under consideration has average risk—that is, the same risk as the overall business. As we discuss later in this chapter and in Chapter 12, the corporate cost of capital must be adjusted to reflect project risk when it differs from the overall risk of the business.

The corporate cost of capital is a weighted average of the *component* (i.e., debt and equity) *costs*, adjusted for tax effects. After the component costs have been estimated, they are combined to form the corporate cost of capital. Thus, the first step in the cost of capital estimation process is to estimate both the cost of debt and the cost of equity. However, before the mechanics of cost estimation are discussed, some other issues regarding the estimation process must be addressed.

### **What Capital Components Should Be Included?**

The first task in estimating a business's corporate cost of capital is to determine which sources of capital, shown on the right side of the business's balance sheet, should be included in the estimate. In general, the corporate cost of capital focuses on the cost of *permanent capital* (long-term capital) because these are the sources used to finance capital asset acquisitions. Thus, for most firms, the capital components included in the corporate cost of capital estimate are equity and long-term debt. Typically, short-term debt is used only as temporary financing to support seasonal or cyclical fluctuations in volume, and hence assets, so it is not included in the cost of capital estimate. However, if a firm does use short-term debt as part of its permanent financing mix, then such debt should be included in the cost of capital estimate. (We will discuss why short-term debt is not well suited for financing permanent assets in Chapter 10.)

### **Do Taxes Need to Be Considered?**

In developing component costs, the issue of tax effects arises for investor-owned businesses. Should the component costs be estimated on a before- or after-tax basis? As we will discuss in the next chapter, the use of debt financing creates a tax benefit because interest expense is tax deductible, while the use of equity financing has no impact on taxes. This tax benefit can be handled in several ways when working with capital costs, but the most common way is to include it in the cost of capital estimate. Thus, the tax benefit associated with debt financing will be recognized in the component cost of debt estimate, resulting in an after-tax cost of debt. For not-for-profit businesses, the benefit that arises from the issuance of tax-exempt debt will be incorporated directly in the cost estimate because investors require a lower interest rate on tax-exempt (i.e., municipal) debt.

### Should the Focus Be on Historical or Marginal Costs?

Two very different sets of capital costs can be measured: (1) *historical*, or *embedded*, costs, which reflect the cost of funds raised in the past, and (2) *new*, or *marginal*, costs, which measure the cost of funds to be raised in the future. Historical costs are important for many purposes. For example, payers that reimburse on a cost basis are concerned with embedded costs, as are taxing authorities. However, the primary purpose in developing a business's corporate cost of capital is to use it in making capital investment decisions, which involve future asset acquisitions and future financing. For these purposes, the relevant costs are the marginal costs of new funds to be raised during some future planning period—say, a year—and not the cost of funds raised in the past.

1. What is the basic concept of the corporate cost of capital?
2. What financing sources are typically included in a firm's cost of capital estimate?
3. Should the component costs be estimated on a before-tax or an after-tax basis?
4. Should the component cost estimates reflect historical or marginal costs?

### Self-Test Questions

### Estimating the Cost of Debt



Although the cost of capital estimation process is the same, some of the details of component cost estimation differ depending on the type of business. We will begin our discussion by focusing on large businesses, primarily publicly traded for-profit businesses. Along the way, we will point out some of the differences in cost estimation between investor-owned and not-for-profit businesses. Then, later in the chapter, we will discuss some unique features of cost of capital estimation in small businesses.

It is unlikely that a business's managers will know at the start of a planning period the exact types and amounts of debt that will be issued in the future; the type of debt actually used will depend on the specific assets to be financed and on market conditions as they develop over time. However, a business's managers do know what types of debt the firm usually issues. For example, Bayside Healthcare, a not-for-profit integrated delivery system, typically uses bank debt to raise short-term funds to finance seasonal or cyclical working capital needs, and it uses 30-year tax-exempt bonds to raise long-term debt capital. Because Bayside does not use short-term debt to finance permanent assets, its managers include only long-term debt in their corporate cost of capital estimate, and they assume that this debt will consist solely of 30-year tax-exempt bonds.

Suppose that Bayside's managers are developing the system's corporate cost of capital estimate for the coming year. How should they estimate the *cost of debt*? Most managers would begin by discussing current and prospective interest rates with their firms' investment bankers, which are the institutions that help businesses obtain financing. Assume that the municipal bond underwriter at Suncoast Securities, Inc., Bayside's investment banker, stated that a new 30-year tax-exempt healthcare issue would require semiannual interest payments of \$30.50 (\$61 annually) for each \$1,000 par value bond issued. Thus, municipal bond investors currently require a  $\$61 / \$1,000 = 0.061 = 6.1\%$  return on Bayside's 30-year bonds. This required rate of return by investors (the interest rate) establishes the cost of debt to Bayside.

The true cost of debt to Bayside would be somewhat higher than 6.1 percent because the system must incur *issuance, or flotation, costs* (such as legal, accounting, and marketing expenses) to sell the bonds. However, flotation costs are often small, especially on debt financing, so their impact on the cost of debt estimate is inconsequential, especially when the uncertainty inherent in the entire cost of capital estimation process is considered. Therefore, as we will discuss later in the chapter, it is common practice to ignore flotation costs when estimating a business's cost of capital. Bayside follows this practice, so its managers would estimate the component cost of debt as 6.1 percent:

$$\text{Tax-exempt component cost of debt} = R(R_d) = 6.1\%$$

If Bayside's currently outstanding debt was actively traded, then the current **yield to maturity (YTM)** on this debt can be used to estimate the cost of new debt. For example, assume that Bayside has an actively traded issue outstanding that has a 7 percent coupon rate with semiannual payments, currently sells for \$1,114.69, and has 25 years remaining to maturity. Using a spreadsheet, the semiannual yield to maturity on this bond is found to be 3.05 percent:

	A	B	C	D
1				
2	50	Nper	Number of periods	
3	\$ (1,114.69)	Pv	Present value (bond price)	
4	\$ 35.00	Pmt	Payment (coupon amount)	
5	\$ 1,000.00	Fv	Future value (principal)	
6				
7				
8	3.05%	=RATE(A2,A4,A3,A5) (entered into Cell A8)		
9				
10				

Because this is a semiannual rate, the resulting solution, 3.05 percent, must be multiplied by two to get the annual yield to maturity, resulting in a cost of debt estimate of 6.1 percent.<sup>1</sup>

Using the yield to maturity on an outstanding issue to estimate the cost of new debt works reasonably well when the remaining life of the old issue approximates the anticipated maturity of the new issue. If this is not the case, then yield curve differentials may cause the estimate to be biased. For example, if the yield curve were upward sloping in the 25- to 30-year range, the yield to maturity on a 25-year outstanding issue would understate the actual cost of a new 30-year issue. If material, an adjustment can be made on the basis of the current yield curve on Treasury securities. To illustrate, suppose the yield on 25-year T-bonds was 5.5 percent and the yield on 30-year T-bonds was 5.7 percent, a difference of 0.2 percentage points. The 6.1 percent estimate for Bayside's cost of debt based on outstanding 25-year bonds could be increased to 6.3 percent to account for yield curve differentials.

A taxable healthcare provider would use one or more of the techniques described here to estimate its before-tax cost of debt. However, the tax benefits of interest payments must then be incorporated into the estimate. To illustrate, consider Ann Arbor Health Systems, Inc., a publicly traded for-profit business that operates 16 acute care hospitals in Michigan, Indiana, and Ohio. The firm's investment bankers indicate that a new 30-year corporate bond issue that has Ann Arbor's BBB rating would require an interest rate of 10.0 percent. Because the firm's federal-plus-state tax rate is 40 percent, its after-tax cost of debt estimate is lowered to 6.0 percent:

$$\begin{aligned}\text{After-tax cost of debt} &= R(R_d) \times (1 - T) \\ &= 10.0\% \times (1 - 0.40) = 10.0\% \times 0.60 = 6.0\%.\end{aligned}$$

By reducing Ann Arbor's component cost of debt from 10.0 percent to 6.0 percent, the cost of debt estimate has incorporated the benefit associated with interest payment tax deductibility.

In general, the **effective** cost of debt is roughly comparable between investor-owned and not-for-profit firms of similar risk. Investor-owned firms have the benefit of tax deductibility of interest payments, while not-for-profit firms have the benefit of being able to issue lower-cost tax-exempt debt. Under normal economic conditions, these two benefits are roughly the same, resulting in a similar cost of debt. In our illustrations, the effective cost of debt is 6.0 percent for Ann Arbor Health Systems, an investor-owned firm, and 6.1 percent for Bayside Healthcare, a similar not-for-profit business.

1. What are some methods used to estimate a business's cost of debt?
2. For investor-owned firms, how is the before-tax cost of debt converted to an after-tax cost?
3. Does the effective cost of debt differ materially between businesses that are similar in all respects except ownership?

## Self-Test Questions

## Estimating the Cost of Equity to Large Investor-Owned Businesses<sup>2</sup>

Large investor-owned businesses (corporations) raise equity capital by selling new common stock and by retaining earnings for use by the firm rather than paying them out as dividends to shareholders. Not-for-profit businesses raise equity capital through contributions and grants and by generating an excess of revenues over expenses, none of which can be paid out as dividends. This section describes how to estimate the cost of equity capital within large investor-owned businesses. The next major section focuses on large not-for-profit businesses, while small business cost of equity estimation is discussed later in the chapter.

The cost of debt is based on the return (interest rate) that investors require on debt securities, and the *cost of equity* to investor-owned businesses can be defined similarly: it is the rate of return that investors require on the firm's common stock. At first glance, it may appear that equity raised through **retained earnings** is a costless source of capital to investor-owned businesses. After all, dividend payments must be paid at some point in time on any new shares of stock that are issued, but no such payments are required on funds that are obtained by retaining earnings. The reason why a cost of capital must be assigned to all forms of equity financing involves the *opportunity cost principle*. An investor-owned firm's net income literally belongs to its common stockholders. Employees are compensated by wages, suppliers are compensated by cash payments for supplies, bondholders are compensated by interest payments, governments are compensated by tax payments, and so on. The residual earnings of a firm, its net income, belongs to the stockholders and serves to "pay the rent" on stockholder-supplied capital.

Management can either pay out earnings in the form of dividends or retain earnings for reinvestment in the business. If part of the earnings is retained, an opportunity cost is incurred: stockholders could have received these earnings as dividends and then invested this money in stocks, bonds, real estate, commodity futures, or any other investment. Thus, the firm should earn on its retained earnings at least as much as its stockholders themselves can earn on alternative investments of similar risk. If the firm cannot earn as much as stockholders can in similar risk investments, then the firm's net income should be paid out as dividends rather than retained for reinvestment within the firm. What rate of return can stockholders expect to earn on other investments of equivalent risk? The answer is  $R(R_e)$ , the required rate of return on equity. Investors can earn this return either by buying more shares of the firm in question or by buying the stock of similar businesses.

Whereas debt is a contractual obligation with an easily estimated cost, it is not nearly as easy to estimate the cost of equity. Three primary methods are used in the estimation process for large investor-owned businesses: (1) the Capital Asset Pricing Model (CAPM), (2) the discounted cash flow (DCF)

model, and (3) the debt cost plus risk premium method. These methods should not be regarded as mutually exclusive, for no single approach dominates the estimation process. In practice, all approaches should be used to estimate the cost of equity, and then the final value should be chosen on the basis of the managers' confidence in the data at hand.

### Capital Asset Pricing Model Approach

The CAPM, which was first discussed in Chapter 4, is a widely accepted finance model that specifies the equilibrium risk/return relationship on common stocks. Basically, the model assumes that investors consider only one risk factor when setting required rates of returns: the volatility of returns on the stock relative to the volatility of returns on a well-diversified portfolio called the *market portfolio*, or just the *market*. The measure of risk in the CAPM is the stock's *market beta*. The market, which is a large collection of stocks such as the S&P 500 Index, has a beta of 1.0. A stock with a beta of 2.0 has twice the volatility of returns as the market, while a stock with a beta of 0.5 has only half the volatility of returns as the market. Because relative volatility measures market risk, a low beta stock (which has a beta less than 1.0) is less risky than the market, while a high beta stock (which has a beta greater than 1.0) is more risky than the market.

Within the CAPM, the actual equation that relates risk to return is called the *Security Market Line (SML)*:

$$\begin{aligned} R(R_c) &= RF + [R(R_M) - RF] \times b_i \\ &= RF + (RP_M \times b_i). \end{aligned}$$

Here,

RF = risk-free rate.

$R(R_M)$  = required rate of return on the market.

$b_i$  = beta coefficient of the stock in question.

$[R(R_M) - RF]$  =  $RP_M$  = market risk premium, the premium above the risk-free rate that investors require to buy a stock with average risk.

$(RP_M) \times b_i$  = stock risk premium, the premium above the risk-free rate that investors require to buy the stock in question.

Managers can calculate the required rate of return on a firm's stock given estimates of the risk-free rate, RF; the beta of the firm's stock,  $b_i$ ; and the required rate of return on the market,  $R(R_M)$ . This result, in turn, can be used as one estimate for the firm's cost of equity.

The starting point for the CAPM cost of equity estimate is RF, the risk-free rate. Unfortunately, there is no unambiguous proxy for this rate. Treasury

**Estimating the Risk-Free Rate**



securities are essentially free of default risk, but long-term T-bonds will suffer capital losses if interest rates rise, and a portfolio invested in short-term T-bills will provide a volatile earnings stream because the rate paid on T-bills varies over time.

Because we cannot, in practice, find a truly riskless rate on which to base the CAPM, what rate should we use? In recent years, most analysts have used the rate on long-term Treasury bonds, traditionally defined as 30-year bonds. There are many reasons for favoring the T-bond rate, including the fact that T-bill rates are very volatile because they are directly affected by actions taken by the Federal Reserve Board. Perhaps the most persuasive argument is that common stocks have traditionally been viewed as long-term investments, so stock returns should embody the long-term inflation expectations embodied in bonds, rather than the short-term inflation expectations embodied in bills. On this account, the cost of equity should be more highly correlated with T-bond rates than with T-bill rates.

However, some recent events have shaken the position that the CAPM risk-free rate should be based on 30-year T-bonds. First, there is no doubt that some investors view common stocks not as long-term investments but rather as short-term trading vehicles. Until the mid-1960s, stock-fund managers bought and sold about 15 percent of their portfolios each year, which implies a holding period of about seven years. Since then, however, managers have been trading with ever increasing frequency, with turnover rates today at about 90 percent, which translates into a holding period of just over a year.

Second, in recent years the U.S. Treasury has emphasized the use of shorter maturity debt. In fact, the Treasury even suspended the issue of 30-year bonds from 2001 to 2006. This action caused the *Wall Street Journal* to change its “benchmark” long-term interest rate from 30-year Treasuries to 10-year Treasuries, and hence many analysts are now using the 10-year note as the basis for the CAPM risk-free rate. We are not going to agonize over the issue because typically there is little difference in the yields on the two securities. In fact, we will often “hedge our bet” by using the 20-year T-bond rate as the proxy for the CAPM risk-free rate. Still, we feel strongly that the risk-free rate should **not** be based on the T-bill rate, which is subject to many influences that are not related to stock returns.

### Estimating the Market Risk Premium

The market risk premium,  $RP_M = [R(R_M) - RF]$ , can be estimated on the basis of historical returns or expected returns.

The most complete, accurate, and up-to-date historical returns study is published annually by Ibbotson Associates. It examines market data over long periods of time (from 1926 to the present) to determine the average annual rates of return and standard deviations of various classes of securities.<sup>3</sup> By examining the spread between the historical rates of return on stocks and Treasury bonds, it is possible to obtain the historical average risk premium of stocks over T-bonds. The data suggest that this risk premium is about 6 to 7

percentage points when arithmetic average returns are used and about 4 to 5 percentage points when geometric average returns are used.

However, the basic returns data have large standard deviations, so one must use historical averages with caution. Also, in years such as 2000–2002, bonds had higher returns than stocks, which would indicate a negative risk premium. In addition, when stock returns are abnormally high, the average risk premium is pushed up, while the opposite occurs when stock returns are abnormally low. This impact on the historical average is just the opposite of what it should be, as low stock returns indicate an increasing risk premium, and vice versa.

Finally, it should be noted that the choice of the beginning and ending periods can have a major impact on the calculated risk premiums. All of this suggests that the historical average risk premium should be used with caution, although in some situations it may be the only measure available. As one businessman muttered after listening to a professor give a lecture on the CAPM: “Beware of academics bearing gifts!”

The historical approach to risk premiums assumes that investors expect future results, on average, to equal past results. However, as we noted, the historical risk premium varies greatly depending on the period selected; and, in any event, investors today probably expect results in the future to be different from those achieved many years ago, all of which are included and given equal weight in the historical returns data. The questionable assumption that future expectations are equal to past realizations, together with the sometimes nonsensical results obtained when calculating historical risk premiums, has led to the search for expected (forward looking) risk premiums.

The most common approach used to estimate expected market risk premiums uses the discounted cash flow (DCF) model to estimate the expected market rate of return,  $E(R_M)$ . Then, assuming market equilibrium, the expected rate of return is used as proxy for the required rate of return,  $R(R_M)$ . Finally,  $R_F$  is subtracted to obtain the estimate for the expected market risk premium. Many financial services firms publish forecasts for the expected rate of return on the market, and these values can be used as inputs into the CAPM.

It is clear that there is no good answer to the question of how to estimate the CAPM market risk premium. Still, it has to be done to use the CAPM method to estimate a firm's cost of equity. It is our view that the risk premium is driven primarily by equity investors' attitudes toward risk, and there are good reasons to believe that investors are less risk averse today than they were many years ago. The advent of pension plans, Social Security, health and disability insurance, and dual-earner families means that investors can take on more risk with their stock investments, which lowers the market risk premium.

The bottom line is that we favor a market risk premium of about 5 percentage points, but we would have a hard time arguing against someone using a premium anywhere in the range of 4 to 6 percentage points. We believe

that investor risk aversion is relatively stable, but not absolutely constant from year to year. When stock prices are relatively high, then investors are acting less risk averse, so we use a smaller risk premium. Conversely, we use a larger premium (but still in the range) when stock prices are relatively low. There is really no way to prove that a particular risk premium value is right or wrong, although we would be suspicious of an estimated premium that is much less than 4 percentage points or much greater than 6 percentage points.

### Estimating Beta

The last parameter needed for a CAPM cost of equity estimate is the beta coefficient. Recall from Chapter 5 that a stock's beta is a measure of its volatility relative to that of an average stock, and that betas are generally estimated from the stock's characteristic line, which is estimated by running a linear regression between past returns on the stock in question and past returns on some market index. We will define betas developed in this manner as *historical betas*.

Unfortunately, historical betas show how risky a stock was *in the past*, whereas investors are interested in *future* risk. It may be that a given firm appeared to be quite safe in the past, but that things have changed and its future risk is judged to be higher than its past risk, or vice versa. The hospital industry presents a good example. Prior to 1983, when the industry operated on a cost-plus basis, investor-owned hospitals were among the bluest of the blue chips. However, when prospective payment began, the industry became riskier. The increasing market power of managed care plans has further added to hospitals' risk.

When we use a historical beta in a CAPM framework to measure the firm's cost of equity, we are implicitly assuming that future risk is the same as past risk. This would be a troublesome assumption for a hospital in 1983, but what about most firms in most years? As a general rule, is future risk sufficiently similar to past risk to warrant the use of historical betas in a CAPM framework? For individual firms, historical betas are often not very stable, so past risk is often *not* a good predictor of future risk.

Because historical betas may not be good predictors of future risk, researchers have sought ways to improve them. This has led to the development of two other types of betas: (1) adjusted betas and (2) fundamental betas. *Adjusted betas* recognize the fact that true betas tend to move toward 1.0 over time. Therefore, one can begin with a firm's pure historical statistical beta; make an adjustment for the expected future movement toward 1.0; and produce an adjusted beta that, on average, will be a better predictor of the future beta than would the unadjusted historical beta.<sup>4</sup>

Finally, *fundamental betas* extend the adjustment process to include such fundamental risk variables as the use of debt financing, sales volatility, and the like. These betas are constantly adjusted to reflect changes in a firm's operations and capital structure, whereas with historical betas, including ad-

justed ones, such changes might not be fully reflected until several years after the firm's "true" beta has changed.

Adjusted betas are obviously heavily dependent on unadjusted historical betas, and so are fundamental betas as they are actually calculated. Therefore, the "regular" historical beta, calculated as the slope of the characteristic line, is important even if one goes on to develop a more exotic version. With this in mind, it should be noted that several different sets of data can be used to calculate historical betas and the different data sets produce different results.

Here are some points to note:

- Betas can be based on historical periods of different lengths. For example, data for the past one, two, three, and so on, years may be used. Most analysts who calculate betas today use five years of data, but this choice is arbitrary, and different lengths of time usually significantly alter the calculated beta for a given firm.<sup>5</sup>
- Returns may be calculated on holding periods of different lengths—a day, a week, a month, a quarter, a year, and so on. For example, if it has been decided to analyze data on NYSE stocks over a five-year period, then we might obtain  $52 \times 5 = 260$  weekly returns, or  $1 \times 5 = 5$  annual returns. The set of returns on each stock, however large it turns out to be, would then be regressed on the corresponding market returns to obtain the stock's beta. In statistical analysis, it is generally better to have more, rather than fewer, observations because using more observations generally leads to greater statistical confidence. This suggests the use of weekly returns and, say, five years of data, for a sample size of 260, or even daily returns for an even larger sample size. However, the shorter the holding period, the more likely the data are to exhibit random "noise," and the greater the number of years of data, the more likely it is that the firm's market risk will have changed. Thus, the choice of both the number of years of data and the length of the holding period involves a trade-off between a desire to have many observations versus a desire to have recent and consequently more relevant data.
- The value used to represent "the market" is also an important consideration and one that can have a significant effect on the calculated beta. Most beta calculators today use the NYSE Composite Index, which is based on over 2,000 stocks, weighted by the value of each firm, but others use the S&P 500 Index or some other group, including one—the Dow Jones Wilshire 5000 Index (also called the Total Stock Market Index)—with about 6,300 stocks. In theory, the broader the index, the better the beta; indeed, the index should really include returns on all risky assets, including stocks, bonds, leases, private businesses, real estate, and even "human capital." As a practical matter, however, we cannot get

accurate returns data on most types of assets, so measurement problems dictate the use of stock indexes to measure market returns.

The bottom line of all of this is that one can calculate betas in many different ways, and, depending on the methods used, different betas and hence different cost of equity estimates will result. Where does this leave managers regarding the proper beta? The choice is a matter of judgment and data availability because there is no “right” beta. With luck, the betas derived from different sources will, for a given firm, be close together. If they are not, then the confidence in the CAPM cost of equity estimate will be diminished.

Table 9.1 contains the betas of some representative investor-owned healthcare businesses as provided by *Reuters*, an online information service. On the basis of this very limited selection, it appears that, on average, health-care business lines, except for managed care, carry below-average market risk for stockholders.

### Illustration of the CAPM Approach



To illustrate the CAPM approach, consider Ann Arbor Health Systems, which has a beta coefficient,  $b$ , of 1.50. Furthermore, assume that the current yield on T-bonds,  $R_F$ , is 6.0 percent, and that the best estimate for the current market risk premium,  $RP_M$ , is 5 percentage points. In other words, the current required rate of return on the market,  $R(R_M)$ , is 11.0 percent. All the required input parameters have been estimated, and the SML equation can be completed as follows:

$$\begin{aligned} R(R_e) &= R_F + [R(R_M) - R_F] \times b_{AAHS} \\ &= 6.0\% + (11.0\% - 6.0\%) \times 1.50 \\ &= 6.0\% + (5.0\% \times 1.50) \\ &= 6.0\% + 7.5\% = 13.5\% \end{aligned}$$

Thus, according to the CAPM, Ann Arbor’s required rate of return on equity is 13.5 percent.

What does the 13.5 percent estimate for  $R(R_e)$  imply? In essence, equity investors believe that Ann Arbor’s stock, with a beta of 1.50, is more risky than the average stock with a beta of 1.00. With a risk-free rate of 6.0 percent, and a market risk premium of 5 percentage points, an average firm, with  $b = 1.0$ , has a required rate of return on equity of  $6.0\% + (5.0\% \times 1.00) = 6.0\% + 5.0\% = 11.0\%$ . Thus, according to the CAPM, equity investors require 250 basis points (2.50 percentage points) more return for investing in Ann Arbor Health Systems, with  $b = 1.50$ , rather than an average stock, with  $b = 1.00$ .

There is a great deal of uncertainty in the CAPM estimate of the cost of equity. Some of this uncertainty stems from the fact that there is no assurance that the CAPM is correct (i.e., the CAPM accurately describes the risk/return preference of stock investors). Additionally, there is a great deal

Company	Symbol	Primary Line of Business	Beta
Aetna	AET	Managed care	1.17
HCA	HCA	Acute care hospitals	0.64
HEALTHSOUTH	HRC	Outpatient/rehabilitative care	0.57
Humana	HUM	Managed care	1.41
Medtronic	MDT	Medical devices	0.54
Manor Care	HCR	Long-term care	0.72
Merck	MRK	Major pharmaceutical	0.64
US Oncology	USON	Practice management	0.88

**TABLE 9.1**

Beta Coefficients  
for Selected  
Healthcare  
Businesses

*Note:* Historically, finding the market betas of firms meant obtaining hardcopy reports from investment bankers or investment advisory firms. Now, there are numerous websites that supply such information in a matter of seconds.  
*Source:* [www.investor.reuters.com](http://www.investor.reuters.com), February, 2006.

of uncertainty in the input parameter estimates, especially the beta coefficient. Because of these uncertainties, it is highly unlikely that Ann Arbor's true, but unobservable, cost of equity is 13.5 percent. Thus, instead of picking single values for each parameter, it may be better to develop high and low estimates and then to combine all of the high estimates and all of the low estimates to develop a range, rather than a point estimate, for the CAPM cost of equity.

### Discounted Cash Flow Approach

The second procedure for estimating the cost of equity is the *DCF method*. As we discussed in Chapter 7, the value of a stock with a predictable dividend stream can be found as the present value of that expected dividend stream. Furthermore, if the dividend is expected to grow each year at a constant rate,  $E(g)$ , then the *constant growth model* can be used to estimate the expected rate of return on equity,  $E(R_e)$ :

$$E(R_e) = \frac{D_0 \times [1 + E(g)]}{P_0} + E(g) = \frac{E(D_1)}{P_0} + E(g) = R(R_e).$$

Because stock prices typically are in equilibrium, the expected rate of return,  $E(R_e)$ , is also the required rate of return,  $R(R_e)$ .

As in the CAPM approach, there are three input parameters in the DCF model. Current stock price is readily available for firms that are actively traded. Ann Arbor Health Systems' stock is traded in the over-the-counter (OTC) market, so its stock price generally can be found in the *Wall Street Journal*. At the time of the analysis, Ann Arbor's stock price was \$40, so  $P_0 = \$40$ .

**Estimating the  
Current Stock  
Price**

Next year's dividend payment is also relatively easy to estimate. If you are one of Ann Arbor's managers, you can look in the firm's five-year financial plan for the dividend estimate. If you are an outsider, dividend data on larger publicly traded firms are available from brokerage houses and investment

**Estimating the  
Next Dividend  
Payment**

advisory firms. Also, current dividend information is published in the *Wall Street Journal*, and it can be used as a basis for estimating next year's dividend. Ann Arbor Health Systems is followed by several analysts at major brokerage houses, and their consensus estimate for next year's dividend payment is \$2.50, so for purposes of this analysis,  $E(D_1) = \$2.50$ .

### Estimating the Expected Growth Rate

The expected growth rate,  $E(g)$ , is the most difficult of the DCF model parameters to estimate. Here, we discuss several methods for estimating  $E(g)$ .

- **Using historical growth rates to forecast future growth.** If growth rates in earnings and dividends have been relatively stable in the past and if investors expect these trends to continue, then the past realized growth rate may be used as an estimate of the expected future growth rate. To illustrate the concept, consider Table 9.2, which gives earnings per share (EPS) and dividends per share (DPS) data from 1997 to 2006 for Ann Arbor Health Systems. Ten years (nine growth periods) of data are shown in the table, but we could have used 15 years or five years, or some other historical time period. There is no rule about the appropriate number of years to analyze when calculating historical growth rates. However, the period chosen should reflect, to the extent possible, the longest period **that replicates conditions expected in the future.**

The easiest historical growth rate to calculate is the compound rate between two dates, called the *point-to-point rate*. For example, EPS grew at an annual rate of 6.8 percent from 1997 to 2006, and DPS grew at a 7.2 percent rate during this same period. Note that the point-to-point growth rate can change radically if we use two other points. For example, if we calculate the five-year EPS growth rate from 2001 to 2006, we would obtain only 2.8 percent. This radical change occurs because the point-to-point rate is extremely sensitive to the beginning and ending years chosen.

**TABLE 9.2**

Ann Arbor Health Systems: Historical EPS and DPS Data

Year	EPS	DPS
1997	\$2.95	\$1.24
1998	3.07	1.32
1999	3.22	1.32
2000	3.40	1.52
2001	4.65	1.72
2002	5.12	1.92
2003	5.25	2.00
2004	5.20	2.20
2005	5.12	2.20
2006	5.35	2.32



To alleviate the problem of beginning and ending year sensitivity, some analysts use the *average-to-average method*, which reduces the sensitivity of the growth rate to beginning and ending year values. The 1997–1999 average EPS is  $(\$2.95 + \$3.07 + \$3.22) / 3 = \$3.08$ , the average 2004–2006 EPS is  $(\$5.20 + \$5.12 + \$5.35) / 3 = \$5.22$ , and the number of years of growth between the two averages is 1998 to 2005 = 7. The average-to-average DPS growth rate is 8.2 percent, and the average-to-average EPS growth rate is 7.8 percent. Note that we are calculating compound annual growth rates, which are much easier to interpret than a single growth rate over the entire period.

A third way, and in our view the best way, to estimate historical growth rates is by *log-linear least squares regression*.<sup>6</sup> The regression method gives consideration to all data points in the series; thus, it is the least likely to be biased by a randomly high or low beginning or ending year. The only practical way to estimate a least squares growth rate is to use a computer or a financial calculator. Using a spreadsheet's data regression capability, we find the growth rate in earnings to be 7.9 percent, while the growth rate in dividends is 7.7 percent.

When earnings and dividends are growing at approximately the same rate, there is more confidence in the resultant growth rate forecast. However, if EPS and DPS historically have grown at different rates, something is going to have to change in the future because these two series cannot grow at different rates indefinitely. There is no rule for handling differences in historical earnings and dividend growth rates, and when they differ, this simply demonstrates in yet another way the problems with using historical growth as a proxy for expected future growth. Like many aspects of healthcare finance, judgment is required when estimating growth rates.

Table 9.3 summarizes the historical growth rates that were just discussed. It is obvious that one can take a given set of historical data and, depending on the years and the calculation method used, obtain a large number of quite different growth rates. If past growth rates have been stable, then investors might base future expectations on past trends. This is a reasonable proposition, but, unfortunately, one rarely finds much historical stability. Therefore, the use of historical growth rates in a DCF analysis must be applied with judgment and also used, if at all, in conjunction with the estimation methods discussed next.

<i>Method</i>	<i>EPS</i>	<i>DPS</i>	<i>Average</i>
Point-to-point	6.8%	7.2%	7.0%
Average-to-average	7.8	8.2	8.0
Log-linear regression	7.9	7.7	7.8

**TABLE 9.3**  
Ann Arbor  
Health Systems:  
Historical  
Growth Rates,  
1997–2006



- **Retention growth model.** The *retention growth method* is another method for estimating the expected growth rate in dividends:

$$E(g) = \text{Retention ratio} \times \text{Expected ROE.}$$

This model produces a constant growth rate, and when we use it we are, by implication, making four important assumptions: (1) we expect the payout ratio, and thus the retention ratio, to remain constant; (2) we expect the return on equity (ROE) on new investment to equal the firm's current ROE, which implies that we expect the ROE to remain constant; (3) the firm is not expected to issue new common stock, or if it does we expect this new stock to be sold at a price equal to its book value; and (4) future projects are expected to have the same degree of risk as the firm's existing assets.

Ann Arbor Health Systems has had an average ROE of about 14 percent over the past ten years. The ROE has been relatively steady, but even so, it has ranged from a low of 8.9 percent to a high of 17.6 percent during this period. In addition, the firm's dividend payout ratio has averaged 0.45 over the past ten years, so its retention ratio has averaged  $1.0 - 0.45 = 0.55$ . Using these data, the retention growth method gives a divided growth estimate of 7.7 percent:

$$E(g_{AAHS}) = 0.55 \times 14\% = 7.7\%.$$

This figure, together with the historical EPS and DPS growth rates summarized in Table 9.3, might lead us to conclude that Ann Arbor Health System's expected dividend growth rate is in the range of 7.0 to 8.0 percent.

- **Analysts' forecasts.** A third growth-rate estimation technique calls for using security analysts' forecasts. Analysts forecast and then publish growth rate estimates for most of the larger publicly owned businesses. For example, *Value Line* provides such forecasts on about 1,700 stocks, and all of the larger brokerage houses provide similar forecasts. Also, many online sites provide dividend forecast data. Finally, several data collection firms compile analysts' forecasts on a regular basis and provide summary information, such as the median and range of forecasts, on widely followed businesses. These growth-rate summaries, such as the one compiled by Lynch, Jones & Ryan in its *Institutional Brokers Estimate System (I/B/E/S)* and by Zacks Investment Research, can be ordered for a fee and obtained either in hard-copy format or as online computer data. In addition, some data are available free on the web.

The problem for our purposes is that most analysts' forecasts correctly assume nonconstant growth. For example, some analysts that follow Ann Arbor Health Systems are forecasting a 12.0 percent annual growth rate in earnings and dividends over the next five years, followed by

a steady-state (constant) growth rate of 6.5 percent. A simple way to handle this situation is to use the nonconstant growth forecast to develop a proxy constant growth rate. Computer simulations indicate that dividends beyond Year 50 contribute very little to the value of any stock—the present value of dividends beyond Year 50 is virtually zero, so for practical purposes, anything beyond that point can be ignored. If we consider only a 50-year horizon, we can develop a weighted-average growth rate and use it as a constant growth rate for cost of capital purposes. For Ann Arbor Health Systems, we assumed a growth rate of 12.0 percent for five years followed by a growth rate of 6.5 percent for 45 years, which produced an arithmetic average annual growth rate of  $(0.10 \times 12.0\%) + (0.90 \times 6.5\%) = 7.0\%$ .<sup>7</sup>

To illustrate the DCF approach, consider the data developed thus far for Ann Arbor Health Systems. The firm's current stock price,  $P_0$ , is \$40, and its next expected annual dividend,  $E(D_1)$ , is \$2.50. Thus, the firm's DCF estimate of  $E(R_e) = R(R_e)$ , according to the DCF model is:

$$\begin{aligned} E(R_e) &= \frac{E(D_1)}{P_0} + E(g) \\ &= \frac{\$2.50}{\$40} + E(g) = 6.25\% + E(g). \end{aligned}$$

With an  $E(g)$  estimate range of 7 to 8 percent, the midpoint—7.5 percent—will be used as the final estimate. Thus, the DCF point estimate for Ann Arbor Health System's cost of equity is  $6.25\% + 7.5\% = 13.75\% \approx 13.8\%$ . Note, however, that it might be best to think of this estimate as a range of values—say, from 13.3 to 14.3 percent—because of the uncertainty in the growth rate estimate.

### Debt Cost Plus Risk Premium Approach

The *debt cost plus risk premium approach* relies on the assumption that stock investments are riskier than debt investments; hence the cost of equity for any business can be thought of as the before-tax cost of debt to **that business** plus a risk premium:

$$R(R_e) = R(R_d) + \text{Risk premium.}$$

The cost of debt is relatively easy to estimate, so the key input to this model is the risk premium.

Note that the risk premium used here is **not** the same as the market risk premium used in the CAPM. The market risk premium is the amount that investors require above the **risk-free rate** to invest in average risk common stocks. Here, we need the risk premium above the **before-tax cost of debt**. How might this new risk premium be estimated? Using the data from above,

*Illustration of  
the DCF  
Approach*



we know that the cost of equity for an average risk ( $b = 1.0$ ) stock is 11.0 percent. Furthermore, the cost of debt for an average firm, which has roughly an A rating, is 7.0 percent. Thus, for an average firm, the risk premium of the cost of equity over the cost of debt is  $11.0\% - 7.0\% = 4.0$  percentage points.

Empirical work suggests that, in recent years, the risk premium for use in the debt cost plus risk premium model has ranged from 3 to 5 percentage points. When interest rates are high in the economy, this risk premium tends to be at the lower end of the range, while lower interest rates often lead to higher-risk premiums. Perhaps the biggest weakness of this approach is that there is no assurance that the risk premium for the average firm is the same as the risk premium for the firm in question, which in this case is Ann Arbor Health Systems. Thus, the risk premium method does not have the theoretical precision that the other models do. On the other hand, the input values required by the debt cost plus risk premium model are fewer and easier to estimate than in the other models.

With a cost of debt estimate of 10.0 percent and a current risk premium estimate of 4.0 percentage points, the debt cost plus risk premium estimate for Ann Arbor's cost of equity is 14.0 percent:

$$\begin{aligned}R(R_e) &= R(R_d) + \text{Risk premium} \\ &= 10.0\% + 4.0\% = 14.0\%.\end{aligned}$$

### ***Comparison of the CAPM, DCF, and Debt Cost Plus Risk Premium Methods***

We have discussed three methods for estimating the cost of equity. The CAPM estimate was 13.5 percent, the DCF estimate was 13.8 percent, and the debt cost plus risk premium estimate was 14.0 percent. At this point, most analysts would conclude that there is sufficient consistency in the results to warrant the use of 13.8 percent, or thereabouts, as the final estimate of the cost of equity for Ann Arbor Health Systems. If the three methods had produced widely different estimates, then Ann Arbor's managers would have to use their judgment regarding the relative merits of each estimate and then choose the estimate, or some average of the estimates, that seemed most reasonable under the circumstances. In general, this choice would be made on the basis of the managers' confidence in the input parameters of each approach.

### **Self-Test Questions**

1. Describe the CAPM approach to estimating a business's cost of equity.
2. What is the best proxy for the risk-free rate in the CAPM? Why?
3. What are the three types of beta that can be used in the CAPM?
4. Describe the DCF approach to estimating a business's cost of equity.
5. What are three common methods for estimating the future dividend growth rate for use in the DCF model?

6. Describe the debt cost plus risk premium approach to estimating a business's cost of equity.
7. Is there a difference between the risk premium used in the CAPM and the one used in the debt cost plus risk premium model?
8. How would you choose among widely different estimates of  $R(R_c)$ ?

## Estimating the Cost of Equity to Not-for-Profit Businesses

Not-for-profit businesses raise equity (fund) capital in two basic ways: (1) by receiving contributions and grants and (2) by earning an excess of revenues over expenses (retained earnings). In this section we first discuss some views regarding the cost of fund capital, and then we illustrate how this cost might be estimated.

### *Is There a Cost to Fund Capital?*

Our primary purpose in this chapter is to develop a corporate cost of capital estimate that can be used in capital budgeting decisions. Thus, the estimated “costs” represent the cost of using capital to purchase fixed assets, rather than for alternative uses. What is the cost of using equity capital for real-asset investments within not-for-profit businesses? There are at least five positions that can be taken on this question.<sup>8</sup>

1. **Fund capital has a zero cost.** The rationale here is that (1) contributors do not expect a monetary return on their contributions and that (2) the firm's stakeholders, especially the patients who pay more for services than warranted by the firm's tangible costs, do not require an explicit return on the capital retained by the firm. Because no explicit monetary return is required by the suppliers of fund capital, its cost is zero.
2. **Fund capital has a cost equal to the return forgone on marketable securities investments.** When a not-for-profit firm receives contributions or retains earnings, it can always invest these funds in marketable securities (highly liquid, safe securities) rather than immediately use these funds to purchase real assets (plant and equipment). Thus, fund capital has an opportunity cost that should be acknowledged; this cost is roughly equal to the return available on a portfolio of short-term, low-risk securities such as T-bills. Because such securities provide relatively low returns, the cost of fund capital is relatively small.
3. **Fund capital has a cost equal to the expected growth rate of the business's assets.**<sup>9</sup> To better understand the logic here, assume that a hospital in a growing city must increase its services to meet growing demand and, because it does not have excess capacity, its total assets must increase by 8 percent per year to keep pace with the increasing patient load. Because the left side of the balance sheet (total assets) must increase

by 8 percent, the right side (total capital) also must increase by the same amount to keep the balance sheet balanced. To increase its capital without increasing the proportion of debt used to finance its assets, the hospital must grow its fund capital at an 8 percent rate. In this way, it can finance asset growth by growing both debt and equity at the same 8 percent rate as assets and hence hold the relative amount of debt constant. If the hospital earned zero return on its fund capital, its equity base would remain constant over time, and the only way it could add new assets would be to take on additional debt without matching equity, and hence drive up its debt ratio, or to rely solely on contributions to provide the needed equity. In general, reliance on contribution capital is quite risky, and, at some point, lenders would be unwilling to provide additional debt financing, so it would be difficult to support the desired growth without a return on the equity invested.

Even if no volume growth is expected, a not-for-profit business must earn a return on its fund capital just to replace its existing asset base as assets wear out or become obsolete. The ROE invested is required because new assets will cost more than the old ones being replaced because of technological advances and inflation, so depreciation cash flow in itself will not be sufficient to replace worn-out and obsolete assets as needed. The bottom line here is that not-for-profit firms must earn an ROE merely to support dollar growth in assets, and the greater the growth rate, including that caused by inflation, the greater the return that must be earned.

4. **Fund capital has a cost equal to that required to maintain the business's creditworthiness.** One of the factors that debt rating agencies consider when assigning debt ratings is the profitability of the business—all else the same, the higher the profitability, the higher the credit rating. In general, managers of not-for-profit healthcare businesses have some target debt rating that they desire to maintain. Failure to maintain a sound credit rating increases both the cost of debt (interest rate) and the difficulties involved in obtaining future debt financing. Bond rating agencies periodically publish financial measures that they believe to be appropriate for each credit rating. In addition, numerous providers of hospital financial data publish financial measure averages by bond rating. To illustrate, if the average A-rated hospital has an ROE of 7 percent, and a not-for-profit hospital wants to maintain an A rating, then its target ROE (and hence cost of fund capital) should be about 7 percent.
5. **Fund capital has a cost equal to the cost of equity to similar for-profit businesses.** The rationale here rests on the opportunity cost concept as discussed in the second argument, but the opportunity cost is now defined as the return available from investing fund capital in alternative investments of **similar risk rather than investing in low-risk marketable securities**.

To illustrate this position, suppose Bayside Healthcare, a not-for-profit corporation, receives \$500,000 in contributions in 2006 and also retains \$4.5 million in earnings, so it has \$5 million of new fund capital available for investment. The \$5 million can be (1) used to purchase assets related to its core business, such as an outpatient clinic or diagnostic equipment; (2) temporarily invested in securities with the intent of purchasing healthcare assets some time in the future; (3) used to retire debt; (4) used to pay management bonuses; (5) placed in a non-interest-bearing account at the bank; and on and on. By using this capital to invest in real assets (plant and equipment), Bayside is deprived of the opportunity to use this capital for other purposes, so an opportunity cost must be assigned that reflects the riskiness associated with an equity investment in hospital assets. What return is available on securities with similar risk to an equity investment in hospital assets? The answer is the return expected from investing in the stock of an investor-owned hospital business, such as Ann Arbor Health Systems. Instead of using fund capital to purchase real healthcare assets, Bayside can always use the funds to buy the stock of a hospital business, such as Ann Arbor Health Systems, and delay the real-asset purchase until some time in the future.

With these five positions in mind, which one should prevail in practice? Unfortunately, the answer is not clear cut. However, at a minimum, a not-for-profit business should require an ROE investment in real assets that is at least as large as its projected asset growth rate. In that way, the business is setting the minimum rate of return that will, if it is actually achieved, ensure that the forecasted growth rate can be achieved. Thus, the expected growth rate sets the minimum required rate of return, and hence the minimum cost of equity, for not-for-profit businesses. On the other hand, if the rating agency's target ROE is greater than the growth rate, it would be prudent to use this value as the cost of equity to ensure the business maintains its creditworthiness.

However, to fully recover **all opportunity costs**, including the opportunity cost of employing equity capital in real assets, the real-asset investments must offer an expected return equal to the return expected on similar-risk securities investments. Thus, the "true" economic cost of equity to a not-for-profit healthcare provider is the rate that can be earned on stock investments in similar investor-owned firms. Using this cost of equity, a not-for-profit business is requiring that all costs, including full opportunity costs, be considered in the cost of capital estimate.

Although we believe the "full opportunity cost" approach to be most correct theoretically, many would argue that the unique mission of not-for-profit businesses precludes securities investments as realistic alternatives to healthcare plant and equipment investments, because securities investments do not contribute directly to the mission of providing healthcare services.

If that is the case, then the cost of fund capital should be the greater of the expected growth rate or creditworthiness maintaining rate. On the other hand, full opportunity costs do not have to be recovered on every new capital investment. Not-for-profit firms do invest in negative profit projects that benefit their stakeholders, but we believe that managers should be aware of the financial opportunity costs inherent in such investments. We will have more to say about this issue in Chapter 11.

### **Measuring the Cost of Fund Capital**

We have suggested that, at least in theory, the appropriate cost of equity capital to not-for-profit firms is the return available on the stocks of similar investor-owned firms. Thus, if Bayside Healthcare and Ann Arbor Health Systems are equivalent in all respects, then we can use the 13.8 percent estimate for Ann Arbor's cost of equity as our estimate for Bayside's cost of fund capital. However, it is impossible to find identical investor-owned and not-for-profit firms because even when they are in the same line of business and about the same size, they will often use different amounts of debt financing and one is taxable and the other is not. Because of these dissimilarities, most theorists would argue that it is necessary to adjust the cost estimate before it can be used by not-for-profit businesses.

The adjustment is accomplished by using *Hamada's equation*, which was developed by Robert Hamada in 1969. Hamada combined the CAPM with Modigliani and Miller's capital structure model, which we will discuss in the next chapter, to obtain the following equation:<sup>10</sup>

$$b_{\text{Equity}} = b_{\text{Assets}} \times [1 + (1 - T) \times (D/E)].$$

Here,  $b_{\text{Equity}}$  is the market beta of the business's stock;  $b_{\text{Assets}}$  is the inherent market beta of the assets, assuming that the business uses no debt financing;  $T$  is the tax rate;  $D$  is the market value of the business's debt; and  $E$  is the market value of the business's equity. In essence,  $b_{\text{Assets}}$  measures the inherent market risk of the assets, and  $b_{\text{Equity}}$  measures the market risk of the assets when operated by a business with a given capital structure and tax rate.

To illustrate the use of Hamada's equation, remember that the market beta of Ann Arbor's stock is 1.50 and its tax rate is 40 percent. Also, Ann Arbor's target capital structure consists of 60 percent debt and 40 percent equity. Assuming that the firm is at, or close to, its target capital structure, then these weights represent the firm's current market value structure. To begin the adjustment, use Hamada's equation to obtain the beta for hospital assets:

$$b_{\text{AAHS}} = b_{\text{Assets}} \times [1 + [(1 - T) \times (D/E)]]$$

$$1.50 = b_{\text{Assets}} \times [1 + [(1 - 0.40) \times (0.60/0.40)]]$$

$$1.50 = b_{\text{Assets}} \times 1.90$$

$$b_{\text{Assets}} = 1.50/1.90 = 0.79.$$

Now, if 0.79 is the inherent market beta of hospital assets, what is the implied beta of such assets when they are **employed by Bayside Healthcare**, which uses 50 percent debt financing and is tax exempt? To find the answer, we must again use Hamada's equation, but this time, we know the asset beta and are solving for the Bayside's implied equity beta:

$$\begin{aligned} b_{\text{BMH}} &= b_{\text{Assets}} \times [1 + [(1 - T) \times (D/E)]] \\ &= 0.79 \times [1 + [(1 - 0) \times (0.50/0.50)]] \\ &= 0.79 \times 2.0 = 1.58. \end{aligned}$$

Finally, remembering that the risk-free rate is 6.0 percent and the required rate of return on the market is 11.0 percent, we can use the SML to estimate Bayside's cost of equity capital:

$$\begin{aligned} R(R_e) &= R_F + [R(R_M) - R_F] \times b_{\text{BMH}} \\ &= 6.0\% + (11.0\% - 6.0\%) \times 1.58 \\ &= 6.0\% + (5.0\% \times 1.58) = 13.9\%. \end{aligned}$$

Because the tax rate difference is greater than the debt financing difference, Bayside's 13.9 percent cost of equity is somewhat greater than Ann Arbor's 13.5 percent CAPM estimated cost of equity. Note that the cost of equity differential based on the CAPM method is  $13.9\% - 13.5\% = 0.4$  percentage points (40 basis points). Also, the final estimate for Ann Arbor's cost of equity was not 13.5 percent, but rather 13.8 percent because all three methods were considered in the final estimate. Thus, we could apply the 40 basis point differential to the final estimate to obtain a cost of equity estimate for Bayside of  $13.8\% + 0.4\% = 14.2\%$ .

Before closing this section, a few words of caution are in order. There are a lot of issues that cast doubt not only on the accuracy of the adjustment process just described but also on the entire concept of looking to a for-profit firm's cost of equity to set the opportunity cost inherent in the use of fund capital. Here are just a few:

- The risk to an investor-owned firm's stockholders is not the same as the risk to a not-for-profit business's stakeholders. Stockholders are well-diversified investors regarding stock ownership, but stakeholders may not be so well diversified regarding their "investment" in not-for-profit businesses. The point here is that failure of one stock in a well-diversified investment portfolio has minimal impact on a typical equity investor, but



the failure of a not-for-profit business has a catastrophic impact on its stakeholders.

- In general, stock betas, and hence required rates of return on equity, are available only for very large firms, and the risk inherent in the stock ownership of a large, well-diversified firm typically is less than the riskiness of the equity capital of a smaller, less-diversified business. For example, stock ownership of HEALTHSOUTH, which has over 1,000 locations across the United States, even if held in isolation, is less risky than a stakeholder's position in a single outpatient rehabilitation center. In effect, corporate diversification lowers risk, so the comparison of a widely diversified firm with a single enterprise is suspect.
- The use of Hamada's equation is suspect because (1) there is no market value of a not-for-profit firm's fund capital, so the market value of equity is not really defined for not-for-profit firms, and (2) the derivation of Hamada's equation requires many unrealistic assumptions.

The bottom line here is that the entire process of estimating the cost of equity for not-for-profit businesses must be viewed with some skepticism. Nevertheless, the full opportunity cost estimate is the best that finance theory can muster, and a corporate cost of capital developed in this way is better, at least in our view, than ignoring the fact that there is an opportunity cost inherent in fund capital. One reaction to all the uncertainty involved in the estimation process might be to not use Hamada's equation to refine the estimate. Rather, just use Ann Arbor's cost of equity, without adjustment, as a proxy for Bayside's cost of fund capital. This simpler approach would result in an estimate for Bayside's cost of fund capital that is almost identical to the more complicated Hamada-adjusted estimate. Alternatively, if the entire opportunity cost process is unacceptable because of mission differences, the growth rate or creditworthiness maintaining rate can be assigned.

### Self-Test Questions

1. Is there a cost of equity for not-for-profit businesses?
2. How can this cost be estimated?
3. What does Hamada's equation attempt to do when it is used in the cost of equity estimation process?

## Estimating the Corporate Cost of Capital



The final step in the cost of capital estimation process is to combine the debt and equity cost estimates to form the *corporate cost of capital (CCC)*. As we will discuss in the next chapter, each business has a target capital structure in mind, which is defined as the particular mix of debt and equity that causes its overall cost of capital to be minimized. Furthermore, when a business raises new capital, it generally tries to finance in a way that will keep the actual capital

structure reasonably close to its target over time. The corporate cost of capital for any business, regardless of ownership, is calculated using the following equation:

$$CCC = [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_e)].$$

Here,  $w_d$  and  $w_e$  are the target weights for debt and equity, respectively. The cost of the debt component,  $R(R_d)$ , will be an average if the firm uses several types of debt for its permanent financing. Alternatively, the above equation can be expanded to include multiple debt terms. Investor-owned businesses would use their marginal tax rate for  $T$ , while  $T$  would be zero for not-for-profit firms.

The corporate cost of capital represents the cost of each new dollar of capital raised at the margin. It is **not** the average cost of all the dollars that the firm has raised in the past. Our primary interest is in obtaining a cost of capital for use in capital investment analysis; for such purposes, a *marginal cost* is required. The corporate cost of capital formula implies that each new dollar of capital will consist of both debt and equity that is raised, at least conceptually, in proportion to the firm's target capital structure.

### Investor-Owned Businesses

To illustrate the corporate cost of capital calculation for investor-owned businesses, consider Ann Arbor Health Systems, which has a target capital structure of 60 percent debt and 40 percent equity. As previously estimated, the firm's before-tax cost of debt,  $R(R_d)$ , is 10.0 percent; its tax rate,  $T$ , is 40 percent; and its cost of equity,  $R(R_e)$  is 13.8 percent. Using these data, Ann Arbor's corporate cost of capital is estimated to be 9.1 percent:

$$\begin{aligned} CCC_{AAHS} &= [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_e)] \\ &= [0.60 \times 10.0\% \times (1 - 0.40)] + [0.40 \times 13.8\%] \\ &= 9.1\%. \end{aligned}$$

Conceptually, every dollar of new capital that Ann Arbor obtains consists of 60 cents of debt, with an after-tax cost of 6.0 percent, and 40 cents of equity, with a cost of 13.8 percent. The average cost of each new dollar is 9.1 percent. In any one year, Ann Arbor may raise all of its required new capital by issuing debt, by retaining earnings, or by selling new common stock. But over the long run, Ann Arbor plans to use 60 percent debt financing and 40 percent equity financing, so these are the appropriate weights for the cost of capital calculation.

### Not-for-Profit Businesses

The corporate cost of capital for not-for-profit businesses is developed in the same way as for investor-owned businesses. To illustrate the concept, consider the following example. The corporate cost of capital for Bayside Healthcare,

assuming a target capital structure of 50 percent debt and 50 percent equity and using the estimates for the component costs that were developed earlier, is 10.2 percent:

$$\begin{aligned} \text{CCC}_{\text{BMH}} &= [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_e)] \\ &= [0.50 \times 6.1\% \times (1 - 0)] + [0.50 \times 14.2\%] \\ &= 10.2\%. \end{aligned}$$

The primary reason that Bayside's corporate cost of capital estimate is greater than Ann Arbor's is that Ann Arbor uses more debt financing in its target mix and hence uses more of the lower-cost financing component. Perhaps Ann Arbor, as a hospital system, has lower business risk and hence can carry more debt in its optimal financing structure. (This issue will be pursued in the next chapter.)

Businesses, regardless of ownership, cannot raise unlimited amounts of new capital in any given year at a constant cost. Eventually, as more new capital is raised, investors will require higher returns on debt and equity capital, even though the capital is raised in accordance with the firm's target structure. Thus, the corporate costs of capital, as estimated here for Ann Arbor and Bayside, are only valid when the amount required for capital investment falls within each business's normal range. If capital is required in amounts that far exceed those normally raised, the corporate cost of capital must be subjectively adjusted upward to reflect the higher costs involved.

### Self-Test Questions

1. What is the general formula for the corporate cost of capital?
2. What weights should be used in the formula? Why?
3. What is the primary difference between the corporate costs of capital for investor-owned and not-for-profit firms?
4. Is the corporate cost of capital constant regardless of the amount of new capital required? Explain your answer.

## An Economic Interpretation of the Corporate Cost of Capital

Thus far, the focus of the cost of capital discussion has been on the mechanics of the estimation process. Now, it is worthwhile to step back from the mathematics of the process and to examine the corporate cost of capital's economic interpretation.

The component cost estimates (the costs of debt and equity) that make up a business's corporate cost of capital are based on the returns that investors require to supply capital to the firm. In turn, investors' required rates of return are based on the opportunity costs borne by investing in the debt and equity of the business in question, rather than in alternative investments of similar

risk. These opportunity costs to investors, when combined into the corporate cost of capital, establish the **opportunity cost** to the business; that is, the corporate cost of capital is the return that the business can earn by investing in alternative investments that have the same risk as its own real assets. From a pure financial perspective, if a business cannot earn its corporate cost of capital on new capital investments, no new investments should be made and no new capital should be raised. If existing investments are not earning the corporate cost of capital, they should be terminated, the assets liquidated, and the proceeds returned to investors for reinvestment elsewhere.

Note that the corporate cost of capital sets the minimum return required on real-asset investments **regardless of the actual financing anticipated during the planning period**; that is, even if Ann Arbor planned to finance all new capital investments with debt financing, which has an estimated after-tax cost of 6.0 percent, the appropriate cost of capital to the firm is 9.1 percent. The rationale is that the debt financing cannot be obtained at the current cost rate without Ann Arbor's equity base, so in reality the new capital investments are being constructively financed at the firm's target capital structure.

However, the corporate cost of capital is not the appropriate minimum rate of return for all new real-asset investments. The required rates of return set by investors on the business's debt and equity are based on perceptions regarding the riskiness of their investments, which, in turn, are based on two factors: (1) the inherent riskiness of the business and (2) the amount of debt financing used. Thus, the firm's inherent business risk and capital structure are embedded in its corporate cost of capital estimate.

Because different firms have different business risk and use different proportions of debt financing, different firms have different corporate costs of capital. Differential capital costs are most pronounced for firms in different industries, as evidenced by the wide variation in beta values contained in Table 9.1. Still, even firms in the same industry can have different business risk, and capital structure differences among such firms can compound corporate cost of capital differences.

The primary purpose of estimating a business's corporate cost of capital is to help make capital budgeting decisions; that is, the cost of capital will be used as the benchmark capital budgeting *hurdle rate*, or the minimum return necessary for a project to be attractive financially. The firm can always earn its cost of capital by investing in securities that in the aggregate have the same risk as the firm's assets, so it should not invest in real assets unless it can earn at least as much. However, remember that the corporate cost of capital reflects opportunity costs based on the aggregate risk of the firm (i.e., the riskiness of the firm's average project). Thus, the corporate cost of capital can be applied without modification only to those projects under consideration that have average risk, where average is defined as that applicable to the firm's currently held assets in the aggregate. If a project under consideration has risk that

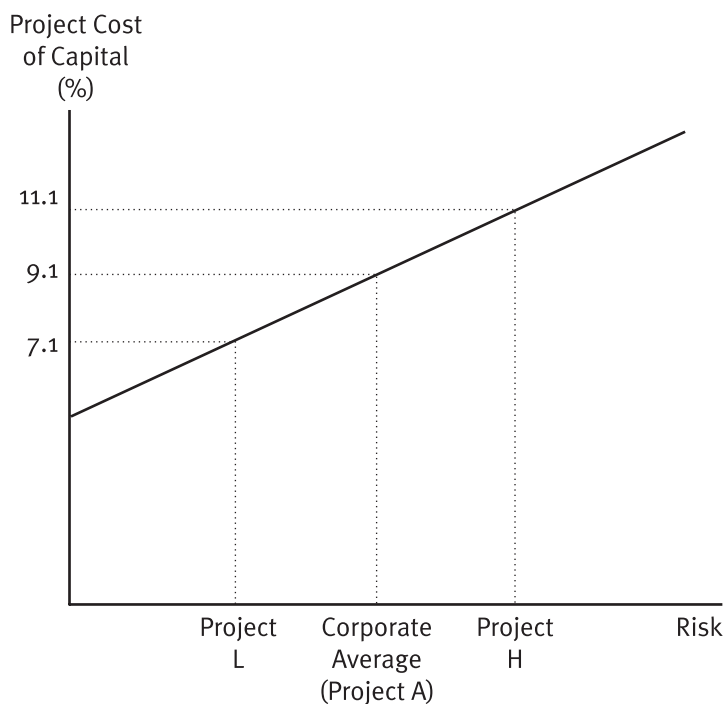
differs significantly from that of the firm's average asset, then the corporate cost of capital must be adjusted to account for the differential risk when the project is being evaluated.<sup>11</sup>

To illustrate the concept, Ann Arbor Health System's corporate cost of capital, 9.1 percent, is probably appropriate for use in evaluating a new outpatient clinic that has risk similar to the hospital's average project, which involves the provision of both inpatient and outpatient services. Clearly, it would **not** be appropriate to apply Ann Arbor's 9.1 percent corporate cost of capital without adjustment to a new project that involves establishing a managed care subsidiary; this project does not have the same risk as the hospital's average asset.

As discussed in Chapter 4, investors require higher returns for riskier investments. Thus, a high-risk project must have a higher *project cost of capital* than a low-risk project. Figure 9.1 illustrates the relationships among project risk, the corporate cost of capital, and project cost of capital. The figure illustrates that Ann Arbor's 9.1 percent corporate cost of capital is the appropriate hurdle rate **only** for an **average risk** project such as Project A, which has the same risk as the aggregate business. Project L, which has less risk than Ann Arbor's average project, has a project cost of capital, 7.1 percent, that is less than the corporate cost of capital. Conversely, Project H, with more risk than the average project, has a higher project cost of capital, 11.1 percent.

**FIGURE 9.1**

Ann Arbor Health Systems: Corporate and Project Costs of Capital



The key point here is that the corporate cost of capital is merely a **benchmark** that will be used as the basis for estimating project costs of capital. It is not a one-size-fits-all rate that can be used with abandon whenever an opportunity cost is needed in a financial analysis. This point will be revisited in Chapter 12 when capital investment risk considerations are addressed.

1. Explain the economic interpretation of the corporate cost of capital.
2. Is the corporate cost of capital affected by short-term financing plans? Explain your answer.
3. Is the corporate cost of capital the appropriate opportunity cost for all projects that a business evaluates?
4. Draw a graph similar to the one shown in Figure 9.1 and explain its implications.

## Self-Test Questions

### Flotation Costs

In our discussion of the corporate cost of capital, we have ignored flotation (issuance) costs. Under some circumstances, such costs can be large, especially for equity issues. One way of handling flotation costs is to incorporate them into the corporate cost of capital estimate, which has the effect of increasing the corporate cost of capital. Here are some points to consider regarding flotation costs.

- Mature for-profit businesses rarely issue new common stock. Rather, it is cheaper to obtain equity capital by earnings retention, which avoids flotation costs. Furthermore, flotation costs on public debt issues are relatively small, while such costs on private placements are near zero. Thus, only businesses that must go to the equity markets frequently bear substantial flotation costs.
- There is considerable uncertainty inherent in the cost of capital estimation process. Thus, attempting to “fine tune” the resulting estimate by incorporating flotation costs may be an exercise in futility.
- When flotation costs are significant, they can be incorporated into the decision process by adding them to the cost of the capital investments under consideration. Thus, if new capital to fund a business’s new investments requires \$2 million in flotation costs, this dollar cost can be assigned directly to the projects under consideration.

For these reasons, and the fact that flotation costs do not play a major role in the corporate cost of capital of not-for-profit businesses, we have chosen not to incorporate flotation costs into the estimation process.<sup>12</sup>

## Self-Test Question

1. Are flotation costs relevant to the corporate cost of capital estimate? Explain your answer.

## Divisional Costs of Capital

The corporate cost of capital reflects the riskiness of the overall business in the aggregate. If a firm has only one line of business, then the corporate cost of capital can be used, with appropriate risk adjustments, on most projects under consideration. However, the corporate cost of capital may not be the appropriate benchmark (starting point) for projects that are in a line of business that differs from the overall firm.

When a firm has multiple divisions that operate in different business lines, it may be best to estimate a *divisional cost of capital* for each division and to use these estimates as the benchmarks for all capital project evaluations. The assumption here is that capital budgeting analyses will be conducted at the divisional level, so the best benchmark for such analyses is the one that reflects the riskiness of each division's business line.

To illustrate the concept, consider the following example. A for-profit healthcare system might, along with its provider network, have one subsidiary that invests primarily in real estate for medical uses and another subsidiary that runs an HMO. Clearly, each of these subsidiaries has its own unique business risk and optimal capital structure. The low-risk, high debt capacity real-estate subsidiary might have a divisional cost of capital of 8 percent, while the high-risk, low debt capacity HMO subsidiary might have a cost of capital of 12 percent. The health system, which consists of these two divisions plus provider assets, would likely have a cost of capital that falls between 8 and 12 percent—say, 10 percent.

If all capital budgeting decisions within the system were made on the basis of the system's 10 percent corporate cost of capital, the process would be biased in favor of the higher-risk HMO subsidiary. The cost of capital would be too low for the HMO subsidiary and too high for the real-estate subsidiary. Over time, this cost of capital bias would result in too many HMO projects and too few real-estate projects being accepted, which would skew the business-line mix toward HMO assets, and hence increase the overall riskiness of the system. Of course, the answer to this problem is to use subsidiary costs of capital, rather than the corporate cost of capital, in the capital budgeting decision process.

Unlike individual project costs of capital, subsidiary costs of capital often can be estimated with some confidence because it is usually possible to identify publicly traded firms that are predominantly in the same line of business as the subsidiary. For example, the cost of capital for the HMO

subsidiary can be estimated by looking at the debt and equity costs of the major for-profit managed care companies, such as Humana and Aetna. This approach, in which a publicly traded firm in the same line of business is used as a proxy for a nonpublicly traded business is called the *pure play* approach. If market data are at hand for pure play firms, it is relatively easy to develop subsidiary costs of capital.

As a final check in the process of estimating divisional costs of capital, note that the corporate cost of capital must equal the weighted average—say, by proportion of assets—of all of the subsidiary costs of capital. If this is not the case, then there are problems in the estimation process that must be resolved.

1. Explain the concept of divisional costs of capital.

## Self-Test Question

### Warning! Warning! Warning!

We have spent a great deal of time describing how the corporate (or divisional) cost of capital is estimated for any business. In addition, we have discussed the interpretation and use of the corporate (or divisional) cost of capital as a hurdle rate in evaluating new capital investment proposals. Once the effort has been expended to estimate the cost of capital, there is a strong tendency (especially among students) to treat the estimate as a “one-size-fits-all” number; that is, “we have a project to consider—no sweat, use the cost of capital estimate as the hurdle rate.”

Unfortunately, the corporate (or divisional) cost of capital cannot just be applied willy-nilly. As we discussed earlier, if the project being evaluated does not have average risk, then a risk adjustment—as illustrated in Figure 9.1—must be applied.

Equally important, if the project under consideration is in a line of business that is **unrelated to the core business**, then the corporate (or divisional) cost of capital **cannot** be used. For example, assume that a hospital is considering the acquisition of a medical group practice. Is it appropriate to use the hospital’s corporate cost of capital as the base hurdle rate in the analysis? The answer is no! Because the project being evaluated (a medical practice) is in a different line of business than the hospital, the corporate cost of capital is not relevant to the analysis. The appropriate cost of capital is one developed using the pure play method applied to practice management businesses.

1. When is it appropriate to apply the corporate cost of capital when evaluating a new project proposal? When is it inappropriate?

## Self-Test Question



## Cost of Capital Estimation for Small Businesses

The guidance given thus far in the chapter focuses on the cost of capital estimation process for large healthcare businesses. But what if the business is small, such as a solo practice; a small group practice; or a small, free-standing hospital? The estimation process is the same as described, but the manner in which the component costs are estimated must be handled differently.

### *Estimating the Cost of Debt*

Small businesses typically obtain the bulk of their debt financing from commercial banks, so a business's commercial loan officer will be able to provide some insights on the cost of future debt financing. Alternatively, managers of small businesses can look to marketplace activity for guidance; that is, the interest rate currently being set on the debt issues of similar-risk firms can be used as an estimate of the cost of debt. Here, similar risk can be judged by subjective analysis (same industry, similar size, similar use of debt, and so on). Alternatively, the prime rate gives small businesses a benchmark for bank loan rates. If the business has borrowed from commercial banks in the past, its managers will know the historical premium charged above the prime rate for the business's bank debt. An awareness of the current interest rate environment generally permits managers to make a reasonable estimate for their own business's cost of debt, even when the business is quite small.

### *Estimating the Cost of Equity*

Although estimating the cost of debt for a small business is relatively easy, the cost of equity estimate is more problematic.

#### **Debt Cost Plus Risk Premium Approach**

Perhaps the easiest way to estimate the cost of equity of a small business is to use the debt cost plus risk premium method. Because the cost of debt is relatively easy to estimate, it is equally easy to add some risk premium—say, 4 percentage points—to the business's before-tax cost of debt to obtain its cost of equity estimate. However, this can only be considered a “ballpark” estimate because the risk premiums that are applicable to small businesses may not be the same as those estimated for large firms.

#### **Pure Play Approach**

As an alternative, a proxy publicly traded firm in the same line of business can be identified and its beta used to estimate the equity risk of the small business. This is the *pure play* approach introduced in the last major section. For example, suppose the beta for a publicly traded practice management firm is 0.88. **If the riskiness inherent in practice management is the same as the risk involved in the ownership of a small group practice**, then a beta of 0.88 can be used to proxy such ownership risk. Then, the CAPM approach can be used to estimate the small business's cost of equity. As in our previous

discussions, Hamada's equation could be applied to refine the beta estimate, but the uncertainties involved make such refinements of dubious value.

To use the pure-play approach for a small business, the assumption must be made that the risk to the owners of the publicly traded proxy firm is the same as the risk to the owners of the small business. However, there are several important differences between the ownership of stock in a large corporation and the ownership of, say, a small group practice. First, the geographic and business-line diversification of a large business typically makes ownership less risky than a similar position in a small, localized single-line business. Second, most stockholders of large businesses hold that stock as part of a well-diversified investment portfolio that has returns that are not highly correlated with the stockholders' employment earnings. With a small group practice, the employment returns and equity returns typically are one and the same. Third, stock owned in an investment portfolio is highly liquid—the owner can sell it quickly at a fair market price with a single phone call. Conversely, an ownership position in a group practice is very difficult to sell.

All of these factors suggest that the cost of equity to a small owner-managed business is higher, perhaps much higher, than that calculated using the CAPM and a proxy company. Unfortunately, finance theory cannot tell us how much higher.

It is common when estimating the cost of equity for small businesses to use an approach called the *build-up method*. Here, the cost of equity of a similar large business is used as the base, or starting point. Then, various adjustments, or premiums, are added to account for the differences between large and small businesses.

### Build-Up Method

- **Size premium.** Although returns data on businesses as small as a group practice are not readily available, studies using historical returns data indicate that the cost of equity for the smallest stocks—those in the bottom decile of market value—listed on the NYSE is about 4 percentage points higher than the cost of equity for large businesses—those in the S&P 500. This added premium to compensate for the additional risk inherent in the ownership of small, as opposed to large, businesses is called the *size premium*. It can be argued that the size premium is even larger than 4 percentage points for firms so small that their equity is not publicly traded. The bottom line here is when the cost of equity of a small business is estimated on the basis of equity costs to similar large businesses, an additional premium must be added just to account for the size differential.
- **Liquidity premium.** Because an ownership position in a small business is less liquid than the stock of a large corporation, it is common to add a liquidity premium when estimating the cost of equity for a small business. This premium is generally thought to be about 2 percentage points. Note,

however, that if an investor has a control position (more than 50 percent ownership), then some of the risk associated with small business ownership is reduced.

- **Unique risk premium.** Some small businesses have unique risk. For example, the success of a start-up business might depend on new, unproven technology. Or the success of a small business might depend on the intellectual capital or managerial prowess of one person. In such situations, an equity investment is **very** risky, and it is not uncommon to add a premium of 5 or more percentage points to account for such unique risk.

To illustrate the build-up method, consider a small medical practice. The cost of equity to a large practice management company is found as follows:

$$\begin{aligned} R(R_e) &= R_F + [R(R_M) - R_F] \times b \\ &= 6.0\% + (11.0\% - 6.0\%) \times 0.88 \\ &= 6.0\% + (5.0\% \times 0.88) = 10.4\%. \end{aligned}$$

Here we used a pure play beta of 0.88 along with the market data used in previous examples to obtain a base cost of equity of 10.4 percent.

Now, using the build-up method, and assuming a size premium of 4 percentage points and liquidity premium of 2 percentage points, we obtain a cost of equity estimate of

$$\text{Cost of equity} = 10.4\% + 4.0\% + 2.0\% = 16.4\%.$$

If any unique risk is identified for this practice, the cost of equity estimate could be even higher.

Although the estimation process clearly is more difficult, it may be even more important for small businesses to recognize their corporate costs of capital than it is for large businesses. The reason is that in small businesses, owners often have their livelihoods, as well as their equity investment, tied to the business. With the techniques described in this section, even a small business owner can “make a stab” at estimating his or her business’s corporate cost of capital.

## Self-Test Questions

1. What are the problems faced by small businesses when estimating the corporate cost of capital?
2. What is the size premium? Liquidity premium? Unique risk premium?
3. Describe the build-up method for estimating a small business’s cost of equity.

## Factors That Influence a Business's Cost of Capital

The corporate cost of capital estimate for any business is influenced by several factors. Some are external to the business, but some can be influenced by managerial actions.

### *Factors That Cannot Be Influenced*

- **The level of interest rates.** Perhaps the factor that has the greatest impact on a business's cost of capital is the general level of interest rates, which typically is a function of inflation expectations. In the early 1980s, interest rates were very high, and hence corporate costs of capital were very high. In such circumstances, only very high return projects are acceptable, and hence capital investment is low. Conversely, in recent years, interest rates in the United States have been low, resulting in relatively low costs of capital.
- **Tax rates.** High corporate tax rates lead to a lower cost of capital because the cost of debt for investor-owned businesses is reduced by one minus the tax rate. At the same time, differential personal taxes encourage the use of one form of capital over another. For example, a capital gains tax rate that is lower than the ordinary tax rate lowers the cost of equity to taxable businesses relative to the cost of debt and hence encourages the use of equity financing. High personal tax rates also affect the cost of debt to not-for-profit businesses because high tax rates make tax-exempt debt more attractive to investors and hence lower the cost of tax-exempt (municipal) debt capital.

### *Factors That Can Be Influenced*

- **Capital structure policy.** As we will discuss in the next chapter, the optimal capital structure is the structure that produces the lowest cost of capital to the business. Thus, businesses that are not using the optimal proportion of debt financing have a corporate cost of capital that is higher than necessary.
- **Capital investment policy.** A business's capital investment policy defines its line of business, which establishes the basic risk of the business. If a business adds more and more risky assets to its fixed asset portfolio, its corporate cost of capital will increase. Likewise, the addition of low-risk assets will lower the cost of capital. Don't forget, however, that the corporate cost of capital is merely a benchmark, and new projects that have differential risk as compared to the business as a whole must use a cost of capital that differs from the corporate cost of capital.

1. What are the factors that affect the corporate cost of capital estimate?

**Self-Test  
Question**

## Key Concepts

This chapter discusses the corporate cost of capital, which is a very important concept to the financial well-being of healthcare businesses. Here are its key concepts:

- The cost of capital to be used in capital budgeting decisions is the *weighted average* of the various types of permanent capital the firm uses, typically debt and common equity.
- The *component cost of debt* is the *after-tax* cost of new debt. For taxable businesses, it is found by multiplying the before-tax cost of new debt by  $(1 - T)$ , where  $T$  is the firm's marginal tax rate, so the component cost of debt is  $R(R_d) \times (1 - T)$ . For not-for-profit businesses, the debt is often tax-exempt, but no other tax effects apply, so the component cost of debt is merely the tax-exempt  $R(R_d)$ .
- The *cost of equity* for an investor-owned business is the rate of return investors require on the firm's common stock, and for large businesses it is usually estimated by three methods: (1) the Capital Asset Pricing Model (CAPM) approach, (2) the discounted cash flow (DCF) approach, and (3) the debt cost plus risk premium approach.
- In the *CAPM approach*, the firm's beta coefficient is multiplied by the market risk premium to determine the firm's risk premium, and this risk premium is added to the risk-free rate to obtain the firm's cost of equity estimate.
- The best proxy for the *risk-free rate* is the yield on long-term T-bonds.
- There are three types of betas that can be used in the CAPM: (1) *historical*, (2) *adjusted*, and (3) *fundamental*.
- The market risk premium can be estimated either *historically* or *prospectively*.
- The *DCF approach* uses the dividend valuation model, which requires the current stock price, last dividend paid, and dividend growth rate to estimate the cost of equity.
- The growth rate can be estimated from historical dividend data, by using the *retention growth model*, or from securities analysts' forecasts.
- The *debt cost plus risk premium model* adds a risk premium to the firm's cost of debt estimate to obtain the cost of equity estimate.
- For not-for-profit businesses, the *cost of equity (fund capital)* can be approximated by the cost of equity of similar investor-owned firms. This approach considers the opportunity costs associated with the use of equity capital.
- Alternatively, the cost of equity to not-for-profit businesses can be set as the greater of the expected asset growth rate or the creditworthiness maintaining rate. This approach does not consider opportunity costs,

but it does recognize that a return on equity is required if the business is to maintain a sound financial posture.

- Each firm has a *target capital structure*, and the target weights are used to estimate the firm's *corporate cost of capital (CCC)*:

$$CCC = [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_e)].$$

- When making *capital investment decisions*, the firm will use the corporate cost of capital as the *hurdle rate* for **average-risk** projects. Note, however, that the corporate cost of capital is irrelevant if the project being analyzed is in a different line of business than the core business.
- If a business has multiple divisions that operate in different business lines, then it is best to estimate a *divisional cost of capital* for each division.
- The corporate cost of capital for small businesses is estimated using the same techniques as for large businesses. However, the estimation of the component costs, particularly the cost of equity, becomes more difficult.
- The *build-up method* is used to estimate the cost of equity for a small business. This method uses the cost of equity of a similar large business as the starting point, and then adds (1) a *size premium*, (2) a *liquidity premium*, and (3) a *unique risk premium*.
- There are several factors that influence the cost of capital estimate for any business, including (1) the *current level of interest rates*, (2) *tax rates*, (3) *capital structure policy*, and (4) *capital investment policy*.

The concepts developed here will be used extensively throughout the text, especially in capital structure decisions—Chapter 10—and in capital budgeting decisions—Chapters 11 and 12.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used to estimate a business's corporate cost of capital.

In addition, the chapter has six problems in spreadsheet format that focus on cost of capital issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

## Selected References

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- Smith, Dean G., and John R. C. Wheeler. 1989. "Accounting Based Risk Measures for Not-for-Profit Hospitals." *Health Services Management Research* (November): 221–226.
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## Selected Websites

Selected websites listed in Chapter 6 are applicable to cost of capital estimation.

- To see some interesting articles related to cost of capital estimation, see the Ibbotson Associates site at [www.ibbotson.com](http://www.ibbotson.com). When there, click on Knowledge Center, then Published Research, then Cost of Capital. You will then see a list of available articles.
- To access a "calculator" that can be used to estimate the corporate cost of capital for any business, see the Valuation Technologies site at [www.valtechs.com](http://www.valtechs.com). Then, click on Research, followed by the Valuation Methods button that refers to cost of capital calculation.
- The TeachMeFinance website has several tutorial-type discussions that cover various aspects of financial management. For a cost of capital tutorial, see [teachmefinance.com](http://teachmefinance.com). Then, click on Cost of Capital in the list along the left side of the page.

## Selected Case

There is one case in *Cases in Healthcare Finance* that is applicable to this chapter:

- Case 16: Southeast Homecare, which focuses on the cost of capital estimation process for both investor-owned and not-for-profit businesses.

## Notes

1. A question arises here as to whether the stated rate or the effective annual rate should be used in the cost of debt estimate. In general, the difference will be inconsequential, so most analysts opt for the easier approach, which is simply to use the stated rate. (The effective annual rate in this example is  $[1.0305]^2 - 1.0 = 6.19\%$  versus a 6.1 percent stated rate.) More importantly, most capital budgeting analyses use end-of-year cash flows to approximate cash flows that occur throughout the year, in effect creating stated, as opposed to effective, cash flows. For consistency, we prefer to use a cost of capital that does not recognize

intra-year compounding—the cash flows will be understated, but so will the cost of capital.

2. Only a few firms in the health services industry use preferred stock financing, so we will not include preferred stock in our cost of capital examples. If preferred stock is used as a source of permanent financing, then it should be included in the cost of capital estimate, and its cost would be estimated using procedures similar to those discussed for the cost of debt.
3. See *Stocks, Bonds, Bills and Inflation: 2006 Yearbook* (Chicago: Ibbotson Associates, 2006) for a complete discussion of historical risk premiums, including a discussion of arithmetic and geometric averages.
4. See Marshall E. Blume, “Betas and Their Regression Tendencies,” *Journal of Finance*, June 1973, 785–796. To illustrate one beta supplier’s adjustment technique, *Merrill Lynch* uses this formula: Adjusted beta =  $0.34 + (0.66 \times \text{Historical beta})$ .
5. A commercial provider of betas once admitted that his firm, and others, did not know what the right period was to use but that they decided to use five years to reduce the apparent differences between various services’ betas—large differences reduced everyone’s credibility!
6. Log-linear regression is a standard time-series linear regression in which the data points are plotted as natural logarithms. The advantage of a log-linear regression is that the slope of the regression line is the average annual growth rate, assuming continuous compounding. In a standard time-series linear regression of EPS or DPS, the slope of the regression line is the average annual dollar change.
7. The calculation given in the text produces an *arithmetic average* growth rate. A better measure of average growth is the *geometric average* growth rate, which is calculated as follows to be 7.0 percent:

$$(1.12)^5 \times (1.065)^{45} = (1 + x)^{50}$$

$$1.76234 \times 17.01110 = (1 + x)^{50}$$

$$29.97934 = (1 + x)^{50}$$

$$1 + x = (29.97934)^{1/50}$$

$$1 + x = 1.070$$

$$x = 0.070 = 7.0\%$$

The equation is asking: What annual growth rate in dividends over the entire 50-year period is equivalent to growth at 12 percent for five years, followed by growth at 6.5 percent for 45 years? The answer is an annual growth rate of 7.0 percent.

8. For one of the classic works on this topic, see Douglas A. Conrad, “Returns on Equity to Not-For-Profit Hospitals: Theory and Implementation,” *Health Services Research*, April 1984, 41–63. Also, see the follow-up articles by Pauly; Conrad; and Silvers and Kauer in the April 1986 issue of *Health Services Research*.
9. For an excellent discussion of this issue, see William O. Cleverley, “Return on Equity in the Hospital Industry: Requirement or Windfall?” *Inquiry*, Summer 1982, 150–159.
10. For more information on Hamada’s equation, see Robert S. Hamada, “Portfolio



Analysis, Market Equilibrium, and Corporation Finance,” *Journal of Finance*, March 1969, 13–31.

11. In theory, the cost of capital should also be adjusted when projects under evaluation have optimal capital structures that differ from the business’s target mix. Thus, if a project under evaluation by Ann Arbor had a *debt capacity* of 80 percent, versus 60 percent debt for the average project, this differential should be considered when evaluating the project. However, in reality, debt capacities for individual projects typically are impossible to estimate, so the adjustments made to the corporate cost of capital usually are confined to risk differentials.
12. For more information on flotation cost adjustments, see Eugene F. Brigham and Michael C. Ehrhardt, *Financial Management: Theory and Practice* (Fort Worth, TX: Thomson/South-Western, 2005), Chapter 9.

## CAPITAL STRUCTURE DECISIONS

### Learning Objectives

After studying this chapter, readers should be able to:

- Explain the effects of debt financing on a business's risk and return.
- Briefly describe the primary capital structure theories and their implications for managers.
- Discuss the factors that influence the choice between debt and equity financing.
- Explain how businesses choose debt maturities.

### Introduction

In Chapter 9, when we discussed a business's corporate cost of capital, we noted that the weights used in the calculation represent the optimal, or target, mix of debt and equity financing. These weights are defined by the *capital structure* decision. We will see in this chapter that managers analyze a number of quantitative and qualitative factors and then establish the *optimal*, or *target*, *capital structure* for the business. Often, because of uncertainties in the estimation process, the target is expressed as a range rather than as a point value. The target will undoubtedly change over time as conditions that are both internal and external to the business change, but at any given moment, managers have a specific capital structure in mind.

The target structure plays a major role in financing decisions for the business. If too little debt is actually on hand, as compared to the optimal amount, new financings will be biased toward the use of debt. Conversely, if too much debt is on the books, equity would be the first choice for new capital. The key here is that one of the most important factors that influence financing decisions is the target capital structure. Managers prefer to finance in a way that keeps the business's capital structure on target.

Once the optimal capital structure, and hence the optimal amount of debt, is identified, managers must consider the optimal maturity structure of the debt component. Should the business's debt be all long term, all short term, or some combination of the two? This chapter addresses both the optimal capital structure and optimal maturity structure decisions in detail.

## Impact of Debt Financing on Risk and Return<sup>1</sup>



One of the most important concepts in capital structure decisions is the impact of debt financing on a business's risk and return. The best way to present this concept is by illustration. Assume that a new business, Super Health, Inc., is being formed. The business requires \$200,000 in assets to get into operation, and there are only two financing alternatives available to it: (1) all equity and (2) 50 percent debt and 50 percent equity.

Table 10.1 contains the business's projected starting balance sheet and first year's income statement under the two financing alternatives. To begin, consider the balance sheets shown in the top portion of the table. The business will require \$100,000 in current assets and \$100,000 in fixed assets to begin operations. Because asset requirements depend on the nature and size of the business rather than on how the business will be financed, the asset side of the balance sheet is unaffected by the financing scheme. However, the capital, or claims, side of the balance sheet is influenced by the type of financing. Under the all-equity alternative, the owners must put up the entire \$200,000 needed to purchase the assets. If 50 percent debt financing is used, the owners will contribute only \$100,000, with the remaining \$100,000 to be obtained from creditors—say, a bank loan with a 10 percent interest rate.

Now, consider the impact of the two financing alternatives on Super Health's projected income statement. First-year revenues are projected to be

**TABLE 10.1**

Super Health,  
Inc.: Projected  
Financial  
Statements  
Under Two  
Financing  
Alternatives

### Balance Sheets

	<i>All Equity</i>	<i>Debt/Equity</i>
Current assets	\$100,000	\$100,000
Fixed assets	100,000	100,000
Total assets	<u>\$200,000</u>	<u>\$200,000</u>
Bank loan (10% cost)	\$ 0	\$100,000
Total equity	<u>200,000</u>	<u>100,000</u>
Total claims	<u>\$200,000</u>	<u>\$200,000</u>

### Income Statements

Revenues	\$150,000	\$150,000
Operating costs	<u>100,000</u>	<u>100,000</u>
Operating income (EBIT)	\$ 50,000	\$ 50,000
Interest expense	<u>0</u>	<u>10,000</u>
Taxable income	\$ 50,000	\$ 40,000
Taxes (40%)	<u>20,000</u>	<u>16,000</u>
Net income	<u>\$ 30,000</u>	<u>\$ 24,000</u>
ROE	<u>15%</u>	<u>24%</u>
Total dollar return to investors	<u>\$ 30,000</u>	<u>\$ 34,000</u>

\$150,000 and operating costs are forecasted at \$100,000, so the business's operating income—earnings before interest and taxes (EBIT)—is expected to be \$50,000. Because the method of financing does not affect revenues and operating costs, the operating income projection is the same under both financing alternatives. However, interest expense must be paid if debt financing is used, so the debt/equity alternative results in a  $0.10 \times \$100,000 = \$10,000$  annual interest charge, while no interest expense occurs if the business is entirely equity financed. The result is taxable income of \$50,000 under the all-equity alternative and lower taxable income of \$40,000 under the 50 percent debt alternative. Because the business anticipates being taxed at a 40 percent federal-plus-state rate, the expected tax liability is  $0.40 \times \$50,000 = \$20,000$  under the all-equity alternative and  $0.40 \times \$40,000 = \$16,000$  for the debt/equity alternative. Finally, when taxes are deducted from the income stream, Super Health projects a net income of \$30,000 if all-equity financed and \$24,000 if 50 percent debt financing is used.

At first glance, all-equity financing appears to be the best strategy. After all, if the business uses 50 percent debt financing, its projected net income will fall by  $\$30,000 - \$24,000 = \$6,000$ . But the conclusion that debt financing is bad requires closer examination. Business owners are less concerned with net income than with the return that is expected on their equity investment. Perhaps the most meaningful measure of return to a business's owners is the rate of return on equity, or just return on equity (ROE), which is defined as  $\text{Net income} / \text{Total equity}$ . Under all-equity financing, the projected ROE is  $\$30,000 / \$200,000 = 0.15 = 15\%$ , but with 50 percent debt financing, projected ROE increases to  $\$24,000 / \$100,000 = 24\%$ . The key here is that although net income decreases with debt financing, so does the amount of owner-supplied capital, and the capital requirement decreases proportionally more than does net income.

The end result is that the use of debt financing increases the expected rate of return on equity capital. Why does this positive result happen? There is no magic here. The key is in the tax code—interest expense is tax deductible for investor-owned businesses while dividend distributions are not. To understand the impact of the tax deductibility of interest, take another look at the Table 10.1 income statements. The total dollar return to all investors, including both owners and creditors, is \$30,000 in net income if all-equity financed, but \$24,000 in net income plus \$10,000 of interest, for a total of \$34,000, when 50 percent debt financing is used. Where did the “extra” \$4,000 come from? The answer is “from the tax man.” Taxes are \$20,000 if Super Health is all-equity financed, but only \$16,000 when debt financing is used, and \$4,000 less in taxes means \$4,000 more for investors. Because debt financing reduces taxes, more of a business's operating income (EBIT) is available for distribution to investors, including both owners and creditors.

It now appears that Super Health's financing decision is clear. Given only the two alternatives, Super Health should use the 50 percent debt alter-

native because it provides the owners with the higher return on investment. Unfortunately, like the proverbial no free lunch, there is a catch. The use of debt financing not only increases owners' return but also increases their risk.

To demonstrate the risk-increasing characteristics of debt financing, consider Table 10.2. Here we recognize that Super Health, like all businesses, is risky. The owners do not know precisely what the first year's revenues and operating costs will be. Assume, for illustrative purposes, that Revenues – Operating costs = Operating income can be as low as \$0 or as high as \$100,000 in the business's first year of operations. Furthermore, assume that there is a 25 percent chance of the worst and the best cases occurring, and a 50 percent chance that the Table 10.1 forecast, with an operating income of \$50,000, will be realized.

The assumptions regarding uncertainty in the future profitability of the business lead to three different ROEs for each financing alternative. The expected ROEs are the same as when we ignored uncertainty—that is, 15 percent if Super Health is all-equity financed and 24 percent when 50 percent debt financing is used. However, the uncertainty in operating income produces uncertainty, and hence risk, in owners' returns. If we measure owners' risk by the standard deviation of ROE, we see that the return is more risky when 50 percent debt financing is used. To be precise, owners' risk is twice as much in the 50 percent debt financing alternative: 21.2 percent standard deviation of ROE versus 10.6 percent standard deviation in the zero-debt alternative.

Intuitively, this risk increase occurs because the use of debt financing imposes a fixed cost—the \$10,000 interest expense—into an uncertain income stream; that is, the fixed interest payment must be made regardless of the level of operating income. The insertion of the fixed interest expense magnifies the variability of all values below the insertion point. Note that the increased risk

**TABLE 10.2**

Super Health,  
Inc.: Partial  
Income  
Statements in an  
Uncertain World

	<i>All Equity</i>			<i>Debt/Equity</i>		
	0.25	0.50	0.25	0.25	0.50	0.25
Operating income (EBIT)	\$ 0	\$ 50,000	\$ 100,000	\$ 0	\$ 50,000	\$ 100,000
Interest expense	0	0	0	10,000	10,000	10,000
Taxable income	\$ 0	\$ 50,000	\$ 100,000	(\$ 10,000)	\$ 40,000	\$ 90,000
Taxes (40%)	0	20,000	40,000	(4,000)	16,000	36,000
Net income	\$ 0	\$ 30,000	\$ 60,000	(\$ 6,000)	\$ 24,000	\$ 54,000
ROE	0%	15%	30%	–6%	24%	54%
Expected ROE		15%			24%	
Standard deviation of ROE		10.6%			21.2%	

is apparent without performing any calculations. Under all-equity financing, the worst result is an ROE of zero. However, with 50 percent debt financing, the owners can realize a ROE of  $-6$  percent. (Here the assumption is made that the business's \$10,000 loss could be used to offset the owners' personal income, resulting in a \$4,000 tax savings. If this were not the case, the loss would be even worse.) In fact, with no operating income to pay the \$10,000 interest due if the worst-case scenario occurs, the owners would either have to put up additional personal funds or declare the business bankrupt. Clearly, the use of 50 percent debt financing has increased the riskiness of the equity investment in the business.

This simple example illustrates two key points about the use of debt financing:

1. The use of debt financing increases the percentage return (ROE) to a business's owners. Note, however, that for the use of debt financing to increase owners' returns, the basic (inherent) return on the business must be greater than the interest rate on the debt. The basic return on the business in the Super Health illustration is 25 percent ( $\$50$  in operating income divided by  $\$200$  in assets), and debt financing costs only 10 percent, so the use of debt financing increases ROE.
2. At the same time that return is increased, the use of debt financing also increases owners' risk. In the Super Health example, we saw that 50 percent debt financing doubled the risk to owners (as measured by standard deviation of ROE).

Super Health's ultimate decision regarding financial structure is not clear-cut. One alternative—no debt—has a lower expected ROE but also lower risk. The second alternative—50 percent debt—offers a higher expected ROE but only at the price of higher risk. To complicate matters even more, there are actually an almost unlimited number of debt-level choices available to the business, not just the 50/50 mix used in the illustration. Later sections will try to resolve the dilemma facing Super Health, but first we need to introduce two other concepts.

1. What is the impact of debt financing on a business's risk and return?
2. Why does the use of debt financing leverage up (increase) the return to stockholders?

## Self-Test Questions

## Business and Financial Risk

In Chapter 4, we discussed several different dimensions of risk, including stand-alone risk and portfolio (corporate and market) risk. Now, we introduce two new dimensions: (1) business risk and (2) financial risk. Here, the term

“financial risk” has a very specific connotation, as opposed to its use in Chapter 4 where the term was used generically to mean the risk arising from business transactions as opposed to other types of risk, such as risk to life and limb. Note that the concepts of business and financial risk apply just as much to not-for-profit businesses as they do to for-profit businesses, but in not-for-profits the risk concepts apply to the business’s noncreditor stakeholders, including the community at large, rather than to the business’s owners.

### **Business Risk**

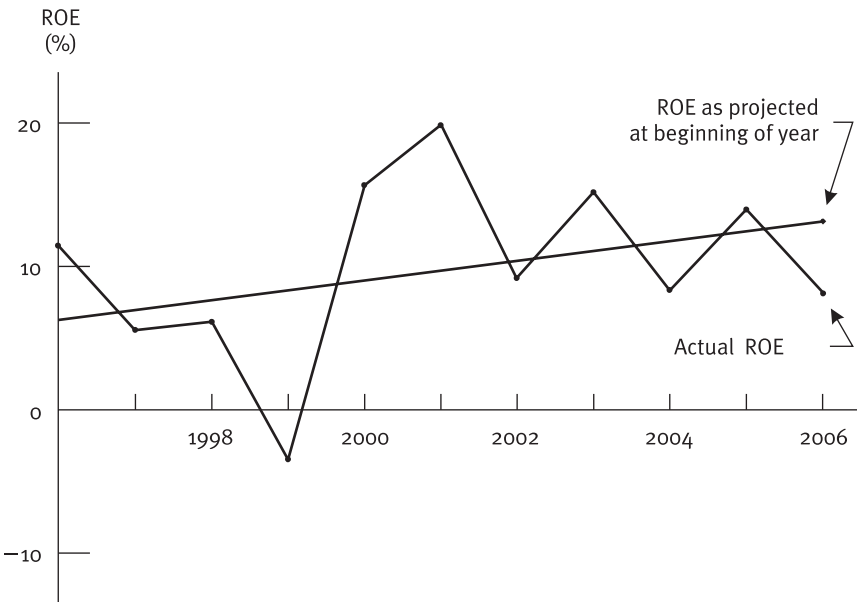
*Business risk* is the inherent riskiness of a business as seen by its owners, and it is measured by the uncertainty inherent in the business’s ROE **assuming that no debt financing is used**. In other words, business risk is the riskiness of a business’s assets assuming they are all-equity financed. To illustrate the concept of business risk, consider Santa Fe Healthcare, Inc., a **debt-free**, investor-owned hospital chain that operates in the southwestern United States. Figure 10.1 provides some insights into the firm’s business risk.

The top graph gives both security analysts and Santa Fe’s management an idea of the historical variability of ROE and, consequently, how the firm’s ROE might vary in the future. This graph also shows that Santa Fe’s ROE is growing slowly, so the relevant variability of ROE is the dispersion about the trend line rather than the overall standard deviation of historical ROE. The lower graph shows the beginning-of-year subjectively estimated probability distribution of Santa Fe’s ROE for 2006, based on the trend line in the top graph of Figure 10.1. As both graphs indicate, Santa Fe’s actual ROE in 2006 was only 8 percent, well below the expected value of 12 percent.

Santa Fe’s past fluctuations in ROE were caused by many factors—changes in the economy, actions by competing hospitals, changes in payer mix, changes in payment policies of third-party payers, changing labor costs, and so on. Similar events will undoubtedly occur in the future, and because they do, Santa Fe’s realized ROE will almost always be higher or lower than the projected level. Furthermore, there is always the possibility that some event that permanently depresses the company’s earning power might occur. For example, the federal government could move to a single-payer system with dramatically reduced hospital reimbursement rates.

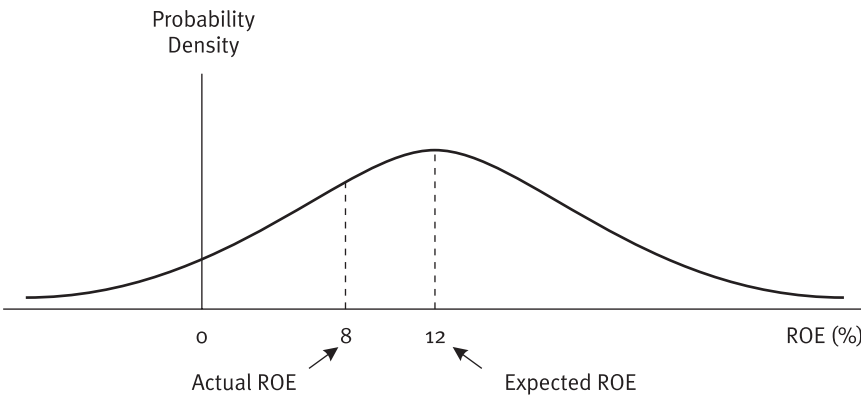
**Because Santa Fe uses no debt financing**, the uncertainty regarding its future ROE defines the firm’s business risk. The key point here is that we are trying to measure the riskiness of the business before it is influenced by the use of debt financing. Business risk varies not only from industry to industry but also among firms in a given industry. Furthermore, business risk can change over time. As mentioned in the previous chapter, hospitals were regarded for years as having little business risk, but events in the 1980s and 1990s—primarily the move of governmental payers to prospective payment and the increasing bargaining power of managed care plans—greatly increased the industry’s business risk.

## Trend in Return on Equity (ROE)



**FIGURE 10.1**  
Sante Fe  
Healthcare:  
Trend in ROE,  
1996–2006,  
and Subjective  
ROE  
Distribution,  
2006

## Subjective Probability Distribution of (ROE) for 2006



Business risk depends on a number of factors, including the following:

- **Demand (volume) variability.** The more stable the demand for a business's products or services, other things held constant, the lower its business risk.
- **Sales price variability.** Businesses whose products or services are sold in markets with highly volatile prices are exposed to more business risk than firms whose sales prices are more stable.
- **Input cost variability.** Businesses whose input costs—labor, materials, and capital—are highly uncertain are exposed to a high degree of business risk.



- **Ability to respond to changing market conditions.** Some businesses are better able than others to respond to changing market conditions. For example, some hospitals are in a better position to raise their own prices when input costs rise. Or, some hospitals are more adept at cutting costs if the need arises. The greater the ability to respond to changing market conditions, the lower the degree of business risk, other things held constant.
- **Liability exposure uncertainty.** The greater the uncertainty in liability losses, the greater the business risk. For example, hospitals that perform a large number of high-risk surgeries face more liability risk than do hospitals with a limited surgery program.
- **Operating leverage.** *Operating leverage* measures the proportion of fixed costs, as opposed to variable costs, in a business's cost structure. If a high percentage of a business's costs are fixed, and hence do not decline when demand falls off, then the business is exposed to a relatively high degree of business risk.

Each of the factors that influence business risk is determined partly by industry characteristics, but each of them also can be influenced to some extent by managerial decisions. For example, consider operating leverage. Higher fixed costs generally are associated with more highly technical, capital-intensive businesses and industries. Thus, hospitals have higher fixed costs, relative to total costs, than do home health care agencies. Also, healthcare providers that employ highly skilled workers who must be retained and paid even during periods of low utilization have a relatively high proportion of fixed costs.

To what extent can businesses control their operating leverage? Operating leverage is determined by industry characteristics to a large extent. Firms such as drug manufacturers, hospitals, and ambulatory care clinics simply must have heavy investments in fixed assets and labor, which results in a high proportion of fixed costs and hence high operating leverage. On the other hand, firms such as home health agencies generally have significantly lower fixed-cost proportions and hence lower operating leverage. Still, although industry factors do exert a major influence, all businesses do have some control over their operating leverage. For example, a hospital can expand its diagnostic imaging capability by either buying a new imaging device or by leasing it on a per procedure basis.<sup>2</sup> If the device were purchased, the hospital would incur fixed costs, but the device's per procedure operating costs would be relatively low. If leased, the hospital would have lower fixed costs, but the variable—per procedure—costs for the device would be higher. Thus, by its financing decisions, and also by its capital investment decisions, a business can influence its operating leverage and hence its basic business risk.

## Financial Risk

*Financial risk* is the additional risk placed on owners as a result of the decision to use debt financing. Conceptually, a business has a certain amount of risk inherent in its operations—this is its business risk. However, the use of debt financing, or *financial leverage*, concentrates (increases) the risk seen by the business's owners. Because the return to debt suppliers is fixed by contract and is independent of fluctuations in the business's revenues and costs, creditors bear a fixed amount of the firm's business risk. To illustrate the concept, consider the Super Health illustration. The business can be financed either by \$200,000 of equity or \$100,000 of equity and \$100,000 of debt. Using debt financing concentrates the business risk of the enterprise, which is fixed, on a smaller equity base and hence increases owner's risk.

Business and financial risk can be easily measured. Refer again to Table 10.2. The standard deviation of ROE to Super Health if it uses no debt financing,  $\sigma_{\text{ROE}}(\text{U})$ , where U stands for unleveraged (no debt), measures its business risk. The standard deviation of ROE at any positive debt level,  $\sigma_{\text{ROE}}(\text{L})$ , where L stands for leveraged (some debt), measures the risk borne by owners. Because the use of debt financing increases the risk to owners,  $\sigma_{\text{ROE}}(\text{L})$  is always greater than  $\sigma_{\text{ROE}}(\text{U})$ . Financial risk is the difference between the actual risk seen by owners and the inherent business risk of the enterprise, or  $\sigma_{\text{ROE}}(\text{L}) - \sigma_{\text{ROE}}(\text{U})$ . Applying these measures to Super Health, we see that its business risk is  $\sigma_{\text{ROE}}(\text{U}) = 10.6\%$  and its risk under 50 percent debt financing is  $\sigma_{\text{ROE}}(\text{L}) = 21.2\%$ , so the financial risk at that level of debt is  $\sigma_{\text{ROE}}(\text{L}) - \sigma_{\text{ROE}}(\text{U}) = 21.2\% - 10.6\% = 10.6\%$ .

Operating leverage and financial leverage normally work in the same way; they both increase expected ROE, but they also increase the risk borne by owners. Operating leverage affects the business risk of the enterprise, while financial leverage affects its financial risk.

1. What is business risk? How can it be measured?
2. What are some determinants of business risk?
3. What is operating leverage?
4. What is financial risk? How can it be measured?
5. What are the similarities between operating leverage and financial leverage?

## Self-Test Questions

## Capital Structure Theory

The preceding discussion points out the fact that the use of debt financing increases the expected ROE capital, but it also increases the overall risk of the business. The obvious question now is whether the benefit of debt financing—increased expected return—exceeds the cost of debt financing—increased risk.

*Capital structure theory* attempts to determine the relationship between the amount of debt financing and the value of a business; thus, its goal is to determine, after risk is considered, whether the use of financial leverage is beneficial or not. The theory is directly applicable to investor-owned businesses, but it also provides some guidance for not-for-profit businesses. Although capital structure theory does not provide a complete answer to the optimal capital structure question, it does provide many insights into the value of debt financing versus equity (or fund) financing. Thus, an understanding of capital structure theory will aid managers in making capital structure decisions.

### The Modigliani-Miller Models

Until 1958, capital structure theories were little more than loose assertions about investor behavior rather than carefully constructed models that could be tested by formal statistical studies. In what has been called the most influential set of financial papers ever published, *Franco Modigliani and Merton Miller (MM)* addressed the capital structure issue in a rigorous, scientific fashion and set off a chain of research that continues to this day.<sup>3</sup>

**Assumptions** To begin, Modigliani and Miller made the following assumptions, some of which were later relaxed.

- The business risk of an enterprise can be measured by the standard deviation of earnings before interest and taxes ( $\sigma_{\text{EBIT}}$ ). Firms with the same degree of business risk are said to be in a *homogeneous risk class*.
- All present and prospective investors have identical estimates of each firm's future EBIT; that is, investors have *homogeneous expectations* about expected future corporate earnings and the riskiness of those earnings.
- Stocks and bonds are traded in *perfect capital markets*. This assumption implies, among other things, that there are no brokerage costs and that investors—both individual and institutions—can borrow at the same rate as corporations.
- The debt of businesses and individuals is *riskless*, so the interest rate on debt is the risk-free rate. Furthermore, this situation holds regardless of how much debt a business, or an individual, uses.
- All cash flows are perpetuities; that is, businesses are assumed to have *zero growth* with an “expectationally constant” EBIT, and its bonds are perpetuities. “Expectationally constant” means that investors expect EBIT to be constant, but the realized, or after the fact, value in any year can be different from the expected level.

**MM Without Taxes** Modigliani and Miller first performed their analysis under the assumption that **there are no corporate or personal income taxes**. On the basis of the preceding assumptions, and in the absence of taxes, they proposed and then algebraically proved two propositions:<sup>4</sup>

The value of any business,  $V$ , is established by discounting its expected net operating income (EBIT when  $T = 0$ ) at a constant rate that is appropriate for its risk class, regardless of the amount of debt financing used:

*Proposition I*

$$V_L = V_U = \frac{\text{EBIT}}{\text{CCC}} = \frac{\text{EBIT}}{R(R_{eU})}$$

Here, the subscripts L and U designate levered—with debt financing—and unlevered—without debt financing—businesses in a given risk class; CCC is the corporate cost of capital; and  $R(R_{eU})$  is the required rate of return on equity for an unlevered (zero debt) business. The key point here is that the discount rate used to determine the value of the business is a constant,  $\text{CCC} = R(R_{eU})$ , regardless of the amount of debt financing used, and because EBIT is unaffected by debt financing, the value of the business also is a constant.

Since  $V$ , as established by Proposition I, is a constant regardless of the level of debt financing, then **under the MM model with no taxes, the value of a business is independent of its leverage.** This also implies (1) that the CCC to any business is completely independent of its capital structure and (2) that the CCC for all businesses with the same business risk (in the same risk class) is equal to the cost of equity to an unlevered firm in that risk class, regardless of the amount of debt financing used.

The cost of equity to a levered firm,  $R(R_{eL})$ , is equal to (1) the cost of equity to an unlevered firm in the same risk class,  $R(R_{eU})$ , plus (2) a risk premium that depends on both the differential between the costs of equity and debt to an unlevered firm and the amount of leverage used:

*Proposition II*

$$R(R_{eL}) = R(R_{eU}) + \text{Risk premium} = R(R_{eU}) + \{[R(R_{eU}) - R(R_d)] \times (D/E)\}.$$

Here,  $D$  = market value of the business's debt;  $E$  = market value of the business's equity; and  $R(R_d)$  = constant cost of debt. Proposition II states that **as a business's use of debt increases, its cost of equity also rises and in a mathematically precise manner.**

Taken together, the two MM propositions imply that the inclusion of debt in a business's capital structure will not increase its value because the benefits of the less costly, as compared to equity, debt financing will be exactly offset by an increase in the riskiness, and hence in the cost, of the business's equity. Thus, MM theory implies that **in a world without taxes, both the value of a firm and its corporate cost of capital are unaffected by its capital structure.**

MM used an *arbitrage proof* to support their propositions.<sup>5</sup> They showed that, under their assumptions, if two firms differed only (1) in the way they are financed and (2) in their total market values, then investors would sell shares of the higher-valued firm, buy those of the lower-valued firm, and continue this process until the firms had exactly the same market value. Thus,

the actions of investors would ensure that the two firms had identical market values. Once the values are proved to be equal, the two MM propositions are the logical result.<sup>6</sup>

Note that each of the assumptions listed in the beginning of this section is necessary for the arbitrage proof to work. For example, if the firms are not identical in business risk, then the arbitrage process cannot be invoked. We will discuss further implications of the assumptions later in the chapter.

**MM with Corporate Taxes** Modigliani and Miller's original work, published in 1958, assumed zero taxes. In 1963, MM published a second article that **included corporate tax effects**. With corporate income taxes, the authors concluded that the use of financial leverage will increase a business's value. When businesses are subject to income taxes, the Modigliani and Miller propositions are as follows.

**Proposition I** The value of a levered firm is equal to (1) the value of an unlevered firm in the same risk class plus (2) the gain from leverage, which is the present value of the tax savings and which equals the corporate tax rate,  $T$ , times the amount of debt the firm uses,  $D$ :<sup>7</sup>

$$V_L = V_U + (T \times D).$$

The important point here is that when corporate taxes are introduced, the value of a levered business exceeds that of a similar unlevered business by the amount  $T \times D$ . Note also that the differential increases as the use of debt increases, so a business's value is maximized at virtually 100 percent debt financing.

To find the MM value for  $V_U$  for any business, recognize that all businesses are assumed to have zero growth, a constant EBIT, and all earnings are paid out as dividends. Thus, the total market value of a business's equity,  $E$ , can be found using perpetuity valuation techniques as follows:

$$E = \frac{\text{Dividends}}{R(R_c)} = \frac{\text{Net income}}{R(R_c)} = \frac{\{\text{EBIT} - [R(R_d) \times D]\} \times (1 - T)}{R(R_c)}.$$

With zero debt,  $D = \$0$  and the total value of the firm is its equity value, so

$$E = V_U = \frac{\text{EBIT} \times (1 - T)}{R(R_{cU})}.$$

**Proposition II** The cost of equity to a levered firm is equal to (1) the cost of equity to an unlevered firm in the same risk class (equal business risk) plus (2) a risk premium that depends on the differential between the costs of equity and debt to an unlevered firm, the amount of financial leverage used, **and the corporate tax rate**:

$$\begin{aligned} R(R_{eL}) &= R(R_{eU}) + \text{Risk premium} \\ &= R(R_{eU}) + \{[R(R_{eU}) - R(R_d)] \times (1 - T) \times (D/E)\}. \end{aligned}$$

Notice that Proposition II here is identical to the corresponding without-tax equation, **except for the term  $(1 - T)$** . Because  $(1 - T)$  is less than 1.0 for any positive tax rate, the imposition of corporate taxes causes the cost of equity to rise at a slower rate when debt is used than it did in the absence of taxes. It is this characteristic, along with the fact that the effective cost of debt is reduced because of the tax deductibility of interest, that produces the Proposition I result—namely, the increase in firm value as leverage increases.

To illustrate the Modigliani and Miller models, assume that the following data and conditions hold for New England Clinical Laboratories, Inc., an old, established firm that operates in several no-growth areas in rural Maine, New Hampshire, and Vermont:

### *Illustration of the MM models*

- New England currently has no debt; it is an all-equity firm.
- Expected EBIT = \$2,400,000. EBIT is not expected to increase over time, so New England is in a no-growth situation.
- New England pays out all of its income as dividends because no retained earnings are required to finance growth. (Worn-out assets are replaced using depreciation cash flow.)
- If New England begins to use debt, it can borrow at a rate  $R(R_d) = 8\%$ . This borrowing rate is constant, and it is independent of the amount of debt used. Any money raised by selling debt would be used to retire common stock, so New England's assets and EBIT would remain constant.
- The risk of New England's assets, and thus its EBIT, is such that its shareholders require a rate of return,  $R(R_{eU})$ , of 12 percent if no debt is used.

To begin, assume that there are no taxes, so  $T = 0\%$ . At any level of debt, Proposition I can be used to find New England's value, \$20 million:

### *With Zero Taxes*

$$V_L = V_U = \frac{\text{EBIT}}{R(R_{eU})} = \frac{\$2.4 \text{ million}}{0.12} = \$20.0 \text{ million.}$$

With zero debt, the \$20 million represents all-equity value. Now, assume that New England decides to use \$10 million of debt financing. According to Proposition I, its total value will not change, so the business's equity value must fall to \$10 million:

$$E = V - D = \$20 \text{ million} - \$10 \text{ million} = \$10 \text{ million.}$$

This decrease occurs because the \$10 million of new debt financing is used to repurchase \$10 million of existing equity.

We can also find New England's cost of equity,  $R(R_{eL})$ , and its corporate cost of capital (CCC) at a debt level of \$10 million. First, we use Proposition II to find  $R(R_{eL})$ , New England's levered cost of equity:

$$\begin{aligned} R(R_{eL}) &= R(R_{eU}) + \{[R(R_{eU}) - R(R_d)] \times (D/E)\} \\ &= 12\% + \{[12\% - 8\%] \times (\$10\text{million}/\$10\text{million})\} \\ &= 12\% + 4.0\% = 16.0\%. \end{aligned}$$

Now, we can find the firm's corporate cost of capital:

$$\begin{aligned} \text{CCC} &= [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_{eL})] \\ &= [(\$10/\$20) \times 8\% \times 1.0] + [(\$10/\$20) \times 16.0\%] = 12.0\%. \end{aligned}$$

We can easily expand the illustration to show New England's value and corporate cost of capital at various debt levels. We would see that in an MM world without taxes, financial leverage does not matter: the value of the firm and its overall cost of capital are independent of the amount of debt financing used. The key to this result is that the additional risk imposed by the use of debt financing increases the cost of equity just enough to counteract any benefit that results from the fact that debt costs are lower than equity costs. In essence, each of these security classes is priced—has a required rate of return—such that the business is indifferent to the choice. Debt costs less than equity, but to the business it is a riskier form of financing than equity. Thus, each type of capital is priced correctly on the basis of the risk that it brings to a business.

### With Corporate Taxes

To illustrate the MM model with corporate taxes, assume that all of the previous assumptions hold except these two:

1. Expected EBIT = \$4,000,000.
2. New England has a 40 percent federal-plus-state tax rate, so  $T = 40\%$ .

Note that we increased New England's EBIT from \$2.4 million to \$4 million to make the numerical comparison between the two models easier. If we had not, **the introduction of corporate taxes would lower New England's value by Expected EBIT  $\times$  (1 - T) = \$2.4 million  $\times$  0.6 = \$1.44 million.**

When New England has zero debt but pays taxes, and its expected EBIT is increased to \$4 million, its value with zero debt financing is \$20 million:

$$V_U = \frac{\text{EBIT} \times (1 - T)}{R(R_{eU})} = \frac{\$4 \text{ million} \times 0.6}{0.12} = \$20.0 \text{ million.}$$

With \$10 million of debt in a world with taxes, Proposition I indicates that New England's total market value rises to \$24 million.

$$V_L = V_U + (T \times D) = \$20 \text{ million} + (0.4 \times \$10 \text{ million}) = \$24 \text{ million.}$$

Therefore, the value of New England's equity must be \$14 million:

$$E = V_L - D = \$24 \text{ million} - \$10 \text{ million} = \$14 \text{ million.}$$

To find New England's cost of equity and its corporate cost of capital at a debt level of \$10 million, we first use Proposition II to find the levered cost of equity:

$$\begin{aligned} R(R_{eL}) &= R(R_{eU}) + \{[R(R_{eU}) - R(R_d)] \times (1 - T) \times (D/E)\} \\ &= 12\% + [(12\% - 8\%) \times 0.6 \times (\$10 \text{ million}/\$14 \text{ million})] \\ &= 12\% + 1.71\% = 13.71\%. \end{aligned}$$

Then, we can find the firm's weighted average cost of capital:

$$\begin{aligned} CCC &= [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_{eL})] \\ &= [(\$10/\$24) \times 8\% \times 0.6] + [(\$14/\$24) \times 13.71\%] = 10.0\%. \end{aligned}$$

Again, we can easily expand the illustration to include additional debt levels. We see that in an MM world with corporate taxes, financial leverage does matter: the value of the firm is maximized and its overall cost of capital is minimized if it uses virtually 100 percent debt financing. Furthermore, we know that the increase in value solely results from the tax deductibility of interest payments, which causes both the cost of debt and the increase in the cost of equity with leverage to be reduced by  $(1 - T)$ . With tax deductibility of interest payments, the cost of debt is now less than that warranted by the risk that it brings to a business, and hence businesses prefer debt to equity, which remains fairly priced in relationship to the risk that it brings to a business.

1. What is the single most important conclusion of the MM zero-tax model?
2. What is the single most important conclusion of the MM model with corporate taxes?
3. What is the underlying cause of the "gain from leverage" in the MM model with corporate taxes?

## Self-Test Questions

### The Miller Model



Although Modigliani and Miller included **corporate** taxes in the second version of their model, they did not extend the model to analyze the effects of



**personal** taxes. However, Merton Miller later introduced a model designed to show how leverage affects firms' values when both personal and corporate taxes are taken into account.<sup>8</sup> To explain Miller's model, let us begin by defining  $T_c$  as the corporate tax rate,  $T_e$  as the personal tax rate on equity returns, and  $T_d$  as the personal tax rate on debt returns. Note that equity returns typically come partly as dividends and partly as capital gains, so  $T_e$  is a weighted average of the effective tax rates on dividends and capital gains, while essentially all debt income comes from interest, which is taxed at investors' top rates.

With personal taxes included, **and under the remaining assumptions used in the earlier MM models**, the value of an unlevered firm is found by the following equation:

$$V_U = \frac{\text{EBIT} \times (1 - T_c) \times (1 - T_e)}{R(R_{eU})}$$

Note that this is the same equation used in the previous examples, except for the addition of the  $(1 - T_e)$  term, which adjusts for personal taxes. Now, the numerator shows how much of a business's operating cash flow is available to investors after the unlevered firm itself pays corporate income taxes and the equityholders subsequently pay personal taxes on the equity income. In effect, the numerator is the perpetual after-all-taxes cash flow stream to equity investors. Because the introduction of personal taxes lowers the usable income to equityholders, personal taxes reduce the value of the unlevered firm, other things held constant.

The Miller model, which can be derived using an arbitrage proof similar to the one used to prove the MM models, is as follows.

$$V_L = V_U + \left\{ \left[ 1 - \frac{(1 - T_c) \times (1 - T_e)}{1 - T_d} \right] \times D \right\}$$

Here are some relevant points about the Miller Model:

- The term bracketed by [ ], when multiplied by  $D$ , is the new gain from leverage. It replaces  $T = T_c$  in the earlier MM model with corporate taxes.
- If we ignore all taxes—that is, if  $T_c = T_e = T_d = 0$ —then the bracketed term reduces to zero, so, in that case, the Miller model is the same as the original MM model without taxes.
- If we ignore personal taxes—that is, if  $T_e = T_d = 0$ —then the bracketed term reduces to  $T_c$ , so the Miller model reduces to the MM model with corporate taxes.
- If the effective personal tax rates on stock and bond incomes were equal—that is, if  $T_e = T_d$ —then the bracketed term would again reduce to  $T_c$ .
- If  $(1 - T_c) \times (1 - T_e) = 1 - T_d$ , then the bracketed term would go to zero and the value of using leverage would also be zero. This implies that the tax advantage of debt to the firm would be exactly offset by the

personal tax advantage of equity. Under this condition, capital structure would have no effect on a firm's value or its cost of capital, so we would be back to Modigliani and Miller's original zero-tax theory.

- Because the tax rate on dividends and capital gains is less than the tax rate on ordinary income (generally 15 percent versus 28, 33, or 35 percent), and because taxes on capital gains are deferred, the effective tax rate on equity income is less than the effective tax rate on debt income. This being the case, what would the Miller model predict as the gain from leverage? To answer this question, assume that the tax rate on corporate income is  $T_c = 34\%$ , the effective rate on bond income is  $T_d = 36\%$ , and the effective rate on stock income is  $T_e = 10\%$ . Using these values in the Miller model, we find that a levered firm's value increases over that of an unlevered firm by 18 percent of the market value of corporate debt:

$$\begin{aligned} \text{Gain from leverage} &= \left[ 1 - \frac{(1 - T_c) \times (1 - T_e)}{1 - T_d} \right] \times D \\ &= \left[ 1 - \frac{(1 - 0.34) \times (1 - 0.10)}{1 - 0.36} \right] \times D \\ &= [1 - 0.93] \times D = 0.07 \times D. \end{aligned}$$

Note that with these data, the MM model with corporate taxes would indicate a gain from leverage of  $T_c \times D = 0.34 \times D$ , or 34 percent of the amount of corporate debt. Thus, with these assumed tax rates, adding personal taxes to the model significantly lowers the benefit derived from corporate debt financing. In general, whenever the effective tax rate on equity income is less than the effective rate on debt income, the Miller model produces a lower gain from leverage than is produced by the MM with corporate taxes model. The fact that personal tax rates favor equity investments means that interest rates must be higher (than in the absence of personal taxes) on corporate debt financing to attract debt capital. These higher interest rates reduce the value of debt financing to businesses and hence lowers the gain from leverage.

In his paper, Miller argued that firms in the aggregate would issue a mix of debt and equity securities such that the before-tax yields on corporate securities and the personal tax rates of the investors who bought these securities would adjust until equilibrium was reached. At equilibrium,  $(1 - T_d)$  would equal  $(1 - T_c) \times (1 - T_e)$ , so, as we noted earlier, the tax advantage of debt to the firm would be exactly offset by personal taxation and capital structure would have no effect on a firm's value or its cost of capital. Thus, according to Miller, the conclusions derived from the original MM zero-tax model are correct!

Others have extended and tested Miller's analysis. Generally, these extensions disagree with Miller's conclusion that there is no advantage to the use of corporate debt. In the United States, the effective tax rate on equity income is less than the effective tax rate on debt income, so it appears that there is an

advantage to the corporate use of debt financing. However, Miller's work does show that personal taxes offset some of the benefits of corporate debt, so the tax advantages of corporate debt probably are less than were implied by the earlier MM model that considered only corporate taxes.

### Self-Test Questions

1. How does the Miller model differ from the MM model with corporate taxes?
2. What are the implications of the Miller model under various tax assumptions?
3. What is the primary implication of the Miller model given the current tax situation in the United States?

### Criticisms of the MM and Miller Models

The conclusions of each of the three models follow logically from their initial assumptions: if the assumptions are correct, then the resulting conclusions must be reached. However, both academics and managers have voiced concern over the validity of these models, and virtually no businesses follow the recommendations of any of the models. The MM zero-tax model leads to the conclusion that capital structure does not matter, but we observe some regularities in structure within industries. Furthermore, when used with “reasonable” tax rates, both the MM model with corporate taxes and the Miller model lead to the conclusion that firms should use 100 percent debt financing. That situation is not observed in practice except by firms whose equity has been eroded by operating losses. Those who disagree with the MM and Miller models and their suggestions for financial policy generally attack the models on the grounds that their assumptions do not reflect real-world conditions. Some of the main objections include the following:

- Modigliani and Miller and, later, Miller assume that personal and corporate leverage are perfect substitutes. However, an individual investing in a levered firm has less loss exposure, and hence more limited liability, than if he or she used “homemade” leverage by taking on personal debt. This increased personal risk exposure would tend to restrain investors from engaging in the type of arbitrage required to derive the models, and that can cause the models to be incorrect.
- Brokerage costs were assumed away in the MM and Miller models. However, brokerage and other transaction costs do exist, and they too impede the arbitrage process.
- MM initially assumed that both businesses and individual investors can borrow at the risk-free rate. Although risky debt has been introduced into the analysis by others with no significant change in results, it is still necessary to assume that both corporations and investors can borrow at

the same rate to reach the MM and Miller conclusions. Although major institutional investors probably can borrow at the corporate rate, many institutions are not allowed to borrow to buy securities. Furthermore, most individual investors must borrow at higher rates than those paid by large corporations.

- The MM and Miller models assume that there are no costs associated with financial distress. These costs are discussed in the next section.

1. Should we accept one of the models presented thus far as being correct? Why or why not?
2. In your view, which of the assumptions used in the models is most likely to cause the models to be invalid?

## Self-Test Questions

### Financial Distress Costs

Some of the assumptions inherent in the MM and Miller models can be relaxed, and when this is done, their basic conclusions remain unchanged. However, as we discuss next, when financial distress costs are added, the MM and Miller results are altered significantly.

A number of firms experience *financial distress* each year, and some of them are forced into bankruptcy. Financial distress includes, but is not restricted to, bankruptcy, and when it occurs, several things can happen including:

- Arguments between claimants often delay the liquidation of assets. Bankruptcy cases can take many years to settle, and during this time equipment loses value, buildings are vandalized, inventories become obsolete, and so on.
- Lawyer's fees, court costs, and administrative expenses can absorb a large part of a business's value. Together, the costs of physical deterioration plus legal fees and administrative expenses are called the *direct costs of bankruptcy*.
- Managers generally lose their jobs when a firm fails. Knowing this, the managers of a business that is in financial distress often take actions that keep it alive in the short run but that dilute its long-run value. For example, a hospital in financial distress may fail to modernize or may sell off valuable nonessential assets at bargain prices to raise cash or cut costs so much that the quality of its services is impaired and the firm's long-run market position is eroded.
- Stakeholders of organizations that are experiencing financial difficulties are aware of the problems and often take actions that further damage troubled firms. For example, patients may go elsewhere, suppliers may be reluctant to sell on credit, and it may be difficult to recruit and retain medical staff.

Suboptimal managerial actions associated with financial distress, as well as the costs imposed by stakeholders, are called the *indirect costs of financial distress*. Of course, a business in financial distress may incur these costs even if it does not go into bankruptcy; bankruptcy is just one point on the continuum of financial distress.

All things considered, the direct and indirect costs associated with financial distress are high, but financial distress typically occurs only if a firm uses debt financing because debt-free businesses rarely experience financial distress. Therefore, the greater the use of debt financing, and the larger the fixed interest charges, the greater the probability that a decline in earnings will lead to financial distress, and hence the higher the probability that the costs of financial distress will be incurred.

An increase in the probability of financial distress raises a firm's cost of equity capital and hence lowers the current value of the firm's equity. Furthermore, the probability of financial distress increases with leverage, causing the expected present value cost of financial distress to rise as more and more debt financing is used. A firm's creditors also feel the effects of financial distress. Businesses that experience financial distress have a higher probability of defaulting on debt payments, so the expectation of financial distress influences creditors' required rates of return: the higher the probability of financial distress, the higher the required return on debt. Thus, as a firm uses more and more debt financing, and hence increases the probability of financial distress, its cost of debt also increases.

## Self-Test Questions

1. Describe some types of financial distress costs.
2. How are financial distress costs related to the use of financial leverage?

## Trade-off Models

Both the MM with corporate taxes and Miller models as modified to reflect financial distress costs are described as *trade-off models*; that is, the optimal capital structure is found, at least conceptually, by balancing the tax shield benefits of leverage against the financial distress costs of leverage, so the costs and benefits are “traded off” against one another.

### Model Structure

If the MM model with corporate taxes were correct, a firm's value would rise continuously as it moved from zero debt toward 100 percent debt: the equation  $V_L = V_U + (T \times D)$  shows that  $T \times D$ , and hence  $V_L$ , is maximized if  $D$  is at a maximum. Recall that the rising component of value,  $T \times D$ , results directly from the tax shelter provided by interest on the debt. However, the present value of the costs associated with potential future financial distress

would cause  $V_L$  to decline as the level of debt increases. Therefore, the MM with corporate taxes model's relationship between a firm's value and its use of leverage has this form when financial distress costs are added:

$$V_L = V_U + (T \times D) - \text{PV of expected financial distress costs.}$$

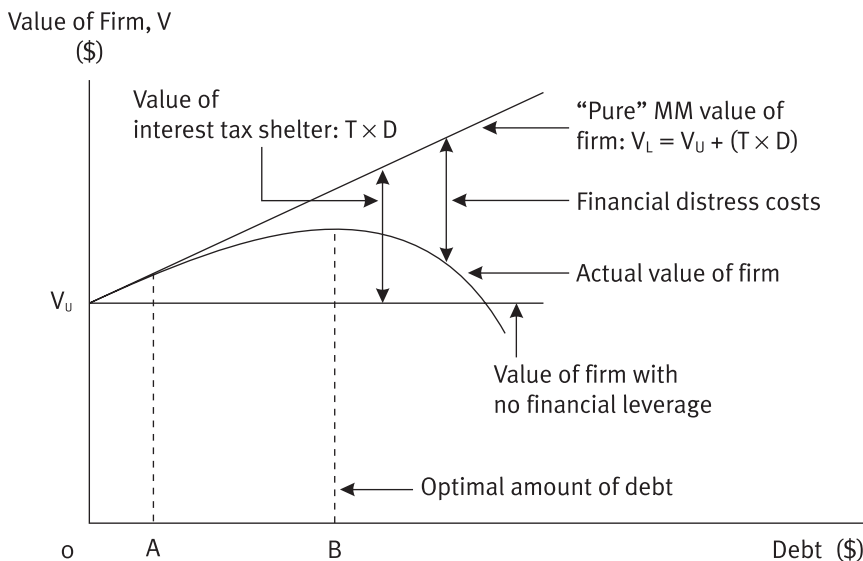
The relationship expressed in this equation is graphed in Figure 10.2. The tax shelter effect totally dominates until the amount of debt reaches Point A. After Point A, financial distress costs become increasingly important, offsetting some of the tax advantages. At Point B, the marginal tax shelter benefits of additional debt are exactly offset by the marginal disadvantages of debt, and beyond Point B, the marginal disadvantages outweigh the marginal benefits.

The Miller model can also be modified to reflect financial distress costs. The equation would be identical to that developed above for the MM with corporate taxes model, except that the gain-from-leverage term,  $T \times D$ , would be adjusted to reflect the addition of personal taxes. In either the MM or Miller models, the gain from leverage can at least be roughly estimated, but the value reduction resulting from potential financial distress costs is almost entirely subjective. We know that these costs must increase as the use of debt financing rises, but we simply do not know the specific functional relationship.

### Model Implications

The trade-off models are not capable of specifying precise optimal capital structures, but they do enable us to make three statements about debt usage:

1. Higher-risk businesses, as measured by the variability of returns on the business's assets, ought to borrow less than lower-risk firms, with other



**FIGURE 10.2**  
Net Effect of  
Financial  
Leverage on the  
Value of  
the Firm

things being equal. The greater this variability, the greater the probability of financial distress at any level of debt, and hence the greater the expected costs of distress. Thus, firms with lower business risk can borrow more before the expected costs of distress offset the tax advantages of borrowing.

2. Businesses that employ tangible assets, such as real estate and standardized equipment, should borrow more than firms whose value is derived either from intangible assets, such as intellectual capital and goodwill, or from growth opportunities. The costs of financial distress depend not only on the probability of incurring distress but also on what happens if distress occurs. Specialized assets, intangible assets, and growth opportunities are more likely to lose value if financial distress occurs than are standardized, tangible assets.
3. Businesses that are currently paying taxes at the highest rate, and that are likely to continue to do so in the future, should carry more debt than should firms with current and/or prospectively lower tax rates. High corporate tax rates lead to greater benefits from debt financing, and hence high-tax-rate firms can carry more debt, other factors held constant, before the tax shield is offset by financial distress costs.

According to the trade-off models, each business should set its target capital structure such that its costs and benefits of leverage are balanced at the margin because such a structure will maximize its value. We would expect to find actual target structures that are consistent with the three points just noted. Furthermore, we would generally expect to find that firms within an industry have similar capital structures because such firms have roughly the same types of assets, business risk, and profitability.

### *The Empirical Evidence*

The trade-off models have intuitive appeal because they lead to the conclusion that both no debt and all debt are bad, while a “moderate” debt level is good. However, we must ask ourselves whether these models explain actual behavior. If they do not, then we must search for other explanations or else assume that managers, and hence investors, are acting irrationally, which is an assumption that we are unwilling to make.

The trade-off models do have some empirical support.<sup>9</sup> For example, businesses that have primarily tangible assets tend to borrow more heavily than do firms whose value stems from intangibles and/or growth opportunities. However, other empirical evidence refutes the trade-off models. First, several studies have examined models of financing behavior to see if firms’ financing decisions reflect adjustment toward a target capital structure. These studies provide some evidence that this occurs, but the explanatory power of the models is very low, suggesting that trade-off models capture only a part of actual behavior. Second, no study has clearly demonstrated that a firm’s tax

rate has a predictable, material effect on its capital structure. In fact, firms used debt financing long before corporate income taxes even existed. Finally, actual debt ratios tend to vary widely across apparently similar firms, whereas the trade-off models suggest that the use of debt should be relatively consistent within industries.

All in all, empirical support for the trade-off models is not strong, which suggests that other factors not incorporated into these models are also at work. In other words, the trade-off models do not tell the full story.

1. What is a trade-off model of capital structure?
2. What are the implications of the trade-off models?
3. Does the empirical evidence support the trade-off models?

## Self-Test Questions

### Asymmetric Information Model of Capital Structure

The asymmetric information model of capital structure traces its roots back to the work done in the 1960s by Gordon Donaldson.<sup>10</sup> Donaldson conducted an extensive survey of investor-owned corporations to find out how managers make financing decisions and reached the following conclusions:

- Businesses prefer to finance with internally generated funds—that is, with retained earnings and depreciation cash flow.
- Businesses set target dividend payout ratios on the basis of their expected future investment opportunities and their expected future cash flows. The target payout ratio is set at a level such that expected retentions plus depreciation cash flow will meet expected capital expenditure requirements.
- Dividends are “sticky” in the short run because firms are reluctant to make major changes in the dollar dividend, and they are especially reluctant to cut the dividend. Thus, in any given year, depending on realized cash flows and actual investment opportunities, a business may or may not have sufficient internally generated funds to cover its capital expenditures.
- If a business has more internal cash flow than is needed for capital investment, then it will invest the excess in marketable securities or else use the funds to retire debt.
- If a business has insufficient internal cash flow to finance its capital investments, then it will first draw down its marketable securities portfolio, then issue debt, then issue convertible bonds—bonds that can be exchanged in the future for common stock—and only as a last resort will it sell new equity.

Thus, Donaldson observed a “pecking order” of financing, and not the balanced approach that is called for by the trade-off models. Indeed, the pecking order causes firms to move away from, rather than toward, a



well-defined capital structure because equity funds are raised in two forms: (1) retained earnings at the top of the pecking order and (2) new common stock sales at the bottom.

For many years, no theoretical model was available to explain this observed behavior of firms, so Donaldson's survey results were not given much credence by academics. Then, Stewart C. Myers proposed the *asymmetric information model* of capital structure.<sup>11</sup> The model is based on two assumptions: (1) managers know more about their firms' future prospects than do investors and (2) managers are motivated to maximize the wealth of their firms' current shareholders.

If managers think that their firm's equity is undervalued, they will be motivated to use debt financing because selling stock at a "bargain" price is detrimental to the firm's existing shareholders. However, if managers think that their firm's equity is overvalued, they will be motivated to issue new common stock. By issuing stock for more than it is actually worth, value is transferred from the buyers of the new stock to the existing shareholders. Thus, managers are motivated to issue new stock only when they believe that the stock is overvalued. Because equity investors are rational, they treat new common stock issues as "signals" that management considers the stock to be overvalued. Thus, investors revise downward their expectations for the firm and the stock price falls.<sup>12</sup>

Because new equity issues have an adverse effect on stock price, managers are reluctant to issue new stock. Although large amounts of new stock are issued each year, the vast majority is issued by small, rapidly growing firms that have large capital needs and hence little choice. Equity issues by mature firms are relatively rare. If external financing is required, debt is the first choice and new common stock will be used only in unusual circumstances. Thus, the asymmetric information model leads managers to act in accordance with Donaldson's pecking order.

Because managers want to avoid new stock issues, especially when they might be least advantageous, it becomes prudent for firms to maintain a *reserve borrowing capacity* that can be used whenever capital investments require an unusually large amount of external capital. By maintaining a reserve borrowing capacity, and then tapping it when necessary, managers can avoid issuing new common stock under unfavorable conditions.

Note that the degree of information asymmetry and its impact on investors' perceptions differ substantially across firms. To illustrate the concept, consider that the degree of asymmetry is typically much greater in the drug industry than in the hospital industry because success in the drug industry depends on secretive proprietary research and development. Thus, managers in the drug industry hold significantly more information about their firms' prospects than do outside analysts and investors. Also, start-up businesses with limited capital and good growth opportunities are recognized as having to use external financing, so new stock offerings by such firms are not viewed with as

much concern by investors as are new offerings by mature firms with limited growth opportunities. Thus, although the asymmetric information theory is applicable to all investor-owned firms, its influence on managerial decisions varies from firm to firm and over time.

1. Briefly, explain the asymmetric information model of capital structure.
2. What does the model suggest about capital structure decisions?

## Self-Test Questions

### A Summary of the Capital Structure Models



The great contribution of the trade-off models of MM, Miller, and their followers is that these models identify the specific benefits and costs of using debt—the tax effects, financial distress costs, and so on. Prior to these models, no capital structure theory existed and we had no systematic way of analyzing the effects of debt financing.

The trade-off model is summarized in Figure 10.3. The top graph shows the relationships between the debt ratio and the cost of debt, cost of equity, and the corporate cost of capital. Both the cost of equity and the effective (after-tax) cost of debt rise steadily with increases in leverage, but the rate of increase accelerates at higher debt levels, reflecting the increased probability of financial distress and its attendant costs. The corporate cost of capital first declines, then hits a minimum, and then begins to rise. Note that a business's corporate cost of capital is minimized and its value is maximized **at the same capital structure**. Also note that the general shapes of the curves apply once we consider the effects of financial distress costs, regardless of whether we are using the MM with corporate taxes model or the Miller model.

The fact that the same capital structure both minimizes the cost of capital and maximizes value should be no surprise. The value of any business is nothing more than the present value of its expected after-tax operating income stream. What discount rate is used to find the present value? It is the corporate cost of capital. Therefore, by minimizing its corporate cost of capital, a business is automatically creating the greatest value.

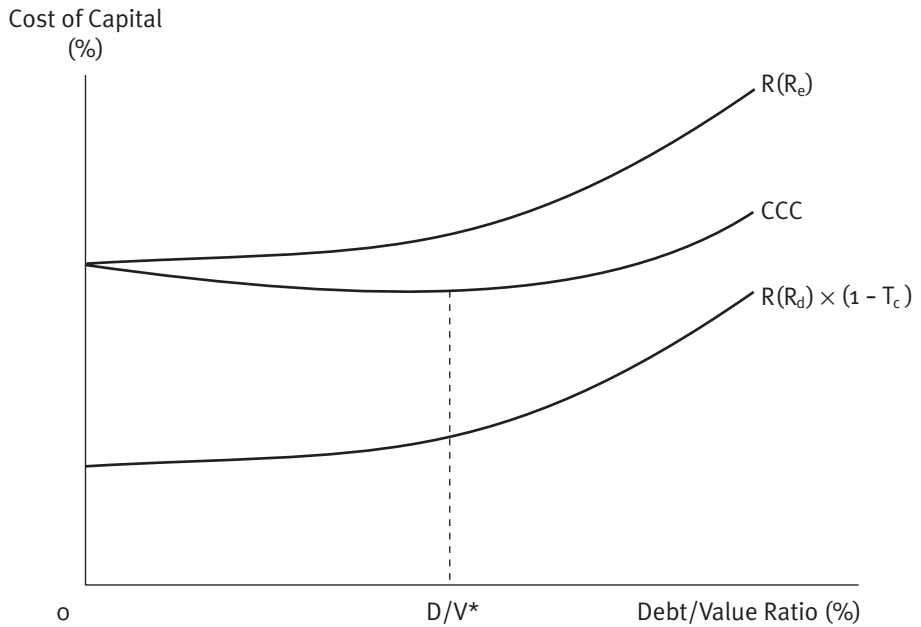
Unfortunately, it is extremely difficult for financial managers to actually quantify the costs and benefits of debt financing to their firms, so it is virtually impossible to pinpoint the capital structure that truly maximizes a business's value. Most experts believe that such a structure exists for every taxable business but that it changes substantially over time as the nature of the business and the capital markets changes. Most experts also believe that, as shown in the lower graph of Figure 10.3, the relationship between firm value and leverage is relatively flat; thus, relatively large deviations from the optimal structure can occur without materially affecting a business's value.

Now, consider the asymmetric information model. Because of asymmetric information, investors know less about a firm's prospects than do its

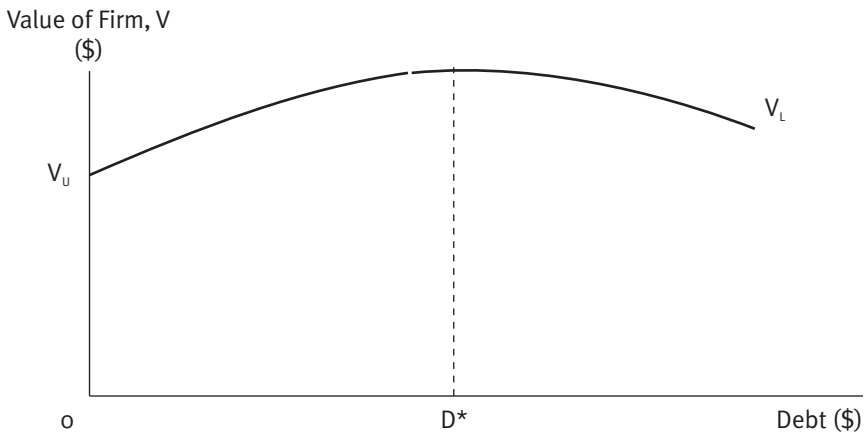
**FIGURE 10.3**

Summary of the  
Trade-off  
Models

### Effects of Leverage on Capital Costs



### Effect of Leverage on Firm Value



managers. Furthermore, managers try to maximize value for current stockholders, not new ones, so if the firm has excellent prospects, management will not want to issue new shares, but if things look bleak, then a new stock offering may be sold. Therefore, investors take a stock offering to be a signal of bad news, so stock prices tend to decline when new issues are announced. As a result, new equity financing can be very expensive, and this fact must be incorporated into the capital structure decision. Its effect is to motivate firms to maintain a reserve borrowing capacity, which permits future investment opportunities to be financed by debt when internal funds are insufficient.

By combining the two theories, we obtain this possible explanation for the capital structure decisions of taxable firms:

- Debt financing provides benefits because of the tax deductibility of interest. Hence, firms should have some debt in their capital structures.
- However, financial distress costs place limits on debt usage—beyond some point, these costs offset the tax advantage of debt.
- Finally, because of asymmetric information, businesses maintain a reserve borrowing capacity to take advantage of good investment opportunities and, at the same time, avoid having to issue stock at distressed prices.

1. Do the capital structure models provide managers with specific quantifiable guidance regarding optimal capital structures?
2. Summarize the information that capital structure models provide to decision makers.

## Self-Test Questions

### Application of Capital Structure Theory to Not-for-Profit Firms

So far, the discussion of capital structure theory has focused on investor-owned businesses. Do the models presented in this chapter apply to not-for-profit firms? No rigorous research has been conducted into the optimal capital structures of not-for-profit firms, but some loose analogies can be drawn. Although not-for-profit businesses do not receive a direct tax subsidy when debt financing is used, they do have access to the tax-exempt debt market, which provides an indirect tax subsidy. (If not-for-profits had to issue taxable debt, their costs of debt would be higher.) Thus, not-for-profit firms receive about the same tax-advantage benefits from the use of debt financing as do investor-owned firms.

What about the costs associated with equity (fund) financing? As discussed in Chapter 9, from a pure opportunity cost perspective, a not-for-profit firm's fund capital has a cost that is roughly equivalent to the cost of equity of a similar investor-owned firm. Thus, we would expect the opportunity cost of fund capital to rise as more and more debt financing is used, just as for an investor-owned firm. After all, the use of debt financing increases the risk to the stakeholders of the organization. Furthermore, not-for-profit firms are subject to the same types of financial distress costs that are borne by investor-owned firms, so these costs are equally applicable. Even if the cost of equity is measured by the return required to support growth or maintain creditworthiness, increased risk means that a higher required rate of return is appropriate, and hence higher risk leads to a higher cost of fund capital.

Thus, we would expect the trade-off models to be roughly applicable to not-for-profit businesses and hence for such firms to have optimal capital

structures defined, at least in theory, as a trade-off between the costs and benefits of debt financing. Note, however, that the asymmetric information model is not applicable to not-for-profit firms because such firms do not sell common stock.

Although the trade-off models may be generally applicable to not-for-profit businesses, a problem arises in practice because for-profit firms have more-or-less unlimited access to equity capital. Thus, if they have more capital investment opportunities than they can finance with retained earnings and debt financing, investor-owned firms can always raise the needed funds by a new stock issue. (According to the asymmetric information theory, managers may not want to issue new stock, but the opportunity still exists.) Additionally, it is quite easy for investor-owned firms to alter their capital structures. If they are financially underleveraged—using too little debt—they can simply issue more debt and use the proceeds to repurchase stock. On the other hand, if they are financially overleveraged—using too much debt—they can issue additional shares and use the proceeds to refund debt.

Not-for-profit businesses do not have access to the equity markets; their sole source of “equity” capital is through governmental grants, private contributions, and excess revenues (retained earnings). Thus, managers of not-for-profit organizations do not have the same degree of flexibility in either capital investment or capital structure decisions as do their proprietary counterparts.

The reduced access to equity capital means that it is often necessary for not-for-profit firms to (1) delay new projects, even profitable ones, because of funding insufficiencies and (2) use more than the theoretically optimal amount of debt because that is the only way that needed services can be financed. Although these actions may be required in certain situations, not-for-profit managers must recognize that such strategies increase costs. Project delays mean that needed services are not being provided on a timely basis. Using more debt than optimal pushes the firm beyond the point of the greatest net benefit of debt financing, and hence capital costs are increased above the minimum. If a not-for-profit firm is forced into a situation where it is using more than the optimal amount of debt financing, its managers should plan to reduce the firm’s level of debt as soon as the situation permits.

The ability of a not-for-profit business to garner governmental grants, attract private contributions, and generate excess revenues plays an important role in establishing its competitive position. A firm that has an adequate amount of fund capital can operate at its optimal capital structure and thus minimize capital costs. If insufficient fund capital is available, too much financial leverage is then used and the result is higher capital costs. Consider two not-for-profit hospitals that are similar in all respects, except that one has more fund capital and can operate at its optimal structure, while the other has insufficient fund capital and thus must use more debt financing than optimal. In effect, the hospital with insufficient fund capital must operate at an inefficient capital structure. The former has a significant competitive advantage

because it can either offer more services at the same cost by using additional (suboptimal) debt financing, or it can offer matching services at lower costs. Thus, sufficient fund capital provides the flexibility to offer all of the necessary services and still operate at the lowest capital cost structure. Like firms that have low operating cost structures, firms that are at their optimal capital structures, and hence have a low capital cost structure, have an advantage over their competitors that have higher capital cost structures.

1. Do the capital structure models apply to not-for-profit firms?
2. Why is capital structure important to not-for-profit firms?

## Self-Test Questions

## Making the Capital Structure Decision

Although the trade-off theory of capital structure provides many insights into the capital structure decision, it cannot directly provide the answer. Thus, managers must apply judgment along with quantitative analysis.

### Quantitative Analysis

Businesses typically have a financial planning model that forecasts their financial statements five years into the future. This model creates pro forma income statements and balance sheets on the basis of a large number of inputs, including financing decisions. By varying the future debt-equity mix, managers can get a feel for the impact of capital structure on future financial performance, and hence this model can provide information that is valuable to the capital structure decision.

### Qualitative Analysis

The judgmental analysis involves several different factors, and in one situation a particular factor might have great importance, while the same factor might be relatively unimportant in another situation. This section discusses some of the more important judgmental issues that should be taken into account.

Managers of businesses that provide vital healthcare services have a responsibility to the community to provide those services for generations. Thus, they must refrain from using financial leverage to the point where the firm's long-run viability is endangered.

### Long-Run Viability

Well-diversified investors have eliminated most, if not all, of the diversifiable risk from their portfolios. Therefore, the typical investor can tolerate some chance of financial distress because a loss on one stock will probably be offset by random gains on other stocks in the investor's portfolio. However, managers of investor-owned firms often view financial distress with more concern because they are typically not well diversified in their careers, and thus the present value of their expected earnings can be seriously affected by the onset

### Managerial Conservatism

of financial distress. Therefore, it is not difficult to imagine that managers might be more “conservative” in their use of leverage than the average stockholder would desire. If this were true, then managers would set somewhat lower target capital structures than the ones that truly maximize firm value.

For not-for-profit firms, one can argue that managerial conservatism is appropriate. Not-for-profit firms have no shareholders, and many of the stakeholders are typically not well diversified in regard to their relationships with the firm. Thus, these stakeholders have much more to lose if the firm fails than do well-diversified shareholders of investor-owned firms.

### **Lender and Rating Agency Attitudes**

Regardless of a manager’s own analysis of the proper leverage for his or her firm, there is no question that lenders’ and rating agencies’ attitudes are frequently important determinants of financial structures. In the majority of cases, corporate managers discuss the firm’s financial structure with lenders and rating agencies and give much weight to their advice. Also, if a particular firm’s management is so confident of the future that it seeks to use leverage beyond the norms for its industry, its lenders may be unwilling to accept such debt increases, or they may do so only at a high price.

Rating agencies publish data that give managers the rough relationship between the use of debt financing and debt rating. For example, Table 10.3 lists the relationship between financial leverage and debt rating for not-for-profit hospitals as provided by Standard & Poor’s. In general, the greater the use of debt, the lower the debt rating. Furthermore, managers typically want to maintain some target debt rating—say, single-A. If a hospital wants to target an A rating, according to the data in Table 10.3 it should set an optimal capital structure of about 35 percent. Note, however, that factors other than financial leverage affect debt ratings, so the ratios provided by the rating agencies can only be considered to be rough guidance.

### **Reserve Borrowing Capacity**

Under the asymmetric information model, businesses should maintain a reserve borrowing capacity that preserves the ability to issue debt at favorable terms if unanticipated needs arise. For example, suppose Merck had just successfully completed a research and development program on a new drug and its internal projections forecast much higher earnings in the future. However, the new earnings are not yet anticipated by investors and hence are not reflected in the price of its stock. Merck’s managers would not want to issue stock; they would prefer to finance with debt until the higher earnings materialize and are reflected in the stock price, at which time the firm can sell an issue of common stock, retire the debt, and return to its target capital structure. To maintain a reserve borrowing capacity, firms generally use less debt under “normal” conditions, and hence present a stronger financial picture than they otherwise would. This is not suboptimal from a long-run standpoint, although it might appear so if viewed strictly on a short-run basis.

<i>Debt Rating</i>	<i>Long-Term Debt/Capital Ratio</i>
AA+	29.2%
AA	26.1
A+	32.3
A	35.3
BBB+	36.8
BBB	40.7
BBB-	50.7
Speculative	52.9

**TABLE 10.3**  
Relationship  
Between  
Financial  
Leverage and  
Debt Rating for  
Not-for-Profit  
Hospitals

*Notes:* (1) Data are for 2005.

(2) Capital is defined as long-term debt plus equity.

*Source:* Standard & Poor's U.S. Not-For-Profit Health Care 2005 Median Ratios, July 20, 2005.

Presumably, managers act rationally, so the capital structures of other firms in the industry, particularly the industry leaders, should provide insights into the optimal structure. In general, there is no reason to believe that the managers of one firm are better than the managers of any other firm. Thus, if one firm has a capital structure that is significantly different from other firms in its industry, the managers of that firm should identify the unique circumstances that contribute to the anomaly. If unique circumstances cannot be identified, then it is doubtful that the firm has identified the correct target structure.

### *Industry Averages*

The effect that a firm's choice of securities has on a management's control position may also influence its capital structure decision. If a firm's management just barely has majority control—just over 50 percent of the stock—but is not in a position to buy any more stock, debt may be the choice for new financing. On the other hand, a management group that is not concerned about voting control may decide to use equity rather than debt if the firm's financial situation is so weak that the use of debt might subject the firm to serious risk of default.

### *Control of Investor-Owned Corporations*

Firms whose assets are suitable as security for loans tend to use debt rather heavily because the use of collateral provides access to lower-cost debt financing. Thus, hospitals tend to be highly leveraged, but firms involved in technological research employ relatively little debt. Also, if the firm's assets carry high business risk, then it will be less able to use financial leverage than a firm with low business risk will. Accordingly, factors such as sales stability and operating leverage, which influence business risk, also influence firms' optimal capital structure. Thus, the greater the amount of "hard" assets and the lower the business risk, the greater the amount of debt financing used.

### *Asset Structure*

Other factors being the same, faster-growing firms must rely more heavily on external capital—slow growth can be financed with retained earnings,

### *Growth Rate*



but rapid growth generally requires the use of external funds. As postulated in the information asymmetry theory, businesses first use debt financing to meet external funding needs. Furthermore, the flotation costs involved in selling common stock exceed those incurred when selling debt. Thus, rapidly growing firms tend to use more debt than do slower-growth firms.

**Profitability** Firms with very high rates of return on investment tend to use relatively little debt. This behavior is consistent with the asymmetric information theory, and the practical reason is that highly profitable firms simply do not need to use much debt financing because their high rates of return enable them to rely primarily on retained earnings.

**Taxes** Interest is a deductible expense, while dividends are not deductible, so the higher a firm's corporate tax rate, the greater the advantage of using corporate debt.

It is clear that some of the considerations that go into the decision are quantitative and some are qualitative. Thus, in practice, the capital structure decision requires a great deal of judgment. As mentioned above, businesses often use forecasting models to help assess the impact of alternative capital structures on financial health, but the final decision is always somewhat judgmental.

### Self-Test Questions

1. Is the capital structure decision mostly objective or subjective?
2. What are some of the factors that managers must consider when setting a business's optimal capital structure?

## Capital Structure Decisions for Small Investor-Owned Businesses

Capital structure theory, and hence its prescriptions for business behavior, is based on large corporations, in which owners and managers are separate groups and the securities issued are publicly traded. Thus, like its application to not-for-profit businesses, the application of capital structure theory to small investor-owned businesses raises more questions than it provides answers.

In small businesses—say, a medical practice of one or just a few physicians—the situation changes dramatically. Now, it is common to distribute returns to the owner/managers through salary bonuses, as opposed to dividends. What makes this situation different? The key to the value of debt financing is that interest on debt financing is tax deductible to a business, while dividends on equity financing are not. In other words, interest is paid from pretax income, while dividends are paid from after-tax income. It is the asymmetric tax deductibility of interest that creates the value inherent in the

use of debt. As proved by Modigliani and Miller, if there were no differential tax effects (the zero-tax case), the increase in riskiness to owners would exactly offset the benefits associated with a cost of debt that is lower than the cost of equity. The tax impact makes the effective cost of debt lower than that appropriate for the risk that it brings to the business, and it is this “externality” that drives the value of debt financing.

When “dividends” to equityholders are paid in the form of bonuses, they too are tax deductible to the business. Thus, we are in a situation in which there are tax advantages inherent in both debt and equity financing. Debt financing still leverages up owners’ return, but the increase in risk that debt financing brings to owners either partially or fully offsets the increase in ROE. Thus, there is no clear value-increasing benefit to debt financing.

Should such small businesses still use debt financing? The answer is probably yes because owner/managers often cannot provide the amount of equity capital needed by the business. If owners do not have the capital needed by the business, and control considerations preclude bringing in outside equity, debt financing is the only choice. Additionally, the use of debt financing means that less of the owners’ wealth is tied up in the business, and hence owners are better diversified in their personal investments.

Interestingly, the debt used by small businesses can be obtained either by the business or by the owners as personal debt, which would then be contributed to the business as equity. This amounts to the “homemade” leverage argument made by MM in their proofs. In general, if the business can borrow at a lower interest rate than can the individual owners, then business debt makes sense, and vice versa. However, the issue becomes cloudy because, under many forms of organization, personal debt has different liability characteristics than does business debt. To add to the complexity, the owners of small businesses typically have to sign personal guarantees on business debt, which further blurs the line between business and personal debt.

The bottom line here is that each small business situation is somewhat unique, and it is impossible to give guidance for capital structure decision making that is applicable in all small business situations.

1. Do the general prescriptions for capital structure decisions apply to small businesses? Explain your answer.

### Self-Test Question

## The Debt Maturity Decision

Thus far, we have focused on the primary capital structure decision, which is identifying the optimal mix of debt and equity financing. Once this is done, a secondary decision arises: what is the optimal mix of debt maturities? In other words, what is the optimal *debt maturity structure*? The answer, as with the optimal capital structure, involves a trade-off between risk and return.

### The Concept of Temporary and Permanent Assets

Most businesses experience seasonal and/or cyclical fluctuations in demand. Typically, businesses respond to such fluctuations by having a sufficient level of fixed assets on hand to meet peak demand needs but allowing current assets to fluctuate as necessary to match rising and falling demand conditions. Still, current assets **never** drop to zero, and this realization has led to the concept of permanent versus temporary assets.

To illustrate the situation, consider Sun Coast Clinics, a for-profit operator of four ambulatory care clinics in South Florida. Table 10.4 contains the business's December 2006 and April 2007 balance sheets. Sun Coast's optimal, or target, capital structure is 40–45 percent debt financing, and its current structure falls within this range. The question at hand now is what maturity structure should Sun Coast use for its 55–60 percent debt financing.

Note that the provision of ambulatory care services in this part of Florida is a seasonal business. The peak season for Sun Coast is December through April, when the population of the area soars because of tourism. Even more important to Sun Coast's peak level of operations is the arrival of the "snow birds" (i.e., retirees who typically live in the north during the summer and fall months but move to residences in Florida for the winter).

In December of each year, Sun Coast has just finished its slow season and is preparing for its busy season. Thus, the firm's accounts receivables are relatively low, but its cash and marketable securities and inventories are relatively high. By the end of April, Sun Coast has completed its busy season, so its

**TABLE 10.4**

Sun Coast  
Clinics, Inc.:  
End-of-Month  
Balance Sheets  
(thousands of  
dollars)

	<i>December 2006</i>	<i>April 2007</i>
Cash and marketable securities	\$ 30	\$ 20
Accounts receivable	155	210
Inventories	<u>15</u>	<u>10</u>
Total current assets	\$200	\$240
Net fixed assets	<u>500</u>	<u>500</u>
Total assets	<u>\$700</u>	<u>\$740</u>
Accounts payable	\$ 30	\$ 40
Accruals	15	25
Short-term debt	<u>85</u>	<u>105</u>
Total current liabilities	\$130	\$170
Long-term debt	170	170
Common equity	<u>400</u>	<u>400</u>
Total liabilities and equity	<u>\$700</u>	<u>\$740</u>

*Note:* These statements have been simplified for ease of illustration.

accounts receivable are relatively high, but its cash and marketable securities and inventories are relatively low in preparation for the slow summer season. On the current liabilities side, Sun Coast's accounts payable and accruals are relatively high at the end of April, just after the busy season. Sun Coast's fluctuations in assets and liabilities result from seasonal factors. Similar fluctuations in current asset requirements, and hence in financing needs, can occur because of business cycles; typically, current asset requirements and financing needs contract during recessions and expand during good times.

Note that at this stage in its life cycle, Sun Coast's total assets fluctuate between \$700,000 and \$740,000. The minimum amount of total assets required to sustain operations during seasonal, or cyclical, lows is defined as a firm's *permanent assets*. Thus, Sun Coast has \$700,000 of permanent assets, which are composed of \$500,000 of fixed assets and \$200,000 of *permanent current assets*. By their nature, fixed assets are always considered as permanent, so temporary assets arise solely from current assets. Sun Coast carries *temporary current assets* that fluctuate seasonally from zero to a maximum of \$40,000. The manner in which the permanent and temporary current assets are financed defines the business's debt maturity mix.

### Alternative Debt Maturity Policies

There are three basic debt maturity policies: (1) maturity matching, (2) aggressive, and (3) conservative.

*Maturity matching*, which represents a moderate approach to the debt maturity decision, calls for the business to match asset and liability maturities **in the financial sense**; that is, permanent assets are financed with permanent capital (i.e., equity and long-term debt) and temporary assets are financed with temporary capital (i.e., short-term debt). To illustrate maturity matching, consider that if Sun Coast were using this strategy, it would have \$700,000 of permanent financing. Because it has \$400,000 in equity, this would suggest \$300,000 in long-term debt. However, Sun Coast will take all the free financing it can get, so it will use the Accounts payable + Accruals = \$30,000 + \$15,000 = \$45,000 in spontaneous (free) current liabilities available during the slow season to replace long-term debt. Thus, maturity matching would call for \$400,000 in equity, \$255,000 in long-term debt, and \$45,000 in free current liabilities for a total of \$700,000 in financing. This is all the financing that would be on the books in December 2006. But, to get to April 2007, Sun Coast would use \$20,000 of short-term debt. Although total assets increase by \$40,000, the business gets the benefit of an additional \$20,000 of free current liabilities, so only \$20,000 of short-term debt is needed.

The maturity-matching strategy limits the risk that a business will be unable to pay off its maturing obligations. To see this point, suppose Sun Coast borrows on a one-year basis and uses the funds obtained to build and equip a new clinic. Cash flows from the clinic (i.e., profits plus depreciation)

### Maturity Matching

would almost never be sufficient to pay off the loan at the end of only one year, so the loan must be renewed at that time. If interest rates increase during the year, Sun Coast's new debt would cost more. Even worse, if the lender refused to renew the loan, Sun Coast would have problems. Had the clinic been financed with long-term financing, however, the required loan payments would have been better matched with cash flows from profits and depreciation and the problem of loan renewal would not have arisen.

At the limit, a business can attempt to match exactly the maturity structure of its assets and liabilities. Inventory expected to be sold in 30 days can be financed with a 30-day bank loan, a machine expected to last for five years can be financed by a five-year loan, a 20-year building can be financed by a 20-year mortgage bond, and so forth. Actually, three factors make this exact maturity-matching strategy both unpractical and wrong: (1) uncertainty about the lives of assets; (2) some common equity, or fund capital, must be used, and this capital has no maturity; and (3) to develop a sound current asset financing policy it is necessary to consider whether an asset is permanent or temporary.

### **Aggressive Approach**

In the *aggressive approach*, a business finances part of its permanent current assets with short-term debt. A look back at Table 10.4 will show that Sun Coast actually follows this strategy. Sun Coast has \$500,000 in net fixed assets and \$570,000 of long-term capital, leaving only \$70,000 of long-term capital to finance \$200,000 in permanent current assets. Additionally, Sun Coast has a minimum of \$45,000 of free short-term liabilities. Thus, Sun Coast must use  $\$200,000 - \$70,000 - \$45,000 = \$85,000$  of short-term debt to help finance its permanent level of current assets.

Note that there are an almost infinite number of degrees of aggressiveness. For example, at the extreme, Sun Coast can replace the \$170,000 of long-term debt with short-term debt, and hence have only \$400,000 of permanent capital—its equity. Such a policy would be a highly aggressive, extremely unconservative position, and Sun Coast would be very much subject to dangers from rising interest rates as well as to loan-renewal problems. However, short-term debt is often cheaper than long-term debt, and some businesses are willing to take on additional financial risk for the chance of higher profits.

### **Conservative Approach**

In the *conservative approach*, the level of permanent financing exceeds the level of permanent assets. For Sun Coast, the conservative approach would call for, say, \$400,000 in equity plus \$300,000 in long-term debt for total permanent financing of \$700,000. Then, \$45,000 of marketable securities would be held at the end of December 2006 and \$65,000 would be held at the end of April 2007. The conservative approach provides Sun Coast with a “safety” reserve of liquid assets that can be tapped at any time to cover unexpected operating losses or for other purposes.

### Conclusions Regarding Debt Maturities

The proper framework for evaluating debt maturity policies requires the use of the concept of permanent and temporary assets. Thus, for financing purposes, assets are **not** classified by their accounting definitions of current and long term but rather as either permanent or temporary. In this framework, maturity matching calls for the permanent portion of cash, receivables, and inventories (i.e., permanent current assets) to be financed with *permanent capital* (i.e., long-term debt and equity). The key is that each dollar of cash, each individual receivable, and each dollar of inventory may well be short term in that these items will be quickly turned over or converted to cash. However, as each individual current asset item is converted, it will be replaced by a like item if it is permanent in nature, and hence such short-term assets are actually carried permanently over the long term. The implication is that the accounting definition of current assets, although useful for many purposes, does not provide managers with the correct guidance regarding the financing of such assets.

The choice among alternative financing policies involves a risk/return trade-off. The aggressive policy, with its high use of generally lower cost short-term debt, has the highest expected return but the highest risk, while the conservative policy has the lowest expected return and lowest risk. The maturity matching policy falls between the extremes. Unfortunately, there is no underlying finance theory that managers can use to pick the “correct” debt maturity policy. Often, firms that have low business risk elect to take on higher-than-average financial risk. Thus, such firms tend to have more debt in their target capital structures and are more likely to use an aggressive debt maturity policy. Conversely, firms with high business risk usually take a conservative view regarding added financial risk, whether that risk arises from a high level of debt or an aggressive debt maturity policy.

1. Explain the difference between permanent and temporary assets.
2. What are the three strategies for choosing debt maturities?
3. How is the choice made?

### Self-Test Questions

### Key Concepts

This chapter presented a variety of topics related to capital structure decisions. Here are its key concepts:

- The use of debt financing increases the *rate of return* to owners, but it also increases their *risk*.
- *Business risk* is the inherent riskiness in a firm’s operations if it uses no debt financing. *Financial risk* is the additional risk that is concentrated on the business’s owners when debt financing is used.

- In 1958, Franco Modigliani and Merton Miller (MM) startled the academic community by proving, under a very restrictive set of assumptions including *zero taxes*, that capital structure is irrelevant because a business's value is not affected by its financing mix.
- Modigliani and Miller later added *corporate taxes* to their model, leading to the conclusion that capital structure does matter and that businesses should use almost 100 percent debt financing to maximize value.
- The MM model with corporate taxes illustrates that the benefits of debt financing stem solely from the *tax deductibility of interest payments*.
- Much later, Miller extended the model to include *personal taxes*. The introduction of personal taxes reduces, but does not eliminate, the benefits of debt financing. Thus, the *Miller model* also prescribes 100 percent debt financing.
- The addition of *financial distress costs* to either the MM corporate tax model or the Miller model results in a *trade-off model*. Here, the marginal costs and benefits of debt financing are balanced against one another and the result is an optimal capital structure that falls somewhere between zero and 100 percent debt.
- *Not-for-profit firms* face a set of benefits and costs associated with debt financing similar to those faced by investor-owned firms, so the trade-off model is at least partially applicable to such firms. However, the inability to sell equity may keep a not-for-profit firm's capital structure above the optimal point, at least temporarily.
- The *asymmetric information model*, which is based on the assumption that managers have better information than investors, postulates that there is a preferred order to financing: first, retained earnings (and depreciation); then, debt; and finally, as a last resort only, new common stock.
- The asymmetric information model prescribes that businesses maintain a *reserve borrowing capacity* so that they can always issue debt on reasonable terms rather than be forced into a new equity issue at the wrong time.
- Unfortunately, capital structure theory does not provide neat, clean answers to the question of the optimal capital structure. Thus, many factors must be considered when actually choosing a firm's target capital structure, and the final decision will be based on both analysis and judgment.
- Within very small investor-owned businesses, such as a solo or small group medical practice, the situation is complicated by the fact that the owners and managers are the same people.
- The second decision regarding capital structure is the selection of *debt maturities*.



- There are three general approaches to debt maturities: (1) *maturity matching*, (2) *conservative*, and (3) *aggressive*.
- The debt maturity choice is a classic *risk/return trade-off*.

This chapter concludes our discussion of cost of capital and capital structure. In the next two chapters, we discuss capital budgeting decisions.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used to estimate a business's optimal capital structure.

In addition, the chapter has three problems in spreadsheet format that focus on capital structure issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Website

Ohio State University maintains a website with video clips by various finance professionals briefly discussing topics of relevance to this course. Unfortunately, the clips do not include healthcare executives. To access the clips, go to [www.cob.ohio-state.edu/fin/clips.htm](http://www.cob.ohio-state.edu/fin/clips.htm). Then, click on the clip of interest. For this chapter, try the clips by Steve Walsh titled "On the Cost of Capital and Debt" and "What We Think of Modigliani/Miller Around Here." Note that video clips are large files that are best accessed using a fast Internet link. Furthermore, player software is required to see the clips.

## Selected Case

There is one case in *Cases in Healthcare Finance* that is applicable to this chapter:

- Case 17: Nursing Temps, Inc., which focuses on the choice between debt and equity financing for a for-profit business.

## Notes

1. The use of preferred stock has roughly the same effect on a business's risk and return, and hence capital structure decision, as does debt financing. However, because most businesses in the health services industry do not use preferred stock, we will confine our discussion to debt financing.
2. Per procedure leases are discussed in Chapter 8.
3. See Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, June 1958, 261–297; "The Cost of Capital, Corporation Finance and the Theory of Investment: Reply," *American Economic Review*, September 1958, 655–669; "Taxes and the Cost of Capital: A Correction," *American Economic Review*, June 1963, 433–443; and "Reply," *American Economic Review*, June 1965, 524–527. In a 1979 survey of Financial Management Association members, the original MM article was judged to have had the greatest impact on the field of finance of any work ever published. See Philip L. Cooley and J. Louis Heck,

- “Significant Contributions to Finance Literature,” *Financial Management*, Tenth Anniversary Issue, 1981, 23–33.
4. MM actually developed three propositions, but the third one is not material to our discussion.
  5. *Arbitrage* means the simultaneous buying and selling of essentially identical assets at different prices. The buying increases the price of the undervalued asset, and the selling decreases the price of the overvalued asset. Arbitrage operations will continue until prices have been adjusted to the point where the arbitrage can no longer earn a profit. At this point, the prices are in equilibrium.
  6. For an illustration of MM’s arbitrage proof, see Eugene F. Brigham and Michael C. Ehrhardt, *Financial Management: Theory and Practice* (Fort Worth, TX: Thomson/South-Western, 2005), Chapter 17.
  7. The annual interest expense associated with  $D$  dollars of debt financing is  $R(R_d) \times D$ , and the resulting tax savings is  $T \times R(R_d) \times D$ . Because MM assumed that all cash flows are perpetuities, the present value of the tax savings stream is  $[T \times R(R_d) \times D] / R(R_d) = T \times D$ .
  8. See Merton H. Miller, “Debt and Taxes,” *Journal of Finance*, May 1977, 261–275. The paper was first presented as the presidential address at the 1976 meeting of the American Finance Association.
  9. For examples of the empirical research in this area, see Robert Taggart, “A Model of Corporate Financing Decisions,” *Journal of Finance*, December 1977, 1467–1484; and Paul Marsh, “The Choice Between Equity and Debt: An Empirical Study,” *Journal of Finance*, March 1982, 121–144.
  10. See Gordon Donaldson, *Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity* (Boston: Harvard Graduate School of Business Administration, 1961).
  11. See Stewart C. Myers, “The Capital Structure Puzzle,” *Journal of Finance*, July 1984, 575–592. It is interesting to note that, like the Miller model, Myers’s paper was presented as a presidential address to the American Finance Association.
  12. Many studies support the contention that the announcement of a new stock issue results in a decrease in stock price. For example, one study found that stock prices decline about 3 percent following the announcement of a new stock issue. See Paul Asquith and David W. Mullins, Jr., “Equity Issues and Offering Dilution,” *Journal of Financial Economics*, June 1986, 61–89.



## Capital Allocation

In Parts III and IV, we focused on capital acquisition, cost of capital, and capital structure—in other words, decisions that provide a business with its capital (funds). Now, we turn our attention to the capital allocation decision, or how those funds can be deployed (spent) in the most economically efficient manner. The overall process of choosing the projects to be undertaken is called *capital budgeting*.

Chapter 11 covers the basic concepts of capital budgeting, such as how to estimate a project's cash flows and how to measure its expected financial impact. Chapter 12 discusses how to assess the riskiness of a project and how to incorporate that assessment into the decision process.



## THE BASICS OF CAPITAL BUDGETING

### Learning Objectives

After studying this chapter, readers should be able to:

- Explain how managers use project classifications and post-audits in the capital budgeting process.
- Discuss the role of financial analysis in health services capital budgeting decisions.
- Discuss the key elements of cash flow estimation, breakeven analysis, and profitability analysis.
- Conduct basic capital budgeting analyses.

### Introduction

Chapters 9 and 10 described how healthcare managers estimate their business's corporate costs of capital and make capital structure decisions. Now, we change our focus to fixed-asset acquisition decisions, which entail the acquisition of new facilities or equipment. Because such decisions require the use, or expenditure, of capital, they are called *capital investment*, or *capital budgeting decisions*. The term “capital budgeting” is used because the listing of projects to be undertaken in the future, along with their total dollar cost, is called the *capital budget*. Capital budgeting decisions are of fundamental importance to the success or failure of any business because a firm's capital budgeting decisions, more than anything else, shape its future.

The discussion of capital budgeting is divided into two chapters. Chapter 11 provides an overview of the capital budgeting process, a discussion of the key elements of project cash-flow estimation, and an explanation of the basic techniques used to assess a project's breakeven characteristics and profitability. In Chapter 12, capital-budgeting risk analysis and the optimal capital budget are considered.

### Importance of Capital Budgeting

Capital budgeting decisions are among the most critical ones that healthcare managers must make. First, and most importantly, the results of capital budgeting decisions generally affect the business for an extended period. If a business invests too heavily in fixed assets, it will have too much capacity and its

costs will necessarily be too high. On the other hand, a business that invests too little in fixed assets may face two problems: (1) technological obsolescence and (2) inadequate capacity. A healthcare provider without the latest in technology will lose patients to its more up-to-date competitors and, further, will deprive its patients of the best healthcare diagnostics and treatments available. A provider with inadequate capacity may lose a portion of its market share to competitors, which would then require it to increase its marketing costs or aggressively reduce prices to regain the lost share.

Effective capital budgeting procedures provide several benefits to businesses. A business that forecasts its needs for capital assets well in advance will have the opportunity to plan the purchases carefully and thus will be able to negotiate the highest-quality assets at the best prices. Additionally, asset expansion typically involves substantial expenditures, and because large amounts of funds are not usually at hand, they must be raised externally. Good capital budgeting practices permit a business to identify its financing needs and sources well in advance, which ensures both the lowest possible capital procurement costs and the availability of funds as they are needed.

### Self-Test Questions

1. Why are capital budgeting decisions so crucial to the success of a business?
2. What are the benefits of effective capital budgeting procedures?

### Project Classifications

Although benefits can be gained from the careful analysis of capital investment proposals, such efforts can be costly. For certain types of projects, a relatively detailed analysis may be warranted; for others, cost/benefit studies suggest that simpler procedures should be used. Accordingly, healthcare businesses generally classify projects into categories and then analyze those in each category differently. For example, Ridgeland Community Hospital uses the following classifications:

- **Category 1: Mandatory replacement.** This category consists of expenditures necessary to replace worn-out or damaged equipment necessary to the operations of the hospital. In general, these expenditures are mandatory, so they are usually made without going through an elaborate decision process.
- **Category 2: Discretionary replacement.** This category includes expenditures to replace serviceable, but obsolete, equipment. The purpose of these projects generally is to lower costs or to provide more clinically effective services. Because Category 2 projects are not mandatory, a more detailed analysis is generally required to support the expenditure than that needed for Category 1 projects.

- **Category 3: Expansion of existing products, services, or markets.** This category includes expenditures to increase capacity, or to expand within markets currently being served by the hospital. These decisions are more complex, so still more detailed analysis is required, and the final decision is made at a higher level within the organization.
- **Category 4: Expansion into new products, services, or markets.** This category consists of projects necessary to provide new products or services, or to expand into geographical areas not currently being served. Such projects involve strategic decisions that can change the fundamental nature of the hospital, and they normally require the expenditure of large sums of money over long periods. Invariably, a particularly detailed analysis is required, and the board of trustees generally makes the final decision as part of the hospital's strategic planning process.
- **Category 5: Safety/Environmental projects.** This category consists of expenditures necessary to comply with government orders, labor agreements, accreditation requirements, and so on. Unless the expenditures are large, Category 5 expenditures are treated like Category 1 expenditures.
- **Category 6: Other.** This category is a catchall for projects that do not fit neatly into another category. The primary determinant of how Category 6 projects are evaluated is their size.

In general, relatively simple analysis and only a few supporting documents are required for replacement decisions and safety/environmental projects, especially those that are mandatory. A more detailed analysis is required for expansion and other projects.

Note that, within each category, projects are classified by size: larger projects require increasingly detailed analysis and approval at a higher level within the hospital. Thus, for example, department heads can authorize spending up to \$25,000 on discretionary replacement projects, while the full board of directors must approve expansion projects that cost more than \$10 million.

1. What is the primary advantage of classifying capital projects?
2. What are some typical classifications?
3. What role does project size (cost) play in the classifications?

## Self-Test Questions

## The Role of Financial Analysis in Health Services Capital Budgeting

For investor-owned businesses, with shareholder wealth maximization as an important goal, the role of financial analysis in investment decisions is clear. Those projects that contribute to shareholder wealth should be undertaken, while those that do not should be ignored. However, what about not-for-



profit firms that do not have shareholder wealth maximization as a goal? In such businesses, the appropriate goal is providing quality, cost-effective service to the communities served. (A strong argument can be made that this should also be the goal of investor-owned firms in the health services industry.) In this situation, capital budgeting decisions must consider many factors besides a project's financial implications. For example, the needs of the medical staff and the good of the community must be taken into account. Indeed, in some instances, these noneconomic factors will outweigh financial considerations.

Nevertheless, good decision making, and hence the future viability of health services organizations, requires that the financial impact of capital investments be fully recognized. If a business takes on a series of highly unprofitable projects that meet nonfinancial goals, and such projects are not offset by other profitable projects, the business's financial condition will deteriorate. If this situation persists over time, the business will eventually lose its financial viability and may even be forced into bankruptcy and closure.

Because bankrupt businesses obviously cannot meet a community's needs, even managers of not-for-profit businesses must consider a project's potential impact on the firm's financial condition. Managers may make a conscious decision to accept a project with a poor financial prognosis because of its nonfinancial virtues, but it is important that managers know the financial impact up front, rather than be surprised when the project drains the firm's financial resources. Financial analysis provides managers with the relevant information about a project's financial impact and hence helps managers make better decisions, including those decisions based primarily on nonfinancial considerations.

## Self-Test Questions

1. What is the role of financial analysis in capital budgeting decision making within for-profit firms?
2. Why is project financial analysis important in not-for-profit businesses?

## Overview of Capital Budgeting Financial Analysis

The financial analysis of capital investment proposals typically involves the following four steps:

1. Estimate the project's expected cash flows, which consist of
  - a. The capital outlay, or cost.
  - b. The operating cash flows.
  - c. The terminal (ending) cash flow.Cash flow estimation is discussed in the next section.
2. The riskiness of the estimated cash flows must be assessed. Risk assessment will be discussed in Chapter 12.
3. Given the riskiness of the project, the project's cost of capital (opportunity cost, or discount, rate) is estimated. As discussed in Chapter 9, a business's

corporate cost of capital reflects the aggregate risk of the business's assets—that is, the riskiness inherent in the average project. If the project being evaluated does not have average risk, the corporate cost of capital must be adjusted.

4. Finally, the financial impact of the project is assessed, including profitability. Several measures can be used for this purpose; we will discuss five in this chapter.

1. Describe the four steps in capital budgeting financial analysis.

## Self-Test Question

### Cash Flow Estimation

The most important, but also the most difficult, step in evaluating capital investment proposals is cash flow estimation: the investment outlays, the annual net operating flows expected when the project goes into operation, and the cash flows associated with project termination. Many variables are involved in cash flow forecasting and many individuals and departments participate in the process. It is difficult to make accurate projections of the revenues and costs associated with a large, complex project; so forecast errors can be quite large. Thus, it is essential that risk analyses be performed on prospective projects. One manager with a good sense of humor developed the following five principles of capital-budgeting cash-flow estimation:

1. It is very difficult to forecast cash flows, especially those that occur in the future.
2. Those who live by the crystal ball soon learn how to eat ground glass.
3. The moment you forecast cash flows, you know that you are wrong; you just don't know by how much and in what direction.
4. If you are right, never let your bosses forget.
5. An expert is someone who has been right at least once.

It is hard to overstate either the difficulty or the importance of correctly forecasting a project's cash flows. However, if the principles discussed in the next sections are observed, errors that often arise in the process can be minimized.

### Identifying the Relevant Cash Flows

The relevant cash flows when evaluating a new capital investment are the project's *incremental cash flows*, which are defined as the difference in the firm's cash flows in each period if the project is undertaken versus the firm's cash flows if the project is not undertaken:

$$\text{Incremental CF}_t = \text{CF}_{t(\text{Firm with project})} - \text{CF}_{t(\text{Firm without project})}$$

Here, the subscript  $t$  specifies a time period, normally years, so  $CF_0$  is the cash flow during Year 0, which is generally assumed to be the beginning of the project;  $CF_1$  is the cash flow during the first year;  $CF_2$  is the cash flow during Year 2; and so on. In practice, the early cash flows, and Year 0 in particular, are usually cash outflows—the costs associated with getting the project “up and running.” Then, as the project begins to generate operating revenues, the cash flows normally turn positive.

### ***Cash Flow Versus Accounting Income***

Accounting income statements prepared in accordance with generally accepted accounting principles are in some respects a mix of apples and oranges. For example, accountants deduct labor costs, which are cash outflows, from revenues, which may not be entirely cash. (For healthcare providers most of the collections are from third-party payers, and payment may not be received until several months after the service is provided.) At the same time, the income statement does not recognize capital outlays, which are cash flows, but it does deduct depreciation expense, which is not a cash flow. In capital investment decisions, it is critical that the decision be based on the actual dollars that flow into and out of the firm because a firm’s true profitability, and hence its ability to provide healthcare services, depends on its cash flows and not on income as reported in accordance with generally accepted accounting principles. Note, however, that accounting items can influence cash flows because items like depreciation can affect tax or reimbursement cash flows.

### ***Cash Flow Timing***

Financial analysts must be careful to account properly for the timing of cash flows. Accounting income statements are for periods, such as years or quarters, so they do not reflect exactly when, during the period, revenues and expenses occur. In theory, capital budgeting cash flows should be analyzed exactly as they occur. Of course, there must be a compromise between accuracy and simplicity. A time line with daily cash flows would, in theory, provide the most accuracy, but daily cash flow estimates would be costly to construct, unwieldy to use, and probably no more accurate than annual cash flow estimates. Thus, in most cases, analysts simply assume that all cash flows occur at year end. However, for some projects, it may be useful to assume that cash flows occur every six months or even to forecast quarterly or monthly cash flows.

### ***Project Life***

One of the first decisions that must be made in forecasting a project’s cash flows is the life of the project: Do we need to forecast cash flows for 20 years, or is five years sufficient? Many projects, such as a new hospital wing or an ambulatory care clinic, potentially have very long lives, perhaps as long as 50 years. In theory, a cash flow forecast should extend for the full life of a project, yet most managers would have very little confidence in any cash flow forecasts

beyond the near term. Thus, most organizations set an arbitrary limit on the project life assumed in capital budgeting analyses, often five or ten years. If the forecasted life is less than the arbitrary limit, the forecasted life is used to develop the cash flows. But if the forecasted life exceeds the limit, project life is truncated and the operating cash flows beyond the limit are ignored in the analysis.

Although cash flow truncation is a practical solution to one problem, it creates another problem—the value inherent in the cash flows beyond the truncation point is lost to the project. This problem can be addressed either objectively or subjectively. The standard procedure at some organizations is to estimate the project's *terminal value*, which is a proxy for the value of the cash flows beyond the truncation point. Often, the terminal value is estimated as the liquidation value of the project at that point in time. If the terminal value is too difficult to estimate, the fact that some portion of the project's cash flow stream is being ignored should, at a minimum, be subjectively recognized by decision makers. The saving grace in all of this is that cash flows well into the future typically contribute a relatively small amount to a project's profitability. For example, a \$100,000 terminal value projected ten years in the future contributes only about \$38,500 to the project's initial value when the cost of capital (discount rate) is 10 percent.

### Sunk Costs

A *sunk cost* refers to an outlay that has already occurred, or has been irrevocably committed, so it is an outlay that is unaffected by the current decision to accept or reject the project. To illustrate the concept, suppose that it is the year 2006 and Ridgeland Community Hospital is evaluating the purchase of a lithotripter system. To help in the decision, the hospital hired and paid \$10,000 to a consultant in 2005 to conduct a marketing study. Is this 2005 cash flow relevant to the 2006 capital investment decision? The answer is no. The \$10,000 is a sunk cost; Ridgeland cannot recover it whether or not the lithotripter is purchased. Costs, such as sunk costs, as well as other cash flows that are not relevant to an analysis are called *nonincremental cash flows*. Sometimes a project appears to be unprofitable when all of the associated costs, including sunk costs, are considered. However, on an *incremental* basis, the project may be profitable and should be undertaken. Thus, the correct treatment of sunk costs may be critical to the decision.

Assume for a moment that Ridgeland goes ahead with the lithotripter project. Then, in 2007, when conducting a periodic analysis of the historical profitability of the project, the \$10,000 cost of the consultant's report might be included because it was part of the total cash flows attributable to the project. Still, when making the 2006 decision regarding whether or not to go ahead with the project, the \$10,000 is nonincremental and hence not relevant to the decision.

### **Opportunity Costs**

All relevant *opportunity costs* must be included in a capital investment analysis. To illustrate the concept, note that one opportunity cost involves the use of the capital. When Ridgeland uses its capital to invest in a lithotripter system, it cannot use the same capital to invest in, say, a new surgical suite. The opportunity cost associated with capital use is accounted for in the project's cost of capital, which is used to discount the project's expected cash flows and represents the return that the business can earn by investing in alternative investments of similar risk. Thus, the opportunity cost associated with capital is automatically considered in a project analysis by the mathematics of the discounting process.

There are other types of opportunity costs, and all such costs should be built into a project's cash flows. For example, assume that Ridgeland's lithotripter would be installed in a freestanding facility and that the hospital currently owns the land on which the facility would be constructed. In fact, the hospital purchased the land ten years ago at a cost of \$50,000, but the current market value of the property is \$130,000, net of taxes (if applicable) and fees. When evaluating the lithotripter, should the value of the land be disregarded because no cash outlay is necessary? The answer is no because there is an opportunity cost inherent in the use of the property. Using the property for the lithotripter facility deprives Ridgeland of its use for anything else. The property might be used for a walk-in clinic or an ambulatory surgery center or a parking garage rather than sold, but the best measure of its value to Ridgeland, and hence the opportunity cost inherent in its use, is the cash flow that can be realized from selling the property. By considering the property's current market value, Ridgeland is letting market forces assign the value for the land's best alternative use. Thus, the lithotripter project should have a \$130,000 opportunity cost charged against it. Note that the opportunity cost is the property's \$130,000 net market value, irrespective of whether the property was acquired for \$50,000 or \$200,000.

### **Effect on the Business's Other Projects**

Capital budgeting analyses must consider the effect of the project under consideration on the business's other projects. When the effect is negative, it is often called *cannibalization*, because the project is expected to "eat away" at other revenues within the business. To illustrate the concept, assume that some of the patients that are expected to use Ridgeland's new lithotripter would have been treated surgically at Ridgeland, so these surgical revenues will be lost if the lithotripter facility goes into operation. Thus, the incremental revenues to Ridgeland are the revenues attributable to the lithotripter, less the revenues lost from forgone surgery services. Of course, the costs saved by virtue of losing these surgery patients would be a benefit to the lithotripter project and hence should also be considered in the analysis. Note, however,

that if the surgical patients would be lost to other providers that are buying lithotripters, then the loss of these patients does not affect the lithotripter project at all because these losses would occur whether or not the lithotripter project is accepted.

Thus far we have focused on the negative impact of a new project on other services. The impact can be positive. To illustrate the concept, note that new patients who use the lithotripter may utilize other services provided by the hospital, such as imaging services. In this situation, the incremental cash flows generated by the lithotripter patients' utilization of other services should be credited to the lithotripter project. If possible, both positive and negative effects on other projects should be quantified, but, at a minimum, they should be noted so that the final decision maker will be aware of their existence.

### **Shipping and Installation Costs**

When a firm acquires new equipment, it often incurs substantial costs for shipping and installation. These charges are added to the invoice price of the equipment to determine the overall cost of the project. Also, the full cost of the equipment, including shipping and installation charges, is used as the basis for calculating depreciation expense. Thus, if Ridgeland Community Hospital purchases intensive care monitoring equipment that costs \$200,000, but another \$20,000 is required for shipping and installation, then the full cost of the equipment would be \$220,000, and this amount would be the starting point (cost basis) for all depreciation calculations.

### **Changes in Net Working Capital**

Normally, expansion projects require additional inventories, and added patient services also lead to additional accounts receivable. The increase in these current asset accounts must be financed, just as an increase in fixed assets must be financed. (To keep the balance sheet balanced, any increases on the left side must be offset by increases on the right side.) However, accounts payable and accruals will probably also increase as a result of the expansion, and these current liability additions will reduce the cash needed to finance the increase in inventories and receivables. The difference between the increase in current assets and the increase in current liabilities that directly result from a new project is called a *change in net working capital*.

If the change in net working capital is positive—that is, if the increase in current assets exceeds the increase in current liabilities—then this amount is as much a cost to the project as is the cost of the asset itself. Thus, the project must be charged an additional amount above the cost of the new asset to reflect the net financing needed for the current asset accounts. Similarly, if the change in net working capital is negative, the project is generating a working capital cash inflow because the increase in liabilities exceeds the project's current asset requirements, and this cash flow partially offsets the cost of the asset being acquired.

As the project approaches termination, inventories will be sold off and not replaced and receivables will be converted to cash without new receivables being created. In effect, the business will recover its investment in net working capital when the project is terminated. This will result in a cash flow that is equal, but opposite in sign, to the change in net working capital cash flow that arises at the beginning of a project.

For healthcare providers, the change in net working capital often is small, and hence can be ignored without materially affecting the analysis. However, when a project has a large change in net working capital, failure to consider the net investment in current assets will result in an overstatement of the project's profitability.

### **Inflation Effects**

Because inflation is a fact of life, and because inflation effects can have a considerable influence on a project's profitability, inflation must be considered in any sound capital budgeting analysis. As we discussed in Chapter 9, a business's corporate cost of capital is based on its costs of debt and equity, which in turn are estimated on the basis of investors' required rates of return. Because investors must protect themselves against the loss of purchasing power as a result of inflation, they incorporate an inflation premium into their required returns. For example, a debt investor might require a 5 percent return on a ten-year bond in the absence of inflation. However, if inflation is expected to average 4 percent over the coming ten years, then the investor would require a 9 percent return.

Because inflation effects are already embedded in the corporate cost of capital, and because this rate is the benchmark used to discount the cash flows in our profitability measures, it is necessary to ensure that inflation effects are also built into the project's estimated cash flows. If cash flow estimates do not include inflation effects (*real* cash flows), and a discount rate is used that does include inflation effects (*nominal* discount rate), then the profitability of the project will be biased downward (understated).

The most effective way to deal with inflation is to build inflation effects into each cash flow component using the best available information about how each component will be affected. For example, per procedure revenues may be expected to increase at a 4 percent rate, labor costs may be expected to increase at an 8 percent rate, supply costs may be expected to increase at a 2 percent rate, and so on. Because it is impossible to estimate future inflation rates with much precision, inflation sometimes is assumed to be *neutral*. That is, inflation is assumed to affect all revenues and costs, except depreciation, equally. However, such an assumption rarely reflects the actual situation facing healthcare businesses, so, in general, different inflation rates should be applied to each cash flow component. Inflation adds to the uncertainty, or riskiness, of capital budgeting as well as to its complexity. Fortunately, com-



puters and spreadsheet programs are available to help with inflation analysis, so the mechanics of inflation adjustments are not difficult.

### **Cash Flow Estimation Bias**

As stated previously, cash flow estimation is the most critical, and the most difficult, part of the capital budgeting process. Cash flow components, such as volume and charges, often must be forecasted many years into the future, and estimation errors are bound to occur, some of which can be quite large.<sup>1</sup> However, large businesses evaluate and accept many projects every year, and as long as cash flow estimates are unbiased and the errors are random, the estimation errors will tend to offset one another; that is, some cash flow estimates will be too high and some will be too low. However, in the aggregate for all projects, the realized cash flows will be very close to the estimates, and hence realized total profitability will be close to that expected.

Unfortunately, there are strong indications that capital budgeting cash flow forecasts are not unbiased; rather, managers tend to be overly optimistic in their forecasts and, as a result, revenues tend to be overstated and costs tend to be understated.<sup>2</sup> The result is an upward bias in estimated profitability. This bias may occur because managers often are rewarded on the basis of the size of their divisions or departments, so they have an incentive to maximize the number of projects accepted rather than the profitability of the projects. Or, managers may be emotionally attached to their projects and become unable to objectively assess a project's potential.

Top management can use two procedures to identify cash flow estimation bias. First, if a project is judged to be highly profitable, this question should be asked: What is the underlying cause of this project's high profitability? If the business has some underlying advantage, such as a monopoly position in a managed care market, or a superior reputation in providing a specific service, such as organ transplants, then there may be a logical rationale supporting the high profitability. If no such unique factor can be identified, then senior management should be concerned about the possibility of estimation bias. Even when these unique factors exist, it is likely that the project's profitability, at some point in the future, will be eroded by competitive pressure from other businesses seeking to capture the high profitability inherent in the project.

Second, the post-audit process, which we discuss later in this chapter, will help to identify divisions and departments that habitually overstate or understate project profitability. (It is difficult to identify projects whose cash flows are understated because many of those projects will be rejected, and hence no cash flow comparisons can be made. Perhaps the best indicator of underestimation bias is when competing firms undertake projects of the type that are being rejected.) Many firms are now identifying managers and divisions that typically submit biased cash flow estimates and are compensating



for this bias in the decision process by reducing cash inflows that are thought to be too rosy or by increasing the cost of capital to such projects.

### Strategic Value

In the previous section, we discussed the problem of cash flow estimation bias, which can result in overstating a project's profitability. Another problem that can occur in cash flow estimation is underestimating a project's true profitability by not recognizing its *strategic value*, which is the value of future investment opportunities that can be undertaken only if the project currently under consideration is accepted.

To illustrate this concept, consider a hospital management company that is analyzing a management contract for a hospital in Hungary, which is its first move into Eastern Europe. On a stand-alone basis this project might be unprofitable, but the project might provide entry into the Eastern European market, which would unlock the door to a whole range of highly profitable new projects. Or consider Ridgeland Community Hospital's decision to start a kidney transplant program. The financial analysis of this project showed the program to be unprofitable, but Ridgeland's managers considered kidney transplants to be the first step in an aggressive transplant program that would not only be profitable in itself but would also enhance the hospital's reputation for technological and clinical excellence and thus would contribute to the hospital's overall profitability.

In theory, the best approach to dealing with strategic value is to forecast the cash flows from the follow-on projects, estimate their probabilities of occurrence, and then add the expected cash flows from the follow-on projects to the cash flows of the project under consideration. In practice, this is usually impossible to do—either the follow-on cash flows are too nebulous to forecast or the potential follow-on projects are too numerous to quantify. In most situations, the strategic value of a project stems from options that arise by virtue of the project being undertaken. Thus, at a minimum, decision makers must recognize that some projects have strategic value, and this value should be qualitatively considered when making capital budgeting decisions.

Strategic value is but one type of “added” value that arises when projects have embedded in them options that may or may not be exercised (taken advantage of) in the future. Options that are inherent in projects, as opposed to options on securities, are called *real*, or *managerial*, *options*. In the next chapter, we will further discuss real options and their implications for a project's risk and value.

### Self-Test Question

1. Briefly, discuss the following concepts associated with cash flow estimation:
  - a. Incremental cash flow
  - b. Cash flow versus accounting income

- c. Cash flow timing
- d. Project life
- e. Sunk costs
- f. Opportunity costs
- g. Effects on other projects
- h. Shipping and installation costs
- i. Changes in net working capital
- j. Inflation effects
- k. Cash flow estimation bias
- l. Strategic value

## Cash Flow Estimation Example



Up to this point, we have discussed a number of key concepts related to cash flow estimation. In this section, we present an example that illustrates some of the concepts already covered and introduces several others that are important to good cash flow estimation.

### *The Basic Data*

Consider the situation facing Ridgeland Community Hospital, a not-for-profit hospital, in its evaluation of a new MRI system. The system costs \$1.5 million, and the hospital would have to spend another \$1 million for shipping, site preparation, and installation. Because the system would be installed in the hospital, the space to be used has a very low, or zero, market value to outsiders, and thus no opportunity cost has been assigned to account for the value of the space.

The MRI site is estimated to generate weekly usage (volume) of 40 scans, and each scan would, on average, cost the hospital \$15 in supplies. The site is expected to operate 50 weeks a year, with the remaining two weeks devoted to maintenance. The estimated average charge per scan is \$500, but 25 percent of this amount, on average, is expected to be lost to indigent patients, contractual allowances, and bad-debt losses. Ridgeland's managers developed the project's forecasted revenues by conducting the revenue analysis contained in Table 11.1.

The MRI site would require two technicians, resulting in an incremental increase in annual labor costs of \$50,000, including fringe benefits. Cash overhead costs would increase by \$10,000 annually if the MRI site is activated. The equipment would require maintenance, which would be furnished by the manufacturer for an annual fee of \$150,000, which is payable at the end of each year of operation. For book (financial statement) purposes, the MRI site will be depreciated by the straight-line method over a five-year life.

**TABLE 11.1**  
Ridgeland Community Hospital: MRI Site Revenue Analysis

<i>Payer</i>	<i>Number of Scans per Week</i>	<i>Charge per Scan</i>	<i>Total Charges</i>	<i>Basis of Payment</i>	<i>Net Payment per Scan</i>	<i>Total Payments</i>
Medicare	10	\$500	\$ 5,000	Fixed fee	\$370*	\$ 3,700
Medicaid	5	500	2,500	Fixed fee	350*	1,750
Private insurance	9	500	4,500	Full charge	500	4,500
Blue Cross	5	500	2,500	Percent of charge	420*	2,100
Managed care	7	500	3,500	Percent of charge	390*	2,730
Self-pay	4	500	2,000	Full charge	55**	220
<b>Total</b>	<b>40</b>		<b>\$20,000</b>			<b>\$15,000</b>
<b>Average</b>			<b>\$ 500</b>			<b>\$ 375</b>

\*Net of contractual allowances.

\*\*Net of bad-debt losses.

The MRI site is expected to be in operation for five years, at which time the hospital's master plan calls for a brand-new imaging facility. The hospital plans to sell the MRI system at that time for an estimated \$750,000 salvage value, net of removal costs. The inflation rate is estimated to average 5 percent over the period, and this rate is expected to apply to all revenues and costs except depreciation. Ridgeland's managers initially assume that projects under evaluation have average risk, and thus the hospital's 10 percent cost of capital is the appropriate project cost of capital. Later, in Chapter 12, a risk assessment of the project may indicate that a different cost of capital is appropriate.

Although the MRI project is expected to take away some patients from the hospital's other imaging systems, the new MRI patients are expected to generate revenues for some of the hospital's other departments. On net, the two effects are expected to balance out; that is, the cash flow loss from other imaging systems is expected to be offset by the cash flow gain from other services utilized by the new MRI patients.

### Cash Flow Analysis

The first step in the financial analysis is to estimate the MRI site's net cash flows. This analysis is presented in Table 11.2. Here are the key points of the analysis by line number:

- **Line 1.** Line 1 contains the estimated cost of the MRI system. In general, capital budgeting analyses assume that the first cash flow, normally an outflow, occurs today or at the end of Year 0. Note that expenses, or cash outflows, are shown in parentheses.
- **Line 2.** The related shipping, site preparation, and installation expense—\$1 million—is also assumed to occur at Year 0.
- **Line 3.** Gross revenues = Weekly volume  $\times$  Weeks of operation  $\times$  Charge per scan =  $40 \times 50 \times \$500 = \$1,000,000$  in the first year. The 5 percent inflation rate is applied to all charges and costs that would likely be affected by inflation, so the gross revenue amount shown on Line 3 increases by 5 percent over time. Although most of the operating revenues and costs would occur more or less evenly over the year, it is very difficult to forecast exactly when most of the flows would occur. Furthermore, there is significant potential for large errors in cash flow estimation. For these reasons, operating cash flows are often assumed to occur at the end of each year. Also, we assume that the MRI system could be placed in operation quickly. If this were not the case, then the first year's operating flows would be reduced because it would be a partial year of operations. In some situations, it might take several years from the first cash outflow to the point when the project is operational and begins to generate operating cash inflows.
- **Line 4.** Deductions from charges are estimated to average 25 percent of gross revenues, so in Year 1,  $0.25 \times \$1,000,000 = \$250,000$  of gross

**TABLE 11.2**  
Ridgeland Community Hospital: MRI Site Cash Flow Analysis

	Annual Cash Flows					
	0	1	2	3	4	5
1. System cost						
2. Related expenses						
3. Gross revenues		\$ 1,000,000	\$ 1,050,000	\$ 1,102,500	\$ 1,157,625	\$ 1,215,506
4. Deductions		250,000	262,500	275,625	289,406	303,877
5. Net revenues		\$ 750,000	\$ 787,500	\$ 826,875	\$ 868,219	\$ 911,630
6. Labor costs		50,000	52,500	55,125	57,881	60,775
7. Maintenance costs		150,000	157,500	165,375	173,644	182,326
8. Supplies		30,000	31,500	33,075	34,729	36,465
9. Incremental overhead		10,000	10,500	11,025	11,576	12,155
10. Depreciation		350,000	350,000	350,000	350,000	350,000
11. Operating cash flow		\$ 160,000	\$ 185,500	\$ 212,275	\$ 240,389	\$ 269,908
12. Taxes		0	0	0	0	0
13. Net operating cash flow		\$ 160,000	\$ 185,500	\$ 212,275	\$ 240,389	\$ 269,908
14. Depreciation		350,000	350,000	350,000	350,000	350,000
15. Net salvage value						750,000
16. Net cash flow		\$ 510,000	\$ 535,500	\$ 562,275	\$ 590,389	\$ 1,369,908

Note: Calculations are rounded.

revenues would be uncollected. This amount increases each year by the 5 percent inflation rate.

- **Line 5.** Line 5 contains the net revenues in each year, Line 3 – Line 4.
- **Line 6.** Labor costs are forecasted to be \$50,000 during the first year, but will increase over time at the 5 percent inflation rate.
- **Line 7.** Maintenance fees must be paid to the manufacturer at the end of each year of operation. These fees are assumed to increase at the 5 percent inflation rate.
- **Line 8.** Each scan uses \$15 of supplies, so supply costs in the first year total  $40 \times 50 \times \$15 = \$30,000$ , which are expected to increase each year by the inflation rate.
- **Line 9.** If the project is accepted, overhead cash costs will increase by \$10,000 in the first year. Note that the \$10,000 are cash costs that are related directly to the acceptance of the MRI project. Existing overhead costs that are arbitrarily allocated to the MRI site are not incremental cash flows and thus should not be included in the analysis. Overhead costs are also assumed to increase over time at the inflation rate.
- **Line 10.** For book purposes, depreciation in each year is calculated by the straight-line method, assuming a five-year depreciable life. The depreciable basis is equal to the capitalized cost of the project, which includes the cost of the asset and related expenses, less the estimated salvage value. Thus, the depreciable basis is  $(\$1,500,000 + \$1,000,000) - \$750,000 = \$1,750,000$ . Then, the straight-line depreciation in each year of the project's five-year depreciable life is  $(1 / 5) \times \$1,750,000 = \$350,000$ . Note that depreciation is based solely on acquisition costs, so it is unaffected by inflation. Also, note that the Table 11.2 cash flows are presented in a generic format that can be used by both investor-owned and not-for-profit hospitals. Depreciation expense is not a cash flow but an accounting convention that prorates the cost of a long-term asset over its productive life. Because Ridgeland Community Hospital is tax exempt, and hence depreciation will not affect taxes, and because depreciation is added back to the cash flows on Line 14, depreciation can be totally omitted from the cash flow analysis.
- **Line 11.** Line 11 shows the project's operating cash flow in each year, which is merely net revenues less all operating expenses.
- **Line 12.** Line 12 contains zeros because Ridgeland is a not-for-profit and hence does not pay taxes.
- **Line 13.** Ridgeland pays no taxes, so the project's net operating cash flow equals its operating cash flow.
- **Line 14.** Because depreciation, a noncash expense, was deducted on Line 10, it must be added back to the project's net operating cash flow in each year to obtain each year's net cash flow.
- **Line 15.** Finally, the project is expected to be terminated after five years, at which time the MRI system will be sold for an estimated \$750,000.

This salvage value cash flow is shown on Line 15 as an inflow at the end of Year 5.

- **Line 16.** The project's net cash flows are shown on Line 16. The project requires a \$2.5 million investment at Year 0 but then generates cash inflows over its five-year operating life.

Note that the Table 11.2 cash flows do not include any allowance for interest expense. On average, Ridgeland hospital will finance new projects in accordance with its target capital structure, which consists of 50 percent debt financing and 50 percent equity (fund) financing. The costs associated with this financing mix, including interest costs, are incorporated into Ridgeland's corporate cost of capital of 10.0 percent. Because the cost of debt financing is included in the discount rate that will be applied to the cash flows, recognition of interest expense in the cash flows would be double counting.

### Taxable Organizations

The Table 11.2 cash flow analysis can be easily modified to reflect tax implications if the analyzing firm is taxable. For example, assume that the MRI project is being evaluated by Ann Arbor Health Systems, an investor-owned hospital chain. Furthermore, assume that all of the project data presented earlier apply to Ann Arbor, except that (1) the MRI falls into the Modified Accelerated Cost Recovery System (MACRS) five-year class for tax depreciation and (2) the firm has a 40 percent tax rate. Table 11.3 contains Ann Arbor's cash flow analysis. Note the following differences:

- **Line 10.** First, depreciation expense must be modified to reflect tax depreciation rather than book depreciation. As we discussed in Chapter 1, tax depreciation is calculated using the MACRS. To determine the MACRS depreciation allowance in any year, multiply the asset's depreciable basis, without considering its estimated salvage value, by the appropriate depreciation factor. In the MRI illustration, the depreciable basis is \$2.5 million, and the MACRS factors for the five-year class are 0.20, 0.32, 0.19, 0.12, 0.11, and 0.06 in Years 1 to 6, respectively. Thus, the tax depreciation in Year 1 is  $0.20 \times \$2,500,000 = \$500,000$ ; in Year 2 the depreciation is  $0.32 \times \$2,500,000 = \$800,000$ ; and so on.
- **Line 12.** Taxable businesses must reduce the operating cash flow on Line 11 by the amount of taxes. Taxes, which appear on Line 12, are computed by multiplying the Line 12 pretax operating cash flow by the business's marginal tax rate. For example, the project's taxes for Year 1 are  $0.40 \times \$10,000 = \$4,000$ . Note that the taxes shown for Year 2 are a negative \$105,800. In this year, the project is expected to lose \$264,500, and hence Ann Arbor's taxable income, assuming its existing projects are profitable, will be reduced by this amount if the project is undertaken. This reduction in taxable income would lower the firm's tax bill by  $T \times$  Taxable income reduction =  $0.40 \times \$264,500 = \$105,800$ .<sup>3</sup>

**TABLE 11.3**  
Ann Arbor Health Systems: MRI Site Cash Flow Analysis

	Annual Cash Flows					
	0	1	2	3	4	5
1. System cost	(\$1,500,000)					
2. Related expenses	(1,000,000)					
3. Gross revenues		\$ 1,000,000	\$ 1,050,000	\$ 1,102,500	\$ 1,157,625	\$ 1,215,506
4. Deductions		250,000	262,500	275,625	289,406	303,877
5. Net revenues		\$ 750,000	\$ 787,500	\$ 826,875	\$ 868,219	\$ 911,630
6. Labor costs		50,000	52,500	55,125	57,881	60,775
7. Maintenance costs		150,000	157,500	165,375	173,644	182,326
8. Supplies		30,000	31,500	33,075	34,729	36,465
9. Incremental overhead		10,000	10,500	11,025	11,576	12,155
10. Depreciation		500,000	800,000	475,000	300,000	275,000
11. Operating cash flow		\$ 10,000	(\$ 264,500)	\$ 87,275	\$ 290,389	\$ 344,908
12. Taxes		4,000	(105,800)	34,910	116,156	137,963
13. Net operating cash flow		\$ 6,000	(\$ 158,700)	\$ 52,365	\$ 174,233	\$ 206,945
14. Depreciation		500,000	800,000	475,000	300,000	275,000
15. Net salvage value						510,000
16. Net cash flow		\$ 506,000	\$ 641,300	\$ 527,365	\$ 474,233	\$ 991,945

Note: Calculations are rounded.



- **Line 14.** The MACRS depreciation, because it is a noncash expense, is added back on Line 14.
- **Line 15.** Investor-owned firms will normally incur a tax liability on the sale of a capital asset at the end of the project's life. According to the IRS, the value of the MRI system at the end of Year 5 is the *tax book value*, which is the depreciation that remains on the tax books. In the illustration, five years worth of depreciation would be taken, so only one year of depreciation remains. The MACRS factor for Year 6 is 0.06, so by the end of Year 5, Ann Arbor has expensed 0.94 of the MRI's depreciable basis and the remaining tax book value is  $0.06 \times \$2,500,000 = \$150,000$ . Thus, according to the IRS, the value of the MRI system is \$150,000. When Ann Arbor sells the system for its estimated salvage value of \$750,000, it realizes a "profit" of  $\$750,000 - \$150,000 = \$600,000$ , and it must repay the IRS an amount equal to  $0.4 \times \$600,000 = \$240,000$ . The \$240,000 tax bill recognizes that Ann Arbor took too much depreciation on the MRI system, so it represents a *recapture* of the excess tax benefit taken over the five-year life of the system. The \$240,000 in taxes reduces the cash received from the sale of the MRI equipment, so the salvage value net of taxes is  $\$750,000 - \$240,000 = \$510,000$ .

As can be seen by comparing Line 16 in Tables 11.2 and 11.3, all else the same, the taxes paid by investor-owned firms tend to reduce a project's net operating cash flows and net salvage value and hence reduce the project's profitability.

### Replacement Analysis

Ridgeland Community Hospital's MRI project was used to illustrate how the cash flows from an *expansion project* are analyzed. All businesses, including Ridgeland Community Hospital, also make *replacement decisions*, in which a new asset is being considered to replace an existing asset that could, if not replaced, continue in operation. The cash flow analysis for a replacement decision is somewhat more complex than for an expansion decision because the cash flows from the existing asset must be considered.

Again, the key to cash flow estimation is to focus on the incremental cash flows. If the new asset is acquired, the existing asset can be sold, so the current market value of the existing asset is a cash inflow at Time 0 in the analysis. When considering the operating flows, the incremental flows are the cash flows expected from the replacement asset less the flows that the existing asset produces. By applying the incremental cash flow concept, the correct cash flows can be estimated for replacement decisions.

### Self-Test Questions

1. Briefly, describe how a project cash flow analysis is constructed.
2. Is it necessary to include depreciation expense in a cash flow analysis by a not-for-profit provider? Explain your answer.

3. What are the key differences in cash flow analyses performed by investor-owned and not-for-profit organizations?
4. How do expansion and replacement project analyses differ?

## Breakeven Analysis

*Breakeven analysis* is used to gain insights into the potential profitability and risk of a project. Furthermore, breakeven analysis often is useful in evaluating operational decisions that do not require an initial capital investment, such as expanding the hours of a clinic. Although breakeven analysis can be applied in many different ways, we will focus here on two types of breakeven: (1) utilization (volume) breakeven and (2) time breakeven.

### Utilization (Volume) Breakeven

To illustrate utilization breakeven, first consider how it can be applied to operating cash flows. Specifically, let's examine operating breakeven in Year 1. From Table 11.2, we know that 40 scans a week would produce a net cash flow in Year 1 of \$510,000. But a logical question to ask would be how many scans per week would be necessary to reach operating break even in Year 1? That is, how many scans per week are required to generate a positive net cash flow in Year 1? With the basic analysis performed using a spreadsheet program, it is very easy to do breakeven analysis. Table 11.4 contains the Year 1 net cash flow at different utilization levels and, as indicated by the data, the project breaks even in Year 1 if the hospital performs 12 scans per week.

Utilization breakeven can also be applied to the entire project. Here, we want to know the answer to this question: What weekly utilization would allow the hospital to break even economically—that is, to recover all of the costs associated with the project, including capital costs? Again, if the analysis is modeled on a spreadsheet, answers to these types of questions are easy to

<i>Number of Scans per Week</i>	<i>Year 1 Net Cash Flow</i>
0	(\$210,000)
5	(120,000)
10	(30,000)
11	(12,000)
12	6,000
13	24,000
14	42,000
15	60,000
20	150,000
30	330,000
40	510,000

**TABLE 11.4**  
Ridgeland  
Community  
Hospital: MRI  
Site Year 1  
Breakeven  
Analysis

develop. As we discuss in a later section, economic breakeven occurs for a project when its net present value (NPV) equals zero or just turns positive. In Ridgeland's MRI project, this occurs at a weekly volume of 39 scans, so the project in its entirety just breaks even when the hospital averages 39 scans per week over the five-year forecasted life of the project. Such information is clearly useful to Ridgeland's managers. If they feel strongly that utilization will exceed 39 scans per week, then it is highly likely that the project will be economically profitable. Conversely, if they believe that utilization will be less than the breakeven level, then the project will probably be unprofitable. Also, if, as in this situation, the projected volume is just above breakeven, a small forecasting error can result in a project that appears profitable on paper but actually is unprofitable if undertaken.

Finally, note that this type of breakeven analysis can be applied to cash flow inputs other than volume. For example, it would be useful for Ridgeland's managers to know the project's breakeven salvage value. Again, with the cash flows on a spreadsheet, it is easy to use trial and error (or even easier if the Goal Seek capability is used) to find the economic breakeven point for salvage value: about \$617,000. Thus, even if the MRI is worth only \$617,000 at the end of five years, as opposed to the actual estimate of \$750,000, the project remains financially worthwhile (or at least neutral).

### Time Breakeven (Payback)

The *payback*, or *payback period*, measures time breakeven. Payback is defined as the expected number of years required to recover the investment in the project. To illustrate the concept, consider the net cash flows for the MRI project contained in Table 11.2. The best way to determine the project's payback is to construct the project's cumulative cash flows as shown in Table 11.5. Here, the cumulative cash flow in each year is the sum of the annual cash flows up to and including that year. For example, the cumulative cash flow in Year 2 is  $-\$2,500,000 + \$510,000 + \$535,500 = -\$1,454,500$ .

Because the cumulative cash flows turn positive in Year 5, the \$2.5 million investment in the MRI site would be recovered some time during Year 5. If the project's cash flows are assumed to come in evenly during the

**TABLE 11.5**

Ridgeland  
Community  
Hospital: MRI  
Site Cumulative  
Cash Flows

Year	Annual Cash Flow	Cumulative Cash Flow
0	(\$2,500,000)	(\$2,500,000)
1	510,000	(1,990,000)
2	535,500	(1,454,500)
3	562,275	(892,225)
4	590,389	(301,836)
5	1,369,908	1,068,072

$$\text{Payback} = 4 + \$301,836 / \$1,369,908 = 4.22 \text{ years.}$$

year, then breakeven would occur  $\$301,836 / \$1,369,908 = 0.22$  of the way through Year 5, so the payback is 4.22 years.

Many years ago, managers used payback as the primary financial evaluation tool in project analyses. For example, a business might accept all projects with paybacks less than five years. However, payback has two serious deficiencies when it is used as a project selection criterion. First, payback ignores all cash flows that occur after the payback period. For example, assume that Ridgeland is evaluating a competing project that has the same cash flows as the MRI project in Years 0 through 5. However, the alternative project has a cash inflow of \$2 million in Year 6. Both projects would have the same payback, 4.22 years, and hence be ranked the same, even though the alternative project clearly is better from a financial perspective. Second, payback ignores the opportunity costs associated with the capital employed. For these reasons, payback generally is no longer used as the primary evaluation tool.

However, payback is useful in capital investment analysis. The shorter the payback, the more quickly the funds invested in a project become available for redeployment within the organization, and hence the more liquid the project. Also, cash flows expected in the distant future are generally more difficult to forecast than near-term cash flows, so shorter payback projects generally are less risky than those with longer paybacks. Therefore, payback is often used as a rough measure of a project's *liquidity* and *risk*.

Another measure, the *discounted payback*, is similar to the straight payback, except that the cash flows in each year are discounted by the project's cost of capital prior to calculating the payback. Thus, discounted payback solves the straight payback's problem of not considering the project's cost of capital in the payback calculation. To illustrate discounted payback, consider Table 11.6. Here, we have created a new column labeled "Discounted Cash Flow." Each entry in this column is the matching annual cash flow discounted at the 10 percent cost of capital for the number of years that it occurs into the future. For example, the discounted Year 2 cash flow is  $\$535,500 / (1.10)^2 = \$442,562$ . The discounted payback is  $4 + 768,112 / 850,605 = 4.90$  years. Because time value is recognized in the discounted payback, it is longer than the regular payback of 4.22 years.

1. Why is breakeven information valuable to decision makers?
2. Describe several types of breakeven analysis.
3. What is the difference between "regular" payback and discounted payback?

## Self-Test Questions

## Return on Investment Analysis

Up to this point, the chapter has focused on cash flow estimation and breakeven analysis. Perhaps the most important element in a project's financial anal-

**TABLE 11.6**

Ridgeland Community Hospital: MRI Site Cumulative Discounted Cash Flows	Year	Annual Cash Flow	Discounted Cash Flow	Cumulative Discounted Cash Flow
	0	(\$2,500,000)	(\$2,500,000)	(\$2,500,000)
	1	510,000	463,636	(2,036,364)
	2	535,500	442,562	(1,593,802)
	3	562,275	422,446	(1,171,356)
	4	590,389	403,244	(768,112)
	5	1,369,908	850,605	82,493

Discounted payback =  $4 + 768,112 / 850,605 = 4.90$  years.

ysis is expected profitability, which generally is assessed by *return on investment* (ROI) measured either in dollars or in percentage rate of return. In the next sections, we present one dollar measure—net present value—and two rate-of-return measures—(1) internal rate of return and (2) modified internal rate of return.

### Net Present Value

*Net present value* (NPV) is a profitability measure that uses the discounted cash flow (DCF) techniques discussed in Chapter 3, so it is often referred to as a *DCF measure*. To apply the NPV method, we proceed as follows:

- Find the present (Time 0) value of each net cash flow, including both inflows and outflows, discounted at the project cost of capital.
- Sum the present values. This sum is defined as the project's NPV.
- If the NPV is positive, the project is profitable, and the higher the NPV the more profitable the project. If the NPV is zero, the project just breaks even in profitability. If the NPV is negative, the project is unprofitable.

Assuming a project cost of capital of 10 percent, the NPV of Ridgeland's MRI project is calculated as follows:

0	1	2	3	4	5
	10%				
(\$2,500,000)	\$510,000	\$535,500	\$562,275	\$590,389	\$1,369,908
463,636	←				
442,562	←	←			
422,446	←	←	←		
403,244	←	←	←	←	
850,605	←	←	←	←	←
<u>\$ 82,493</u>	= NPV				

Spreadsheets have NPV functions that easily perform the mathematics given the cash flows and cost of capital.<sup>4</sup> Here is one example of a spreadsheet calculation for the project:

	A	B	C	D
1				
2	10.0%		Project cost of capital	
3	\$ (2,500,000)		Cash flow 0	
4	510,000		Cash flow 1	
5	535,500		Cash flow 2	
6	562,275		Cash flow 3	
7	590,389		Cash flow 4	
8	1,369,908		Cash flow 5	
9				
10	\$ 82,493	=NPV(A2,A4:A8)+A3 (entered into Cell A10)		

Note that we have merely entered the net cash flows into the spreadsheet. In a typical project analysis, the spreadsheet would be used for the cash flow analysis, with the bottom line being the net cash flows. The project's NPV is calculated in Cell A10 using the NPV function. The first entry in the function (A2) is the discount rate (project cost of capital), while the second entry (A4:A8) designates the range of cash flows from Years 1 through 5. Because the NPV function calculates NPV one period before the first cash flow entered in the range, it is necessary to start the range with Year 1 rather than Year 0. Finally, to complete the calculation in Cell A10, A3 (the initial outlay) is added to the NPV function. The end result, \$82,493, is displayed in Cell A10.

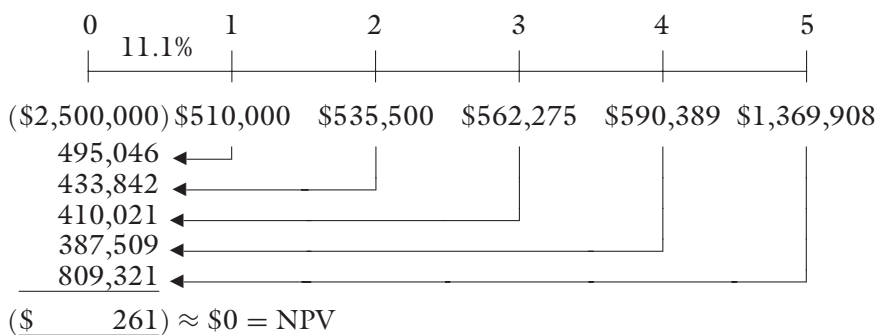
The rationale behind the NPV method is straightforward. An NPV of zero signifies that the project's cash inflows are just sufficient to (1) return the capital invested in the project and (2) provide the required rate of return on that invested capital. In other words, the project just breaks even in an economic sense, which considers **all costs** associated with the employment of capital. If a project has a positive NPV, then it is generating excess cash flows, and these excess cash flows are available to management to reinvest in the firm and, for investor-owned firms, to pay bonuses or dividends. For investor-owned businesses, NPV is a direct measure of the contribution of the project to owners' wealth. If a project has a negative NPV, its cash inflows are insufficient to compensate the business for the capital invested or perhaps will not ever recover the invested capital, so the project is unprofitable and acceptance would cause the financial condition of the business to deteriorate.

The NPV of the MRI project is \$82,493, so on a present value basis the project is projected to generate a cash flow excess of over \$80,000. Thus, the project is economically profitable, and its acceptance would have a positive impact on Ridgeland's financial condition.

## Internal Rate of Return

Whereas NPV measures a project's dollar profitability, *internal rate of return* (IRR), which is another DCF profitability measure, measures a project's percentage profitability or expected rate of return. Mathematically, the IRR is defined as the discount rate that equates the present value of the project's expected cash inflows to the present value of the project's expected cash outflows, so the IRR is simply the discount rate that forces the NPV of the project to equal zero.

For Ridgeland's MRI project, the IRR is the discount rate that causes the sum of the present values of the cash inflows to equal the \$2.5 million cost of the project:



When all of the MRI project's cash flows are discounted at 11.1 percent, the NPV of the project is approximately zero. Thus, the MRI project's IRR is 11.1 percent. Put another way, the project is expected to generate an 11.1 percent rate of return on its \$2.5 million investment.

Spreadsheets have IRR functions that calculate IRRs very rapidly. Simply input the project's cash flows into the spreadsheet and compute the IRR:

	A	B	C	D
1				
2	10.0%		Project cost of capital	
3	\$ (2,500,000)		Cash flow 0	
4	510,000		Cash flow 1	
5	535,500		Cash flow 2	
6	562,275		Cash flow 3	
7	590,389		Cash flow 4	
8	1,369,908		Cash flow 5	
9				
10	11.1%	=IRR(A2:A3:A8) (entered into Cell A10)		

Here we have placed the IRR function in Cell A10. The first entry in the function (A2) gives a starting value for the spreadsheet calculation, while the next entry (A3:A8) specifies the range of cash flows to be used in the calculation. The answer, 11.1%, is displayed in Cell A10.

If the IRR exceeds the project cost of capital, a surplus remains after recovering the invested capital and paying for its use, and this surplus accrues to the firm's stockholders (in Ridgeland's case, to its stakeholders). On the other hand, if the IRR is less than the project cost of capital, then taking on the project imposes a cost on the firm's stockholders or stakeholders. The MRI project's 11.1 percent IRR exceeds the project's 10.0 percent cost of capital. Thus, as measured by the IRR, the MRI project is profitable and its acceptance would enhance Ridgeland's financial condition.

### ***Comparison of the NPV and IRR Methods***

Consider a project with a zero NPV. In this situation, the project's IRR must equal its cost of capital. The project has zero profitability, and acceptance would neither enhance nor diminish the firm's financial condition. To have a positive NPV, the project's IRR must be greater than its cost of capital, and a negative NPV signifies a project with an IRR less than its cost of capital. Thus, projects that are deemed profitable by the NPV method will also be deemed profitable by the IRR method. In the MRI example, the project would have a positive NPV for all costs of capital less than 11.1 percent. If the cost of capital is greater than 11.1 percent, the project would have a negative NPV. In effect, the NPV and IRR are perfect substitutes for one another in estimating whether a project is profitable or not.

### ***Modified Internal Rate of Return***

In general, academics prefer the NPV profitability measure. This preference stems from two factors: (1) NPV measures profitability in dollars, which is a direct measure of the contribution of the project to the value of the business, and (2) both the NPV and the IRR, because they are discounted cash flow techniques, require an assumption about the rate at which project cash flows can be reinvested, and the NPV method has the better assumption.

To further explain the second point, consider the MRI project's Year 2 net cash flow of \$535,500, as shown in Table 11.2. In effect, the discounting process inherent in the NPV and IRR methods automatically assigns a reinvestment rate to this cash flow; that is, both the NPV and IRR methods assume that Ridgeland has the opportunity to reinvest the \$535,500 Year 2 cash flow in other projects, and each method automatically assigns a reinvestment rate to this flow for Years 3, 4, and 5. The NPV method assumes reinvestment at the project cost of capital, 10 percent, while the IRR method assumes reinvestment at the IRR rate, 11.1 percent. Which is the better assumption—reinvestment at the cost of capital or reinvestment at the IRR rate? In general, a business will take on all projects that exceed its cost of capital. Thus, at the margin, the returns from capital reinvested within the firm are more likely to be at, or close to, the cost of capital than at the project's IRR, especially for projects with exceptionally high or low IRRs. Furthermore, a business can

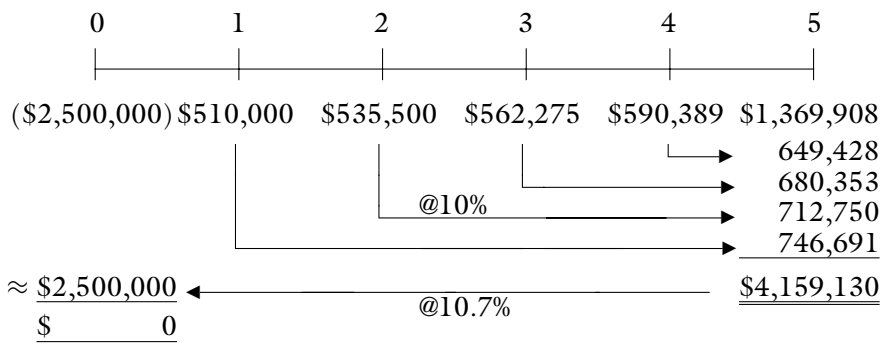


obtain outside capital at a cost roughly equal to the cost of capital, so cash flows generated by a project could be replaced by capital having this cost. Thus, in general, reinvestment at the cost of capital is a better assumption than reinvestment at the IRR rate, so NPV is a theoretically better measure of profitability than IRR.<sup>5</sup>

Even though academics strongly favor the NPV method, practicing managers prefer the IRR method because it is more intuitive for most people to analyze investments in terms of percentage rates of return than dollars of NPV. Thus, an alternative rate of return measure has been developed that eliminates the primary problem with IRR. This method is the *modified IRR* (*MIRR*), and it is calculated as follows:

- Discount all the project's net cash outflows back to Year 0 at the project cost of capital. This value is called the *present value of costs*.
- Compound all the project's net cash inflows forward to the last (terminal) year of the project, at the project cost of capital. This value is called the *inflow terminal value*.
- The discount rate that forces the present value of the inflow terminal value to equal the present value of costs is defined as the MIRR.

Applying these steps to Ridgeland's MRI project produces a MIRR of about 10.7 percent:



The MIRR method, by compounding the cash inflows forward at 10 percent, forces the reinvestment rate to equal 10 percent, which is the project cost of capital. Note that the MIRR for the MRI project is less than the project's IRR because the cash inflows are reinvested at only 10 percent rather than the project's 11.1 percent IRR. In general, the MIRR is less than the IRR when the IRR is greater than the cost of capital, but it is greater than the IRR when the IRR is less than the cost of capital. In effect, the IRR overstates the profitability of profitable projects and understates the profitability of unprofitable projects. By forcing the correct reinvestment rate, the MIRR method provides decision makers with a theoretically better measure of a project's expected rate of return than does the IRR.

Here is the spreadsheet solution for MIRR:

	A	B	C	D
1				
2	10.0%		Project cost of capital	
3	\$ (2,500,000)		Cash flow 0	
4	510,000		Cash flow 1	
5	535,500		Cash flow 2	
6	562,275		Cash flow 3	
7	590,389		Cash flow 4	
8	1,369,908		Cash flow 5	
9				
10	10.7%	=MIRR(A3:A8,A2,A2) (entered into Cell A10)		

The MIRR function was placed in Cell A10. The first entry in the function (A3:A8) is the range of cash flows, while the next two entries (A2,A2) are the project cost of capital. (The MIRR function allows the reinvestment rate to differ from the project cost of capital: the first of the two entries is the project cost of capital and the second is the reinvestment rate. For our purposes, the two rates are the same). The resulting MIRR, 10.7%, is displayed in Cell A10.

In closing our discussion, note that the MIRR has other advantages over the IRR besides the proper reinvestment rate. Primarily, it avoids potential problems when a project has *non-normal* cash flows. A project with normal cash flows has one or more outflows followed by one or more inflows, while one with non-normal cash flows has outflows occurring after one or more inflows have occurred. In the non-normal situation, it is possible for a project to have two IRRs or even to have no IRR. These unusual results occur because of the mathematics of the IRR calculation. The MIRR overcomes these problems, so it is the only rate of return measure available for some projects.<sup>6</sup>

1. Briefly, describe net present value (NPV), internal rate of return (IRR), and modified IRR (MIRR).
2. Explain the rationale behind each method.
3. Why is MIRR a better rate-of-return measure than IRR?

**Self-Test Questions**

**Some Final Thoughts on Breakeven and Profitability Analysis**

We have presented several approaches to breakeven analysis and three profitability measures. In the course of our discussion, we purposely compared the methods against one another to highlight their relative strengths and weaknesses, but, in the process, we may have created the impression that businesses would use only one method in the decision process. Today, virtually all capital budgeting decisions of financial consequence are analyzed by computer, and

hence it is easy to calculate and list numerous breakeven measures along with NPV, IRR, and MIRR. Because each measure contributes slightly different information about the financial consequences of a project, it would be foolish for decision makers to focus on a single financial measure. Thus, we believe that a thorough financial analysis of a new project should include numerous financial measures, and that capital budgeting decisions are enhanced if all the information inherent in all of the measures is considered.

However, just as it would be foolish to ignore any of the quantitative measures, it would also be foolish to base capital budgeting decisions solely on these measures. The uncertainties in the cash flows estimates for many projects are such that the resulting quantitative measures can only be viewed as very rough estimates. Furthermore, organizational missions and strategic factors are important elements in capital budgeting decision making. Thus, qualitative factors should play an important role in the decision process. (We discuss one approach, project scoring, in a later section.)

Finally, managers should be very cautious of potential projects that have very high expected profitability. In a highly competitive environment, there would be no highly profitable projects available because the marketplace would have already identified these opportunities and taken advantage of them. Thus, high profitability projects must have some underlying rationale, such as market dominance or innovation, which justifies the profitability. Even then, under most circumstances, the project's high profitability will be eroded over time by competition.

### Self-Test Questions

1. Should capital budgeting analyses look at only one breakeven or profitability measure? Explain.
2. Why should qualitative factors also play a role in capital budgeting decisions?
3. Why should high profitability projects be viewed with some skepticism?

## Evaluating Projects with Unequal Lives



Occasionally, businesses must choose between two mutually exclusive projects that have unequal lives. (Two projects are *mutually exclusive* when acceptance of one implies rejection of the other.) When this situation arises, if the shorter-life project will be replicated, then an adjustment to the normal capital budgeting process is necessary. We now discuss two procedures—(1) the replacement chain method and (2) the equivalent annual annuity method—to both illustrate the problem and to show how to deal with it.

Suppose American Dental Equipment Corporation is planning to modernize its production facilities, and as part of the process, it is considering either a conveyor system (Project C) or forklift trucks (Project F) for moving

Year	Project C	Project F
0	(\$40,000)	(\$20,000)
1	8,000	7,000
2	14,000	13,000
3	13,000	12,000
4	12,000	—
5	11,000	—
6	10,000	—
NPV @ 11.5%	\$ 7,165	\$ 5,391

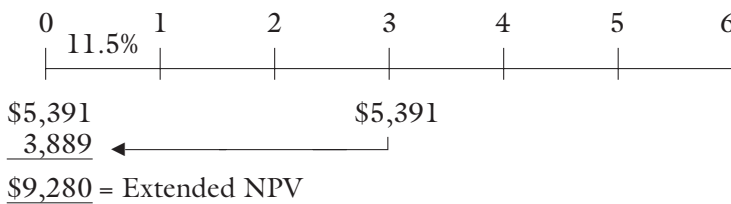
**TABLE 11.7**  
Expected Net Cash Flows for Projects C and F

materials from the parts department to the main assembly line. Table 11.7 shows both the expected net cash flows and the NPVs for these two mutually exclusive alternatives. We see that Project C, when discounted at the firm’s 11.5 percent corporate cost of capital, has the higher NPV and thus appears to be the more profitable project.

**Replacement Chain (Common Life) Analysis**

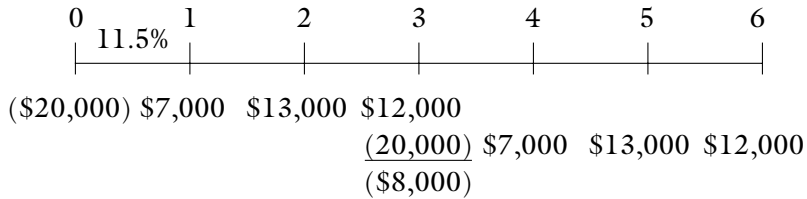
Although the analysis in Table 11.7 suggests that Project C is the more profitable project, the analysis is incomplete and this conclusion is actually incorrect. If the firm chooses Project F, it will have the opportunity to make a similar investment in three years, and if cost and revenue conditions continue at the Table 11.7 levels, this second, or replication, investment will also be profitable. However, if the firm chooses Project C, it will not have this second investment opportunity. Therefore, to make a proper comparison between the three-year and six-year projects, we can apply the *replacement chain (common life)* approach; that is, we can find the extended NPV of Project F over a six-year period by assuming the project is replicated, and then compare this extended NPV with the NPV of Project C over the same period.

The NPV for Project C, as calculated in Table 11.7, is already over the six-year common life. For Project F, however, we must take three additional steps: (1) determine the NPV of the replication project three years hence, (2) discount this NPV back to the present, and (3) sum the two components to obtain the project’s extended NPV. If we assume that the replication project will have the same cash flows as the original project, then Project F’s extended NPV is \$9,280:



Because Project F's six-year (extended) NPV is greater than Project C's six-year NPV, Project F is more profitable when the opportunity to replicate the project is considered.

Note that the time-line analysis above uses NPVs to summarize Project F's estimated cash flows. An alternative approach to the analysis is to place the annual cash flows on the time line:



NPV ≈ \$9,280.

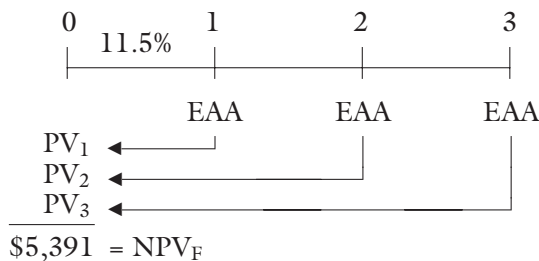
Clearly, the former method is simpler. However, if the cash flows for the replicated project are not the same as the cash flows for the initial project, then the more complex individual cash flow method must be used. By showing each cash flow, the analysis can accommodate changes in project cash flows that occur when the project is replicated.

### Equivalent Annual Annuity Approach

Although the preceding example illustrates why an extended analysis is necessary if two mutually exclusive projects with different lives are being analyzed, the analysis is generally more complex in practice. For example, one project might have a six-year life versus a ten-year life for the other. This would require a replacement chain analysis over 30 years, which is the lowest common multiple of the two lives. In such a situation, it is simpler to use the *equivalent annual annuity (EAA)* approach.

The EAA approach involves three steps:

1. Find each project's NPV over its original life. In Table 11.7, we see that  $NPV_C = \$7,165$  and  $NPV_F = \$5,391$ .
2. For each project, find the annuity (constant value) cash flow over the project's original life that has the same present value as the project's NPV. This cash flow is called the *equivalent annual annuity*. Here is the concept on a time line for Project F:



To find the value of  $EAA_F$  on a financial calculator, enter 5,391 (or  $-5,391$ ) as the PV,  $I = 11.5$ , and  $N = 3$ .<sup>7</sup> Then, solve for  $PMT = 2,225$ . Thus, the equivalent annual annuity for Project F is \$2,225. This is the annuity stream over the original life of the project—three years—that when discounted at the project cost of capital—11.5 percent—has a present value equal to Project F's NPV, \$5,391. The EAA for Project C is found in a like manner, and it is \$1,718. Thus, Project C has an NPV that is equivalent to an annuity of \$1,718 per year for six years, while Project F's NPV is equivalent to an annuity of \$2,225 for three years.

3. Now, when projects are replicated, assuming that the cash flows remain the same, they earn the same NPV over and over, which is equivalent to replicating the project's EAA over time. Thus, over any common life, whether six years or 30 years, the project with the higher EAA will have the higher NPV because its equivalent cash flow will be higher in every year. Because Project F has the higher EAA, under the assumption of constant cash flow replication, it is more profitable than Project C.

The EAA method is generally easier to apply, but the replacement chain method is often easier to explain to decision makers. Still, the two methods always lead to the same results if consistent assumptions are used. When should managers worry about unequal life analysis? As a general rule, the unequal life issue does not arise for independent projects; it is only an issue when mutually exclusive projects are being analyzed. However, even for mutually exclusive projects, it is not always appropriate to extend the analysis to a common life. This should only be done if there is a high probability that the projects will actually be replicated beyond their original lives.

There are several weaknesses inherent in the types of analysis just described. First, if inflation is expected, then replacement cost will probably be higher than the initial cost, both revenues and operating costs will probably rise, and hence the static conditions built into the example would not be appropriate. Second, future replacements may use different technologies, which might also change the project's cash flows. Third, it is difficult enough to estimate the lives of most projects, so estimating the lives of a future series of projects is often just speculation.

In view of these problems, no experienced manager would be too concerned about comparing mutually exclusive projects with lives of, say, eight years and ten years. Given all of the uncertainties in the estimation process, such projects can, for all practical purposes, be assumed to have the same life. Still, it is important to recognize that a problem does exist if mutually exclusive projects that will be replicated have substantially different lives. When the managers of Ann Arbor Health Systems encounter such problems, they build expected inflation, possible efficiency gains, or both directly into the cash flow estimates and then use the replacement chain approach to estimate

the projects' extended NPVs. The cash flow estimation is more complicated than in our example, but the concepts involved are exactly the same.

## Self-Test Questions

1. Is it always necessary to adjust project cash flows to account for unequal lives?
2. Briefly, describe the two methods for adjusting for unequal lives.

## Economic Life Versus Physical Life (Abandonment Value)

Customarily, projects are analyzed as though the business will operate the project over its full *physical life*. However, this may not be the best course of action financially; it may be best to terminate a project prior to the end of its potential life, and this possibility can materially affect a project's estimated profitability. Termination of a project before the end of its physical life is called *abandonment*, and the key to making this decision is a project's *abandonment value*. To illustrate the concept of abandonment value, consider Ridgeland Community Hospital's proposal to establish a taxable medical transportation division that would offer specialized medical transportation services to Ridgeland's patients and others in the community. The project's cash flows are contained in Table 11.8. For simplicity, we have shortened the physical life of the project to three years. The project's investment and operating cash flows are shown in the second column, while the third column contains the project's abandonment values. Abandonment values are equivalent to net salvage values, except that they have been estimated for each year of the project's physical life.

Using a 10 percent cost of capital, the NPV over the project's three-year physical life, with zero abandonment value, is  $-\$11,743$ . Thus, the project is unprofitable when the single alternative of a three-year life with a zero salvage value is considered. However, what would its NPV be if the project were abandoned after two years? In this situation, Ridgeland would receive operating cash flows for two years, plus the  $\$190,000$  abandonment value at the end of Year 2, and the project's NPV would be  $\$13,802$ . Thus, the project is profitable if Ridgeland operates it for only two years and then sells it. To

**TABLE 11.8**

Medical  
Transportation  
Division's  
Projected Cash  
Flows

Year	Initial Investment and Operating Cash Flows	End of Year Net Abandonment Value	NPV if Abandoned at the End of the Year Listed
0	(\$480,000)	\$ 480,000	\$ 0
1	200,000	300,000	(25,455)
2	187,500	190,000	13,802
3	175,000	0	(11,743)

Note: The project cost of capital is 10 percent.

complete the abandonment analysis, note that if the project were abandoned after one year, its NPV would be  $-\$25,455$ .

The *economic life* of the project, which is the life that produces the highest economic value (NPV), is two years. As a general rule, if profitability were the sole criterion in capital budgeting decisions, a project should be abandoned when the net abandonment value is greater than the present value of all cash flows beyond the abandonment point, discounted to the abandonment point. For example, if Ridgeland were to operate the division for one year, the abandonment value at that point is  $\$300,000$ , but the present value at Year 1 of the cash flows beyond Year 1 would be  $\$187,500 / (1.10)^1 + \$190,000 / (1.10)^1 = \$343,182$ , assuming abandonment at the end of Year 2. Thus, the Year 1 abandonment value is less than the Year 1 present value of continuing the project, so the project should not be abandoned at this point. However, a similar analysis at the end of Year 2 would show that the abandonment value is greater than the discounted value of future cash flows, so abandonment at Year 2 would produce the greater profitability. This is, of course, the same conclusion that we reached when calculating the NPVs of each possible project life. In essence, the abandonment decision examines the incremental cash flows to the firm at the abandonment point—the abandonment cash flows versus the cash flows associated with continuing the project—to determine the most profitable course of action.

In this illustration, we examined the concept of abandonment by looking at a project initially being evaluated. However, project performance should be examined on a regular basis, and those that are not meeting financial goals should, if feasible, be abandoned. (Project performance is reviewed in the post-audit process, which we discuss in a later section.) Once a project is up and running, two very different types of abandonment can occur: (1) sale by a business of a still-valuable product or service line because some other party can operate the line more efficiently and (2) abandonment of a product or service line because it is losing money. The first type of situation is illustrated by Ridgeland Community Hospital's sale of its two walk-in clinics to a physician group. Although the clinics were profitable to Ridgeland, the physician group could presumably operate them more efficiently and hence were willing to pay Ridgeland a premium over the value the clinics would have if they remained under hospital control. The second type of abandonment is illustrated by Northeast Medical's decision to discontinue its HMO operation in Boston. Although Northeast's GoodHealth plan had proved profitable in several areas, competition in the Boston market proved destructive, so the firm made the decision to cut its losses.

1. Define economic life, as opposed to physical life.
2. Should projects be viewed as having one fixed life, or should they be considered as having alternative lives?



## Capital Budgeting in Not-for-Profit Businesses

Although the capital budgeting techniques discussed up to this point are appropriate for use by both investor-owned and not-for-profit businesses, a not-for-profit firm has the additional consideration of meeting its charitable mission. In this section, we discuss two models that extend the capital budgeting decision to not-for-profit firms.

### *Net Present Social Value Model*<sup>8</sup>

Except for the discussion of strategic value, the financial analysis techniques discussed so far have focused exclusively on the cash flow implications of a proposed project. Some healthcare businesses, particularly not-for-profit providers, have the goal of producing social services along with commercial services. For such firms, the proper analysis of proposed projects must systematically consider the *social value* of a project along with its pure financial, or cash flow, value.

When social value is considered, the *total net present value* (*TNPV*) of a project can be expressed as follows:

$$\text{TNPV} = \text{NPV} + \text{NPSV}.$$

Here, NPV represents the conventional NPV of the project's cash flow stream and NPSV is the *net present social value* of the project. The NPSV term, which represents managers' assessment of the social value of the project in dollar terms, clearly differentiates capital budgeting in not-for-profit firms from that in investor-owned firms.

In evaluating each project, a project is acceptable if its TNPV is greater than or equal to zero. This means that the sum of the project's financial and social values is at least zero, so when both facets of value are considered, the project has positive, or at least nonnegative, worth. Probably not all projects will have social value, but if a project does, it is considered formally in this decision model. However, no project should be accepted if its NPSV is negative, even if its TNPV is positive. Furthermore, to ensure the financial viability of the business, the sum of the NPVs of all projects initiated in a planning period must equal or exceed zero. If this restriction were not imposed, social value could displace financial value over time, and a firm cannot continue to provide social value without financial integrity.

NPSV is the sum of the present (Year 0) values of each year's social value. In essence, the suppliers of fund capital to a not-for-profit firm never receive a cash return on their investment. Instead, they receive a return on their investment in the form of social dividends. These dividends take the form of services with social value to the community such as charity care, medical research and education, and a myriad of other services that, for one reason or another, do not pay their own way. A service provided to a patient at a price equal to or greater than its cost does not create social value. Similarly, if

governmental entities purchase care directly for beneficiaries of a program or support research, the resulting social value is created by the payer and not by the provider of the services.

In estimating a project's NPSV, it is necessary to estimate the social value of the services provided by the project in each year and determine the discount rate to apply to those services. When a project produces services to individuals who are willing and able to pay for those services, the value of those services is captured by the amount that they actually pay. Thus, the value of the services provided to those who cannot pay, or to those who cannot pay the full amount, can be estimated by the average net price paid by those individuals who are able to pay.

This approach to valuing social services has intuitive appeal, but certain points merit further discussion.

- Price is a fair measure of value only if the payer has the capacity to judge the true value of the service provided. Many observers of the health services industry would argue that information asymmetries between the provider and the purchaser inhibit the ability of the purchaser to judge true value.
- The fact that most payments for healthcare services are made by third-party payers may result in price distortions. For example, insurers may be willing to pay more for services than an individual would pay in the absence of insurance, or the existence of monopsony power by Medicare may result in a net price that is less than individuals would be willing to pay.
- A great deal of controversy exists over the true value of treatment in many situations. Suppose that some people are entitled to whatever healthcare is available, regardless of cost, and are not required to personally pay for the care. Even though society as a whole must cover the bill, people may demand a level of care that is of questionable value. For example, should \$500,000 be spent to keep a comatose 92-year-old alive for a few more days? If the true value of such an expenditure is zero, assigning a \$500,000 value just because that is its cost makes little sense.

In spite of the potential problems, it still seems reasonable to assign a social value to many, but not all, healthcare services on the basis of the price that others are willing to pay for those services.

The second element required to estimate the NPSV of a project is the discount rate to apply to the annual social value stream. Like the required rate of return on equity for not-for-profit firms, there has been considerable controversy over the proper discount rate to apply to future social values. However, contributors of fund capital clearly can capture social value two ways. First, as is commonly done, contributions can be made directly to not-for-profit organizations. Second, contributors can always invest the funds in

a portfolio of securities and then use the proceeds to purchase the healthcare services directly. In the second situation, there would be no tax consequences on the portfolio's return because the contributed proceeds would qualify for tax exemption, but the contributor would lose the tax exemption on the full amount of the funds placed in the portfolio. Because the second alternative exists, providers should require a return on their social value stream that approximates the return available on the equity investment in for-profit firms that offer the same services.

The NPSV model formalizes the capital budgeting decision process applicable to not-for-profit healthcare businesses. Although few organizations actually attempt to quantify NPSV, not-for-profit providers should, at a minimum, subjectively consider the social value inherent in projects under consideration.

### **Project Scoring Approach**

Managers of not-for-profit firms, as well as most managers of investor-owned businesses, recognize that nonfinancial factors should be considered in any capital budgeting analysis. The NPSV model examines only one other factor, and it is difficult to implement in practice. Thus, many firms use a quasi-subjective project scoring approach to capital budgeting decisions that attempts to capture both financial and nonfinancial factors. Table 11.9, the *project scoring matrix* used by Ridgeland Community Hospital, illustrates one such approach.

Ridgeland ranks projects on three dimensions: (1) stakeholder factors, (2) operational factors, and (3) financial factors. Within each dimension, multiple factors are examined and assigned scores that range from two points for very favorable impact to minus one point for negative impact. The scores within each dimension are added to obtain scores for stakeholder, operational, and financial factors, and then the dimension scores are aggregated to obtain a total score for the project. The total score gives Ridgeland's managers a feel for the relative values of projects under consideration when all factors, including financial, are taken into account.

Ridgeland's managers recognize that the scoring system is completely arbitrary, so a project with a score of 16, for example, may be more or less than twice as good as a project with a score of 8. Nevertheless, use of the project scoring matrix forces managers to address multiple issues when making capital budgeting decisions. Although Ridgeland's approach should not be used at other organizations without modification for firm- and industry-unique circumstances, it does provide insight into how a firm-unique matrix might be developed.

### **Self-Test Questions**

1. Describe the net present social value model of capital budgeting.
2. Describe the construction and use of a project scoring matrix.

**TABLE 11.9**  
Project Scoring Matrix

Criteria	Relative Score		
	2	1	0
<i>Stakeholder Factors:</i>			
Physicians	Strongly support	Support	Neutral
Employees	Helps morale a lot	Helps morale a little	No effect
Visitors	Greatly enhances visit	Enhances visit	No effect
Social value	High	Moderate	None
<i>Operational Factors:</i>			
Outcomes	Greatly improves	Improves	No effect
Length of stay	Documented decrease	Anecdotal decrease	No effect
Technology	Breakthrough	Improves current	Adds to current
Productivity	Large decrease in FTEs	Decrease in FTEs	No change in FTEs
<i>Financial Factors:</i>			
Life cycle	Innovation	Growth	Stabilization
Payback	Less than 2 years	2–4 years	4–6 years
IRR	Over 20%	15–20%	10–15%
Correlation	Negative	Uncorrelated	Somewhat positive
Stakeholder factor score	_____		
Service factor score	_____		
Financial factor score	_____		
Total score	_____		

## The Post-Audit

Capital budgeting is not a static process. If there is a long lag between a project's acceptance and its implementation, any new information concerning either capital costs or the project's cash flows should be analyzed before the actual start-up occurs. Furthermore, the performance of each project should be monitored throughout the project's life. The process of formally monitoring project performance over time is called the *post-audit*. It involves comparing actual results with those projected by the project's sponsors; explaining why differences occur; and analyzing potential changes to the project's operations, including replacement or termination.

The post-audit has several purposes:

- **Improve forecasts.** When managers systematically compare their projections to actual outcomes, there is a tendency for estimates to improve. Conscious or unconscious biases that occur can be identified and, one hopes, eliminated; new forecasting methods are sought as the need for them becomes apparent; and managers tend to do everything better, including forecasting, if they know that their actions are being monitored.
- **Develop historical risk data.** Post-audits permit managers to develop historical data on new project analyses regarding risk and expected rates of return. These data can then be used to make judgments about the relative risk of future projects as they are evaluated.
- **Improve operations.** Businesses are run by managers, and they can perform at higher or lower levels of efficiency. When a forecast is made, for example, by the surgery department, the department director and medical staff is, in a sense, putting their reputations on the line. If costs are above predicted levels and utilization is below expectations, the people involved will strive, within ethical bounds, to improve the situation and to bring results into line with forecasts. As one hospital CEO put it: "You academics worry only about making good decisions. In the health services industry, we also have to worry about making decisions good."
- **Reduce losses.** Post-audits monitor the performance of projects over time, so the first indication that termination or replacement should be considered often arises when the post-audit indicates that a project is performing poorly.

### Self-Test Questions

1. What is a post-audit?
2. Why are post-audits important to the efficiency of a business?

## Using Capital Budgeting Techniques in Other Contexts

The techniques developed in this chapter can help healthcare managers make a number of different types of decisions in addition to project selection. One

example is the use of NPV and IRR to evaluate corporate merger opportunities. Healthcare businesses often acquire other firms to increase capacity, to expand into other service areas, or for other reasons. A key element of any merger analysis is the valuation of the target firm. Although the cash flows in such an analysis typically are structured differently than in project analysis, the same evaluation tools are applied. We will demonstrate the use of these techniques in the business valuation section of Chapter 16.

Managers also use capital budgeting techniques when deciding whether or not to divest assets or reduce staffing. Like capital budgeting, these actions require an analysis of the impact of the decision on the business's cash flows. When cutting personnel, businesses typically spend money up-front in severance payments but then receive benefits in the form of lower wages and benefits in the future. When assets are sold, the pattern of cash flows is reversed; that is, cash inflows occur when the asset is sold, but any future cash inflows associated with the asset are sacrificed. (If future cash flows are negative, the decision, at least from a financial perspective, should be easy.) In both situations, the techniques discussed here, perhaps with modifications, can be applied to assess the financial consequences of the action.

1. Can capital budgeting tools be used in different settings? Explain your answer.

## Self-Test Question

### Key Concepts

This chapter discussed the basic capital budgeting process. Here are its key concepts:

- *Capital budgeting* is the process of analyzing potential expenditures on fixed assets and deciding whether the firm should undertake those investments.
- The *capital budgeting* process requires the firm to (1) estimate the project's expected cash flows, (2) assess the riskiness of those flows, (3) determine the appropriate cost of capital at which to discount those flows, and (4) determine the project's profitability and breakeven characteristics.
- The most important, but also the most difficult, step in analyzing a project is estimating the *incremental cash flows* that the project will generate.
- In determining incremental cash flows, *opportunity costs*—the cash flows forgone by using an asset—must be considered, but *sunk costs*—cash outlays that cannot be recouped—are not included. Further, any impact of the project on the firm's *other cash flows* must be included in the analysis.

- *Tax laws* generally affect investor-owned firms in three ways: (1) taxes reduce a project's operating cash flows, (2) tax laws prescribe the depreciation expense that can be taken in any year, and (3) taxes affect a project's salvage value cash flow.
- Capital projects often require an investment in *net working capital* in addition to the investment in fixed assets. Such increases represent a cash outlay that, if material, must be included in the analysis. This investment is recovered when the project is terminated.
- *Cash flow estimation bias* can result if managers are overly optimistic in their forecasts. Estimation bias should be identified and dealt with in the decision process.
- A project may have some *strategic value* that is not accounted for in the estimated cash flows. At a minimum, strategic value should be noted and considered qualitatively in the analysis.
- The *effects of inflation* must be considered in project analyses. The best procedure is to build inflation effects directly into the component cash flow estimates.
- *Breakeven analysis* provides decision makers with insights concerning a project's profitability, liquidity, and risk. Time breakeven is measured by the *payback period*.
- The *net present value (NPV)*, which is simply the sum of the present values of all the project's net cash flows when discounted at the project cost of capital, measures a project's dollar profitability. An NPV greater than \$0 indicates that the project is profitable, and the higher the NPV, the more profitable the project.
- The *internal rate of return (IRR)*, which is the discount rate that forces a project's NPV to equal zero, measures a project's percentage rate-of-return profitability. If a project's IRR is greater than its cost of capital, the project is profitable, and the higher the IRR, the more profitable the project.
- The NPV and IRR profitability measures provide identical indications of profitability; that is, a project that is judged to be profitable by its NPV will also be profitable by its IRR. However, when mutually exclusive projects are being evaluated, NPV might rank a different project higher than IRR. This difference can occur because the two measures have different *reinvestment rate assumptions*—IRR assumes that cash flows can be reinvested at the project's IRR, while NPV assumes that cash flows can be reinvested at the project's cost of capital.
- The *modified internal rate of return (MIRR)*, which forces a project's cash flows to be reinvested at the project's cost of capital, is a better measure of a project's percentage rate of return than the IRR.
- If mutually exclusive projects have *unequal lives*, it may be necessary to adjust the analysis to place the projects on an equal life basis. This can

be done using either the *replacement chain* approach or the *equivalent annual annuity (EAA)* approach.

- A project's profitability may be enhanced if it can be *abandoned* before the end of its physical life.
- The *net present social value (NPSV) model* formalizes the capital budgeting decision process for not-for-profit firms.
- Businesses often use *project scoring matrixes* to subjectively incorporate a large number of factors, including financial and nonfinancial factors, into the capital budgeting decision process.
- The *post-audit* is a key element in capital budgeting. By comparing actual results with predicted results, decision makers can improve both their operations and their cash flow estimation process.

This concludes our discussion of the basics of capital budgeting. In the next chapter, we will discuss risk assessment and incorporation, key issues in capital budgeting analysis.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used to help make capital budgeting decisions.

In addition, the chapter has nine problems in spreadsheet format that focus on capital budgeting issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Website

The TeachMeFinance website has several tutorial-type discussions that cover various aspects of financial management. For a capital budgeting tutorial, go to [www.teachmefinance.com](http://www.teachmefinance.com). Then, click on Capital Budgeting in the list along the left side of the page.

## Selected Case

Because chapters 11 and 12 contain related material, most of the applicable cases require material from both chapters and hence are listed at the end of the next chapter. However, there is one case in *Cases in Healthcare Finance* that is applicable solely to this chapter:

- Case 6: Fairbanks Memorial Hospital, which focuses on estimating the breakeven volume of a walk-in clinic.

## Notes

1. For a discussion of the cash flow estimation practices of some large firms, as well as some estimates of the inaccuracies involved, see Randolph A. Pohlman, Emmanuel S. Santiago, and F. Lynn Markel, "Cash Flow Estimation Practices of Large Firms," *Financial Management*, Summer 1988, 71–79.
2. For more on cash flow estimation bias, see Stephen W. Pruitt and Lawrence J. Gitman, "Capital Budgeting Forecast Biases: Evidence from the *Fortune* 500," *Financial Management*, Spring 1987, 46–51.
3. If Ann Arbor did not have taxable income to offset in Year 2 and had had no taxable income to offset in the three previous years, then the loss would have to be carried forward, and hence the tax benefit would not be immediately realized. In this situation, the tax shield value of the loss would be reduced because it would be pushed into the future rather than recognized immediately.
4. Note that the NPV is the same as the cumulative discounted cash flow shown for Year 5 in Table 11.6. In essence, NPV can be thought of as the total cumulative discounted cash flow of the project.
5. One can argue that not-for-profit firms do not have unlimited access to capital, and thus such firms cannot replace project cash flows with external capital. Furthermore, not-for-profit firms usually do not have sufficient capital to accept all projects that have positive NPVs, so the return on a not-for-profit firm's marginal project may not equal the firm's cost of capital. Nevertheless, for

not-for-profit firms, the average aggregate return on projects will usually be close to the firm's cost of capital, so the cost of capital is still a better reinvestment rate than the project's IRR, especially when projects with exceptionally high or low IRRs are being evaluated.

6. For a more complete discussion of projects with non-normal cash flows, see Eugene F. Brigham and Michael C. Ehrhardt, *Financial Management: Theory and Practice* (Fort Worth, TX: Thomson/South-Western, 2005), Chapter 10.
7. To find the EAA using a spreadsheet, simply enter the NPV, discount rate, and number of years into cells and then apply the PMT function.
8. This section is drawn primarily from an article by John R. C. Wheeler and Jan P. Clement. See "Capital Expenditure Decisions and the Role of the Not-for-Profit Hospital: An Application of the Social Goods Model," *Medical Care Review*, Winter 1990, 467–486.

## PROJECT RISK ANALYSIS

### Learning Objectives

After studying this chapter, readers should be able to:

- Describe the three types of risk relevant to capital budgeting decisions.
- Discuss the techniques used in project risk assessment.
- Conduct a project risk assessment.
- Discuss several types of real options and their impact on a project's value.
- Explain how risk is incorporated into the capital budgeting process.

### Introduction

Chapter 11 covered the basics of capital budgeting, including cash flow estimation, breakeven analysis, and profitability measures. This chapter extends the discussion of capital budgeting to include risk analysis, which is composed of three elements: (1) defining the type of risk relevant to the project, (2) measuring the project's risk, and (3) incorporating that risk assessment into the capital budgeting decision process. Although risk analysis is a key element in all financial decisions, the importance of capital investment decisions to a healthcare organization's success or failure makes risk analysis vital in such decisions.

The higher the risk associated with an investment, the higher its required rate of return. This principle is just as valid for healthcare businesses that make capital expenditure decisions as it is for individuals who make personal investment decisions. Thus, the ultimate goal in project risk analysis is to ensure that the cost of capital used as the discount rate in a project's profitability analysis properly reflects the riskiness of that project. The corporate cost of capital, which was covered in detail in Chapter 9, reflects the cost of capital to the organization based on its aggregate risk—that is, based on the riskiness of the business's average project. In project risk analysis, a project's risk is assessed relative to the firm's average project: Does the project have average risk, below-average risk, or above-average risk? The corporate cost of capital is then adjusted to reflect any differential risk, resulting in a *project cost of capital*. In general, high-risk projects are assigned a project cost of capital that is higher than the corporate cost of capital, average risk projects are

evaluated at the corporate cost of capital, and low-risk projects are assigned a discount rate that is less than the corporate cost of capital. (Note that when capital budgeting is conducted at the divisional level, the adjustment process is handled in a similar manner but the starting value is the divisional cost of capital.)

## Types of Project Risk

Three separate and distinct types of project risk can be defined and, at least in theory, measured:

1. **Stand-alone risk**, which views the risk of a project as if it were held in isolation and hence ignores portfolio effects both within the firm and among equity investors.
2. **Corporate risk**, which views the risk of a project within the context of the business's portfolio of projects.
3. **Market risk**, which views a project's risk from the perspective of the business's owners, who are assumed to hold a well-diversified portfolio of stocks.<sup>1</sup>

The type of risk that is most relevant to a particular capital budgeting decision depends on the business's ownership and the number of projects that the business operates.

### *Stand-Alone Risk*

Stand-alone risk is present in a project whenever there is a chance of a return that is less than the expected return. In effect, **a project is risky whenever its cash flows are not known with certainty**, because uncertain cash flows mean uncertain profitability. Furthermore, the greater the probability of a return far below the expected return, the greater the risk. Stand-alone risk can be measured by the *standard deviation* of the project's profitability (return on investment or ROI), as measured typically by net present value (NPV) or internal rate of return (IRR). Because standard deviation measures the dispersion of a distribution about its expected value, the larger the standard deviation the greater the probability that the project's profitability (NPV or IRR) will be far below that expected.

Conceptually, *stand-alone risk* is only relevant in one situation: when a not-for-profit firm is evaluating its first project. In this situation, the project will be operated in isolation, so no portfolio diversification is present—the business does not have a collection of different projects nor does the firm have stockholders who hold diversified portfolios of stocks.

### *Corporate Risk*

In reality, businesses usually offer a myriad of different products or services and thus can be thought of as having a large number (perhaps even hundreds

or thousands) of individual projects. For example, MinuteMan Healthcare, a New England HMO, offers healthcare services to a large number of diverse employee groups in numerous service areas, and each different group can be considered to be a separate project. In this situation, the stand-alone risk of a project under consideration by MinuteMan is not relevant because the project will not be held in isolation. The relevant risk of a new project to MinuteMan is its contribution to the HMO's overall risk (the impact of the project on the variability of the overall profitability of the business). This type of risk, which is relevant when the project is part of a not-for-profit business's portfolio of projects, is called *corporate risk*.

A project's corporate risk, which is measured by its corporate beta, depends on the context (i.e., the firm's other projects), so a project may have high corporate risk to one business but low corporate risk to another, particularly when the two businesses operate in widely different industries.

### Market Risk

*Market risk* is generally viewed as the relevant risk for projects being evaluated by investor-owned businesses. The goal of shareholder (owner) wealth maximization implies that a project's returns, as well as its risk, should be defined and measured from the shareholders' perspective. The riskiness of an individual project, as seen by a well-diversified shareholder, is not the riskiness of the project as if it were owned and operated in isolation, which is defined as stand-alone risk, nor is it the contribution of the project to the riskiness of the business, which is defined as corporate risk. Most shareholders hold a large diversified portfolio of stocks of many firms, which can be thought of as a very large diversified portfolio of individual projects. Thus, the risk of any single project, as seen by a business's stockholders, is its contribution to the riskiness of their well-diversified stock portfolios.

A project's absolute market risk, as measured by its market beta, is independent of the context; that is, a project's market beta does not depend on the characteristics of the business, assuming the project's cash flows are the same to all firms. However, the market risk of a project, **relative to the market risk of the firm's other projects**, depends on the aggregate market risk of the firm.

1. What are the three types of project risk?
2. How is each type of project risk measured?

### Self-Test Questions

## Relationships Among Stand-Alone, Corporate, and Market Risks

After discussing the three different types of project risk, and the situations in which each is relevant, it is tempting to say that stand-alone risk is almost never

important because not-for-profit businesses should focus on a project's corporate risk and investor-owned businesses should focus on a project's market risk. Unfortunately, the situation is not that simple. First, it is almost impossible in practice to quantify a project's corporate or market risk because it is extremely difficult—some practitioners would say impossible—to estimate the prospective returns distributions for given economic states for either the project, the firm as a whole, or the market. If these return distributions cannot be estimated, then it is impossible to estimate the appropriate beta and hence quantify a project's corporate or market risk.

Fortunately, as will be demonstrated in the next section, it is possible to get a rough idea of the relative stand-alone risk of a project. Thus, managers can make statements such as Project A has above-average risk, Project B has below-average risk, or Project C has average risk, all in the stand-alone sense. After a project's stand-alone risk has been assessed, the primary factor in converting stand-alone risk to either corporate or market risk is correlation. If a project's returns are expected to be highly positively correlated with the firm's returns, high stand-alone risk translates to high corporate risk. Similarly, if the firm's returns are expected to be highly correlated with the stock market's returns, high corporate risk translates to high market risk. The same analogies hold when the project is judged to have average or low stand-alone risk.

Most projects will be in a firm's primary line of business and hence will be in the same line of business as the firm's average project. Because all projects in the same line of business are generally affected by the same economic factors, such projects' returns are usually highly correlated. When this situation exists, a project's stand-alone risk is a good proxy for its corporate risk. Furthermore, most projects' returns are also positively correlated with the returns on other assets in the economy—most assets have high returns when the economy is strong and low returns when the economy is weak. When this situation holds, a project's stand-alone risk is a good proxy for its market risk.

Thus, for most projects, the stand-alone risk assessment also gives good insights into a project's corporate and market risk. The only exception is when a project's returns are expected to be independent of or negatively correlated to the business as a whole. In these situations, considerable judgment is required because the stand-alone risk assessment will overstate the project's corporate risk. Similarly, if a project's returns are expected to be independent of or negatively correlated to the market's returns, the project's stand-alone risk overstates its market risk.

An additional problem arises with investor-owned healthcare businesses. Finance theory specifies that investor-owned businesses should focus on market risk when making capital budgeting decisions. However, most healthcare businesses, even proprietary ones, have corporate goals that focus on the provision of quality healthcare services in addition to shareholder wealth maximization. Furthermore, a proprietary healthcare business's stabil-

ity and financial condition, which primarily depend on corporate risk, are important to all the firm's other stakeholders: its managers, physicians, patients, community, and so on. Some financial theorists even argue that stockholders, including those that are well diversified, consider factors other than market risk when setting required returns. This point is especially meaningful for small businesses, where the owner/managers are not well diversified in regards to their relationship to the business. Considering all the factors, it may be reasonable for managers of investor-owned healthcare businesses, particularly small ones, to be just as concerned about corporate risk as are managers of not-for-profit businesses. Fortunately, in most real-world situations, a project's risk in the corporate sense will be the same as its risk in the market sense.<sup>2</sup>

1. Name and define the three types of risk relevant to capital budgeting.
2. How are these risks related?
3. Should managers of investor-owned providers focus exclusively on a project's market risk?

## Self-Test Questions

### Risk Analysis Illustration



To illustrate project risk analysis, consider Ridgeland Community Hospital's evaluation of a new MRI system presented in Chapter 11. Table 12.1 contains the project's cash flow analysis. If all of the project's component cash flows were known with certainty, the project's projected profitability would be known with certainty and hence the project would have no risk. However, in most project analyses, future cash flows, and hence profitability, are uncertain and, in many cases, highly uncertain, so risk is present.

The starting point for analyzing a project's risk involves estimating the uncertainty inherent in the project's cash flows. Most of the individual cash flows in Table 12.1 are subject to uncertainty. For example, volume was projected at 40 scans per week. However, utilization would almost certainly be higher or lower than the 40 scan forecast. In effect, the volume estimate is really an expected value taken from some probability distribution of potential utilization, as are many of the other values listed in Table 12.1. The distributions of the variables could be relatively tight, reflecting small standard deviations and low risk, or they could be relatively flat, denoting a great deal of uncertainty about the variable in question and hence a high degree of risk. Remember that our focus here is on the stand-alone risk of the project. After the stand-alone risk is assessed, judgment is used to translate that assessment into corporate and market risk.

The component cash flow distributions and their correlations with one another determine the project's profitability distribution and hence the project's risk. In the following sections, three quantitative techniques for assessing a project's risk are discussed: (1) sensitivity analysis, (2) scenario



**TABLE 12.1**  
Ridgeland Community Hospital: MRI Site Cash Flow Analysis

	Annual Cash Flows					
	0	1	2	3	4	5
1. System cost						
2. Related expenses						
3. Gross revenues		\$ 1,000,000	\$ 1,050,000	\$ 1,102,500	\$ 1,157,625	\$ 1,215,506
4. Deductions		250,000	262,500	275,625	289,406	303,877
5. Net revenues		\$ 750,000	\$ 787,500	\$ 826,875	\$ 868,219	\$ 911,630
6. Labor costs		50,000	52,500	55,125	57,881	60,775
7. Maintenance costs		150,000	157,500	165,375	173,644	182,326
8. Supplies		30,000	31,500	33,075	34,729	36,465
9. Incremental overhead		10,000	10,500	11,025	11,576	12,155
10. Depreciation		350,000	350,000	350,000	350,000	350,000
11. Operating cash flow		\$ 160,000	\$ 185,500	\$ 212,275	\$ 240,389	\$ 269,908
12. Taxes		0	0	0	0	0
13. Net operating cash flow		\$ 160,000	\$ 185,500	\$ 212,275	\$ 240,389	\$ 269,908
14. Depreciation		350,000	350,000	350,000	350,000	350,000
15. Net salvage value						750,000
16. Net cash flow		\$ 510,000	\$ 535,500	\$ 562,275	\$ 590,389	\$ 1,369,908

Profitability measures:

Net present value (NPV) = \$82,493.

Internal rate of return (IRR) = 11.1%.

analysis, and (3) Monte Carlo simulation. In a later section, we present a qualitative approach to risk assessment.

1. What condition creates project risk?
2. What makes one project riskier than another?
3. What type of risk is being assessed initially?

## Self-Test Questions

## Sensitivity Analysis



Historically, *sensitivity analysis* has been classified as a risk assessment tool. In reality, it is not very useful in assessing a project's risk. However, it does have significant value in project analysis, so we will discuss it in some detail here.

Many of the variables that determine a project's cash flows are subject to some type of probability distribution rather than known with certainty. If the realized value of such a variable is different from its expected value, the project's profitability will differ from its expected value. Sensitivity analysis indicates exactly how much a project's profitability will change in response to a given change in a single input variable, with all other input variables held constant.

Sensitivity analysis begins with the *base case* developed using **expected values** (in the statistical sense) for all uncertain variables. To illustrate the concept, assume that Ridgeland's managers believe that all of the MRI project's component cash flows, except for weekly volume and salvage value, are known with certainty. The expected values for these variables (volume = 40 and salvage value = \$750,000) were used in Table 12.1 to obtain the base case NPV of \$82,493. Sensitivity analysis is designed to provide managers with the answers to such questions as these: What if volume is more or less than the expected level? What if salvage value is more or less than expected?

In a sensitivity analysis, each uncertain input variable typically is changed by a fixed percentage amount above and below its expected value, while all other variables are held constant at their expected values. Thus, all input variables except one are held at their base case values. The resulting NPVs (or IRRs or MIRR) are recorded and plotted. Table 12.2 contains the NPV sensitivity analysis for the MRI project, assuming that there are two uncertain variables: (1) volume and (2) salvage value.

Note that the NPV is a constant \$82,493 when there is no change in either of the uncertain variables. This situation occurs because a zero percent change recreates the base case. The Table 12.2 values allow managers to get a feel for which input variable has the greatest impact on the MRI project's profitability—the larger the NPV change for a given percentage input change, the greater the impact. Considering only these two variables, we see that the MRI project's NPV is affected by changes in volume to a much greater degree than it is by changes in salvage value.

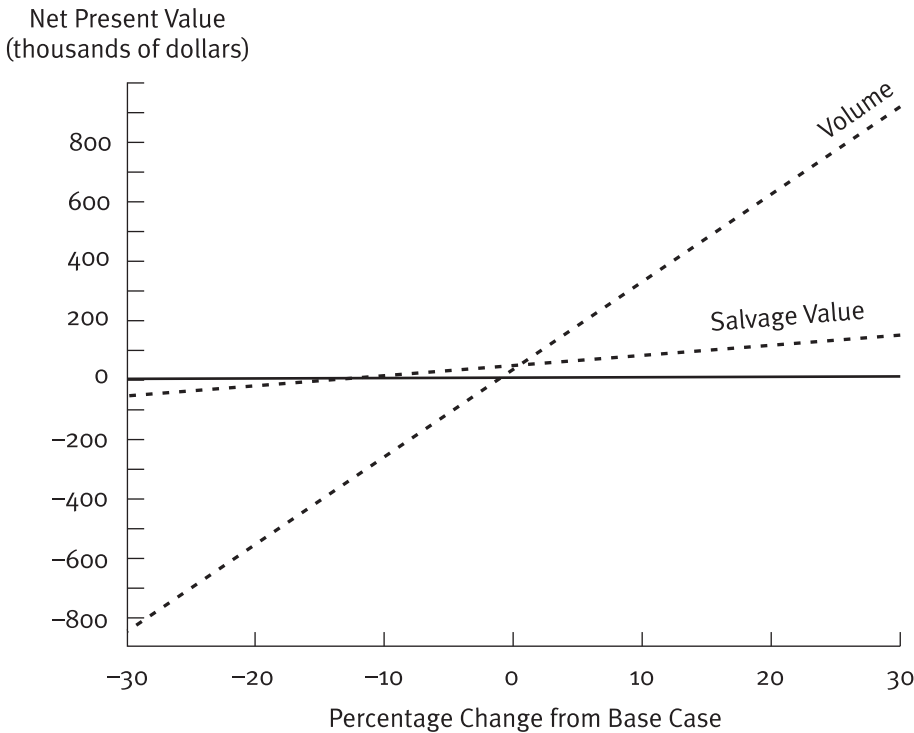
**TABLE 12.2**MRI Project  
Sensitivity  
Analysis

<i>Change from Base Case Level</i>	<i>Net Present Value</i>	
	<i>Volume</i>	<i>Salvage Value</i>
-30%	(\$ 814,053)	(\$ 57,215)
-20	(515,193)	(10,646)
-10	(216,350)	35,923
0	82,493	82,493
+10	381,335	129,062
+20	680,178	175,631
+30	979,020	222,200

Often, the results of sensitivity analyses are shown in graphical form. For example, the Table 12.2 sensitivity analysis is graphed in Figure 12.1. Here, the slopes of the lines show how sensitive the MRI project's NPV is to changes in each of the uncertain input variables—the steeper the slope, the more sensitive NPV is to a change in the variable. Note that the sensitivity lines intersect at the base case values—0 percent change from base case level and \$82,493. Also, spreadsheet models are ideally suited for performing sensitivity analyses because such models both automatically recalculate NPV when an input value is changed and facilitate graphing.<sup>3</sup>

Figure 12.1 vividly illustrates that the MRI project's NPV is very sensitive to volume and only mildly sensitive to changes in salvage value. If a sensitivity plot has a negative slope, it indicates that **increases** in the value of that variable **decrease** the project's NPV. If two projects were being compared, the one with the steeper sensitivity lines would be regarded as riskier because a relatively small error in estimating a variable—for example, volume—would produce a large difference in the project's realized NPV. Thus, a realized volume less than that expected means that the project's actual NPV will be far less than that expected. If information were available on the sensitivity of NPV to input changes for Ridgeland's average project, similar judgments regarding the riskiness of the MRI project could be made but now relative to the firm's average project.

Although sensitivity analysis historically has been thought of as a risk assessment tool, it has severe limitations in this role. For example, suppose that Ridgeland Community Hospital had a contract with an HMO that guaranteed a minimum MRI volume at a fixed reimbursement rate. In that situation, the project would not be very risky at all, in spite of the fact that the sensitivity analysis showed NPV to be highly sensitive to changes in volume. In general, a project's **stand-alone** risk depends on both the sensitivity of its profitability to changes in key input variables **and** the ranges of likely values of these variables. Because sensitivity analysis considers only the first factor, it can give misleading



**FIGURE 12.1**  
Sensitivity  
Analysis Graph

results. Furthermore, sensitivity analysis does not consider any interactions among the uncertain input variables; it considers each variable independently of the others.

In spite of its shortcomings in risk assessment, sensitivity analysis does provide managers with valuable information. First, it provides some breakeven information about the project's uncertain variables. For example, Table 12.2 and Figure 12.1 show that just a small decrease (a few percent) in expected volume makes the project unprofitable, whereas the project remains profitable even if salvage value falls by more than 10 percent. Although somewhat rough, this breakeven information is clearly of value to Ridgeland's managers. (The breakeven points can be easily refined by using a spreadsheet's Goal Seek capability.)

Second, and perhaps more important, sensitivity analysis helps managers identify those input variables that are most critical to the project's profitability and hence to the project's financial success. In this MRI example, volume is clearly the key input variable of the two that were examined, so Ridgeland's managers should ensure that the volume estimate is the best possible. The concept here is that Ridgeland's managers have a limited amount of time to spend on analyzing the MRI project, so the resources expended should be as productive as possible.

## Self-Test Questions

1. Briefly, describe sensitivity analysis.
2. What type of risk does it attempt to measure?
3. Is sensitivity analysis a good risk assessment tool? If not, what is its value in the capital budgeting process?

## Scenario Analysis



*Scenario analysis* is a stand-alone risk analysis technique that considers (1) the sensitivity of NPV or another profitability measure to changes in key variables, (2) the likely range of variable values, and (3) the interactions among the variables. To conduct a scenario analysis, managers pick a “bad” set of circumstances (i.e., low volume, low salvage value, and so on), an average or “most likely” set, and a “good” set (i.e., high volume, high salvage value, and so on). The resulting input values are then used to create a probability distribution of NPV.

To illustrate scenario analysis, assume that Ridgeland’s managers regard a drop in weekly volume below 30 scans as being very unlikely, and a volume above 50 is also improbable. On the other hand, salvage value can be as low as \$500,000 or as high as \$1 million. The *most likely* values are 40 scans per week for volume and \$750,000 for salvage value. Thus, a volume of 30 and a \$500,000 salvage value define the lower bound or *worst-case* scenario, while a volume of 50 and a salvage value of \$1 million define the upper bound or *best-case* scenario.

Ridgeland can now use the worst, most likely, and best case values for the input variables to obtain the NPV corresponding to each scenario. Ridgeland’s managers used a spreadsheet model to conduct the analysis, and Table 12.3 summarizes the results. The most likely case results in a positive NPV, the worst case produces a large negative NPV, and the best case results in an even larger positive NPV. These results, along with the probability of occurrence of each scenario, can now be used to determine the expected NPV and standard deviation of NPV. Suppose that Ridgeland’s managers estimate that there is a

**TABLE 12.3**

MRI Project  
Scenario Analysis

Scenario	Probability of Outcome	Volume	Salvage Value	NPV
Worst case	0.20	30	\$ 500,000	(\$819,844)
Most likely case	0.60	40	750,000	82,493
Best case	0.20	50	1,000,000	984,829
Expected value		40	\$ 750,000	\$ 82,493
Standard deviation				\$ 570,688

20 percent chance of the worst case occurring, a 60 percent chance of the most likely case, and a 20 percent chance of the best case. Of course, it is difficult to estimate scenario probabilities with any confidence, and, in most situations, the probabilities used will not be symmetric. For example, in an environment of increasing managed care penetration and increasing competition among providers, the probability may be higher for the worst-case scenario than for the best-case scenario.

Table 12.3 contains a discrete distribution of returns, so the expected NPV can be found as follows:

$$\begin{aligned}\text{Expected NPV} &= (0.20 \times [-\$819,844]) + (0.60 \times \$82,493) \\ &\quad + (0.20 \times \$984,829) \\ &= \$82,493.\end{aligned}$$

The expected NPV in the scenario analysis is the same as the base case NPV, \$82,493. The consistency of results occurs because the values of the uncertain variables used in the scenario analysis—30, 40, and 50 scans for volume and \$500,000, \$750,000, and \$1 million for salvage value—produce the same expected values that were used in the Table 12.1 base case analysis. If inconsistencies exist between the base case NPV and the expected NPV in the scenario analysis, the two analyses have inconsistent input assumptions. In general, such inconsistencies should be identified and removed to ensure that common assumptions are used throughout the project risk analysis. However, remember that our purpose here is to conduct a risk assessment, not to measure profitability. Ultimately, we will use the base case (expected value) cash flows to reassess the project's profitability when the risk assessment has been completed.

The standard deviation of NPV, as shown here, is \$570,688:

$$\begin{aligned}\sigma_{\text{NPV}} &= [0.20 \times (-\$819,844 - \$82,493)^2 \\ &\quad + 0.60 \times (\$82,493 - \$82,493)^2 \\ &\quad + 0.20 \times (\$984,829 - \$82,493)^2]^{1/2} \\ &= \$570,688,\end{aligned}$$

while the coefficient of variation (CV) of NPV is 6.9:

$$\text{CV} = \frac{\sigma_{\text{NPV}}}{\text{Expected NPV}} = \frac{\$570,688}{\$82,493} = 6.9.$$

The MRI project's standard deviation and coefficient of variation measure its stand-alone risk. Suppose that when a similar scenario analysis is applied to Ridgeland's aggregate cash flows (average project) the result is a coefficient of variation of NPV in the range of 2.5 to 5.0. Then, on the basis of its

stand-alone risk measured by coefficient of variation, along with subjective judgments, Ridgeland's managers might conclude that the MRI project is riskier than the firm's average project, so it would be classified as a high-risk project.

Scenario analysis can also be interpreted in a less mathematical way. The worst case NPV, a loss of about \$800,000 for the MRI project, represents an estimate of the worst possible financial consequences of the project. If Ridgeland can absorb such a loss in value without much impact on its financial condition, the project does not represent a significant financial danger to the hospital. Conversely, if such a loss would mean financial ruin for the hospital, its managers might be unwilling to undertake the project, regardless of its profitability under the most likely and best case scenarios. Note that the risk of the project is **not** changing in these two situations. The difference is in the ability of the organization to **bear** the risk inherent in the project.

While scenario analysis provides useful information about a project's stand-alone risk, it is limited in two ways. First, it only considers a few discrete states of the economy and hence provides information on only a few potential profitability outcomes for the project. In reality, an almost infinite number of possibilities exist. Although the illustrative scenario analysis contained only three scenarios, it can be expanded to include more states of the economy—say five or seven. However, there is a practical limit on how many scenarios can be included in a scenario analysis.

Second, scenario analysis, at least as normally conducted, implies a very definite relationship among the uncertain variables; that is, the analysis assumed that the worst value for volume (30 scans per week) would occur at the same time as the worst value for salvage value (\$500,000) because the worst case scenario is defined by combining the worst possible value of each uncertain variable. Although this relationship (all worst values occurring together) may hold in some situations, it may not hold in others. For example, if volume is low, maybe the MRI will have less wear and tear and hence be worth more after five years of use. The worst value for volume, then, should be coupled with the best salvage value. Conversely, poor volume may be symptomatic of poor medical effectiveness of the MRI and hence lead to limited demand for used equipment and a low salvage value. Scenario analysis tends to create extreme profitability values for the worst and best cases because it automatically combines all worst and best input values, even if these values actually have only a remote chance of occurring together. The next section describes a method of assessing a project's stand-alone risk that deals with these two problems.

### Self-Test Questions

1. Briefly, describe scenario analysis.
2. What type of risk does it attempt to measure?
3. What are its strengths and weaknesses?

## Monte Carlo Simulation

*Monte Carlo simulation*, so named because it grew out of work on the mathematics of casino gambling, describes uncertainty in terms of *continuous* probability distributions, which have an infinite number of outcomes, rather than just a few *discrete* values. Thus, Monte Carlo simulation provides a more realistic view of a project's risk than does scenario analysis.

Although the use of Monte Carlo simulation in capital investment decisions was first proposed many years ago, it was not used extensively in practice primarily because it required a mainframe computer along with relatively powerful financial planning or statistical software. Now, however, Monte Carlo simulation software is available for personal computers as an add-in to spreadsheet software. Because most financial analysis today is being done with spreadsheets, Monte Carlo simulation is now accessible to virtually all health services organizations.

The first step in a Monte Carlo simulation is to create a model that calculates the project's net cash flows and profitability measures, just as was done for Ridgeland's MRI project. The relatively certain variables are estimated as single, or point, values in the model, while continuous probability distributions are used to specify the uncertain cash flow variables. After the model has been created, the simulation software automatically executes the following steps:

1. The Monte Carlo program chooses a single random value for each uncertain variable on the basis of its specified probability distribution.
2. The value selected for each uncertain variable, along with the point values for the relatively certain variables, are combined in the model to estimate the net cash flow for each year.
3. Using the net cash flow data, the model calculates the project's profitability—say, as measured by NPV. A single completion of these three steps constitutes one iteration, or “run,” in the Monte Carlo simulation.
4. The Monte Carlo software repeats the above steps many times—say, 5,000. Because each run is based on different input values, each run produces a different NPV.

The ultimate result of the simulation is an NPV probability distribution based on 5,000 individual scenarios, and hence one that encompasses almost all of the likely financial outcomes. Monte Carlo software usually displays the results of the simulation in both tabular and graphical forms and automatically calculates summary statistical data such as expected value, standard deviation, and skewness.<sup>4</sup>

To illustrate Monte Carlo simulation, again consider Ridgeland Hospital's MRI project. As in the scenario analysis, the illustration has been simplified by specifying the distributions for only two key variables: (1) weekly



volume and (2) salvage value. Weekly volume is not expected to vary by more than  $\pm 10$  scans from its expected value of 40 scans. Because this is a symmetrical situation, the normal (bell-shaped) distribution can be used to represent the uncertainty inherent in volume. In a normal distribution, the expected value plus or minus three standard deviations will encompass almost the entire distribution. Thus, a normal distribution with an expected value of 40 scans and a standard deviation of  $10 / 3 = 3.33$  scans is a reasonable description of the uncertainty inherent in weekly volume.

A triangular distribution was chosen for salvage value because it specifically fixes the upper and lower bounds, whereas the tails of a normal distribution are, in theory, limitless. The triangular distribution is also used extensively when the input distribution is nonsymmetrical because it can easily accommodate skewness. Salvage value uncertainty was specified by a triangular distribution with a lower limit of \$500,000, a most likely value of \$750,000, and an upper limit of \$1 million.

The basic MRI model containing these two continuous distributions was used, plus a Monte Carlo add-in to the spreadsheet program, to conduct a simulation with 5,000 iterations. The output is summarized in Table 12.4, and the resulting probability distribution of NPV is plotted in Figure 12.2. The mean, or expected, NPV, \$82,498, is about the same as the base case NPV and expected NPV indicated in the scenario analysis, \$82,493. In theory, all three results should be the same because the expected values for all input variables are the same in the three analyses. However, there is some randomness in the Monte Carlo simulation, which leads to an expected NPV that is slightly different from the others. The more iterations that are run, the more likely the Monte Carlo NPV will be the same as the base case NPV, assuming that the assumptions are consistent.

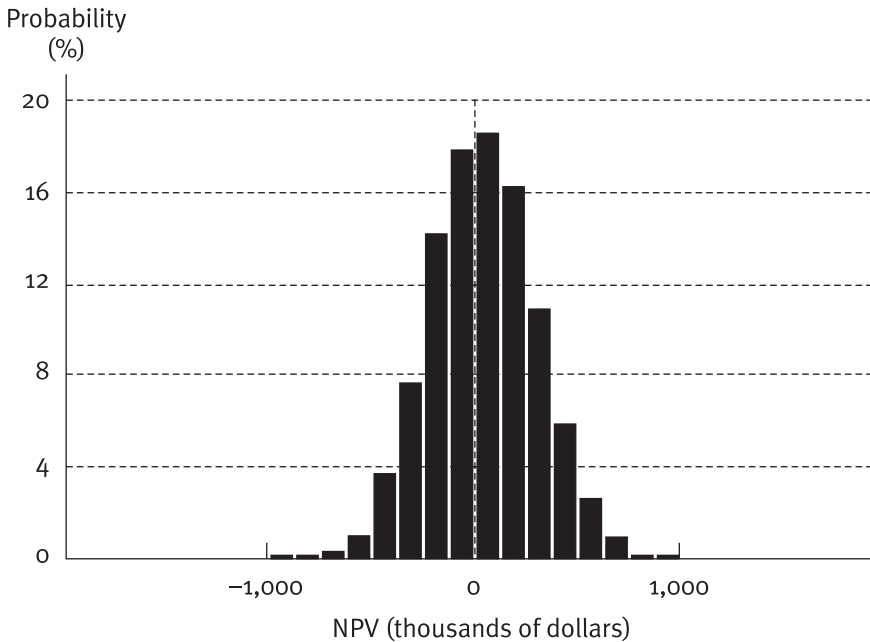
The standard deviation of NPV is lower in the simulation analysis because the NPV distribution in the simulation contains values within the entire range of possible outcomes, while the NPV distribution in the scenario analysis contains only the most likely value and best and worst case extremes.

In this illustration, one value for volume uncertainty was specified for all five years; that is, the value chosen by the Monte Carlo software for volume in Year 1—for example, 40 scans—was used as the volume input for the remaining four years in that iteration of the simulation analysis. As an alternative, the normal distribution for Year 1 can be applied to each year

**TABLE 12.4**

Simulation  
Results  
Summary

Expected NPV	\$ 82,498
Minimum NPV	(\$ 951,760)
Maximum NPV	\$ 970,191
Probability of a positive NPV	62.8%
Standard deviation	\$ 256,212
Skewness	0.002



**FIGURE 12.2**  
NPV  
Probability  
Distribution

separately and hence specify individual volumes for each year. Then, the Monte Carlo software might choose 35 as the value for Year 1, 43 as the Year 2 input, 32 for Year 3, and so on. This approach, however, probably does not do a good job of describing real-world behavior—high usage in the first year presumably means strong acceptance of the MRI system and hence high usage in the remaining years. Similarly, low usage in the first year probably portends low usage in future years.

The volume and salvage value variables were treated as independent in the simulation; that is, the value chosen by the Monte Carlo software from the salvage value distribution was not related to the value chosen from the volume distribution. Thus, in any run, a low volume can be coupled with a high salvage value, and vice versa. If Ridgeland's managers believe that high utilization at the hospital indicates a strong national demand for MRI systems, they can specify a positive correlation between these variables. This would tend to increase the riskiness of the project because a low volume pick in one iteration cannot be offset by a high salvage value pick. Conversely, if the salvage value is more a function of the technological advances that occur over the next five years than local utilization, then it may be best to specify the variables as being independent, as was done.

As in scenario analysis, the project's simulation results must be compared with a similar analysis of the firm's average project. If Ridgeland's average project was considered to have less stand-alone risk when a Monte Carlo

simulation was conducted, then the MRI project would be judged to have above-average (i.e., high) stand-alone risk.

Monte Carlo simulation has two primary advantages over scenario analysis: (1) all possible input variable values are considered and (2) correlations among the uncertain inputs can be incorporated in the analysis. However, these two advantages lead to the primary disadvantage: although it is mechanically easy to input the probability distributions for the uncertain variables as well as their correlations into a Monte Carlo simulation, it is much more difficult to determine what those distributions and correlations are. The problem is that the more information a risk analysis technique requires, the harder it is to develop the data with any confidence, and hence managers can be left with a very elegant result of questionable value.

### Self-Test Questions

1. Briefly, what is Monte Carlo simulation?
2. What type of risk does it attempt to measure?
3. What are its strengths and weaknesses?

## Qualitative Risk Assessment

In some situations, it may be very difficult to conduct a quantitative risk assessment because the input variable estimates are nebulous. In other situations, a quantitative assessment may be possible, but a verification of results provides managers with additional confidence. More and more healthcare organizations are using qualitative risk assessment techniques to confirm quantitative assessment results or as the sole basis for the risk assessment.

Qualitative risk assessment is based on the answers to a set of questions. For example, one large healthcare clinic uses these questions:

- Does the project require additional market share or represent a new service initiative?
- Is the project outside the scope of current management expertise?
- Does the project require difficult-to-recruit physicians, nurses, or technical specialists?
- Will the project pit the organization against a strong competitor?
- Does the project involve new, unproven technology?

To assess project risk, each “yes” answer is assigned one point (while each “no” answer receives zero points). If the total point count for the project is zero, it is judged to have low risk; one or two points indicate moderate risk; and three or more points indicate high risk.

Although at first blush such a subjective approach appears to have little theoretical basis, a closer examination reveals that each question in the above

list is tied to cash flow uncertainty. The greater the number of “yes” answers, the greater the cash flow uncertainty and hence the greater the stand-alone risk of the project.

The value of using the qualitative risk assessment approach in conjunction with a quantitative risk assessment is that it forces managers to think about project risk in alternative frameworks. If the quantitative and qualitative assessments do not agree, then it is clear that the project’s risk assessment requires more consideration.

After some discussion, Ridgeland’s managers concluded that the MRI project’s qualitative risk assessment score was 3. Thus, both the quantitative and qualitative assessments reached the same conclusion: The project has high risk.

1. Describe qualitative risk assessment.
2. Why does it work?

## Self-Test Questions

### Incorporating Risk into the Decision Process

Thus far, the MRI illustration has demonstrated that it is difficult to quantify a project’s riskiness. It may be possible to reach the general conclusion that one project is more or less risky than another or to compare the riskiness of a project with the business as a whole, but it is difficult to develop a really good measure of project risk. This lack of precision in measuring project risk adds to the difficulties involved in incorporating differential risk into the capital budgeting decision.

There are two methods for incorporating project risk into the capital budgeting decision process: (1) the certainty equivalent method, in which a project’s expected cash flows are adjusted to reflect project risk, and (2) the risk-adjusted discount rate method, in which differential risk is dealt with by changing the cost of capital. Although the risk-adjusted discount rate method is used by most businesses, the certainty equivalent method does have some theoretical advantages. Furthermore, it raises some interesting issues related to the risk-adjustment process.

#### The Certainty Equivalent Method

The *certainty equivalent (CE) method* follows directly from the economic concept of *utility*.<sup>5</sup>

Under the CE approach, managers must first evaluate a cash flow’s risk and then specify how much money, with certainty, would be required for an individual to be indifferent between the riskless (certain) sum and the risky cash flow’s expected value. To illustrate the concept, suppose that a rich eccentric offered someone the following choices:

- **Flip a coin.** If it's a head, the individual receives \$1 million; if it's a tail, the individual gets nothing. The expected value of the gamble is  $(0.5 \times \$1,000,000) + (0.5 \times \$0) = \$500,000$ , but the actual outcome will be either zero or \$1 million, so the gamble is quite risky.
- **Do not flip the coin.** Simply pocket \$400,000 in cash.

If the individual is indifferent to the two alternatives, \$400,000 is defined to be his or her certainty equivalent amount for this particular risky expected \$500,000 cash flow. The riskless \$400,000 provides that individual with the same satisfaction (utility) as the risky \$500,000 expected return.

In general, investors are risk averse, so the CE amount for this gamble will be something less than the \$500,000 expected value. But each individual would have his or her own CE value—the greater the individual's degree of risk aversion, the lower the CE amount.

The CE concept can be applied to capital budgeting decisions, at least in theory, in this way:

- Convert each net cash flow of a project to its CE value. Here, the riskiness of **each cash flow** is assessed, and a CE cash flow is chosen on the basis of that risk. The greater the risk, the greater the difference between the expected value and its lower CE value. (If a cash outflow is being adjusted, the CE value is higher than the expected value. The unique risk adjustments required on cash outflows will be discussed in a later section.)
- Once each cash flow is expressed as a CE, discount the project's certainty equivalent cash flow stream by the **risk-free rate** to obtain the project's *differential risk-adjusted NPV*.<sup>6</sup> Here, the term "differential risk-adjusted" implies that the unique riskiness of the project, as compared to the overall riskiness of the business, has been incorporated into the decision process. The risk-free rate is used as the discount rate because CE cash flows are analogous to risk-free cash flows.
- A positive differential risk-adjusted NPV indicates that the project is profitable even after adjusting for differential risk.

The CE method is simple and neat. Furthermore, it can easily handle differential risk among the **individual** cash flows. For example, the final year's CE cash flow might be adjusted downward an additional amount to account for salvage value risk if that risk is considered to be greater than the risk inherent in the operating cash flows.

Unfortunately, there is no practical way to estimate a risky cash flow's CE value. There are no benchmarks available to help make the estimate, so each individual would have his or her own estimate and these can vary significantly. Also, the risk assessment techniques—for example, scenario analysis—focus on profitability and hence measure the stand-alone risk of a project in

its entirety. This process provides no information about the riskiness of individual cash flows, so there is no basis for adjusting each cash flow for its own unique risk.

### **The Risk-Adjusted Discount Rate Method**

In the *risk-adjusted discount rate (RADR) method*, expected cash flows are used in the valuation process, and the risk adjustment is made to the discount rate (the opportunity cost of capital). All average-risk projects are discounted at the business's corporate cost of capital, which represents the opportunity cost of capital for average-risk projects; high-risk projects are assigned a higher cost of capital; and low-risk projects are discounted at a lower cost of capital.

One advantage of the RADR method is that the process has a starting benchmark: the business's corporate cost of capital. This discount rate reflects the riskiness of the business in the aggregate, or the riskiness of the firm's average project. Another advantage is that project risk-assessment techniques identify a project's aggregate risk—the combined risk of all of the cash flows—and the RADR applies a single adjustment to the cost of capital rather than attempts to adjust individual cash flows. However, the disadvantage is that typically there is no theoretical basis for setting the size of the RADR adjustment, so the amount of adjustment remains a matter of judgment.

The RADR method has one additional disadvantage. RADR combines the factors that account for time value (the risk-free rate) and the adjustment for risk (the risk premium):  $\text{Project cost of capital} = \text{Differential risk-adjusted discount rate} = \text{Risk-free rate} + \text{Risk premium}$ . The CE approach, on the other hand, keeps risk adjustment and time value separate—time value in the discount rate and risk adjustment in the cash flows. By lumping together risk and time value, the RADR method compounds the risk premium over time—just as interest compounds over time, so does the risk premium. This compounding of the risk premium means that the RADR method automatically assigns more risk to cash flows that occur in the distant future, and the farther into the future, the greater the implied risk. Because the CE method assigns risk to each cash flow individually, it does not impose any assumptions regarding the relationship between risk and time.

Consciously or unconsciously, the RADR method as it is normally used, with a constant discount rate applied to all cash flows of a project, implies that risk increases with time. This implication imposes a greater burden on long-term projects, so short-term projects will tend to look better financially than long-term projects. For most projects, the assumption of increasing risk over time is probably reasonable because cash flows are more difficult to forecast the further one moves into the future. However, managers should be aware that the RADR approach automatically penalizes distant cash flows, and an additional explicit penalty based solely on cash flow timing is not warranted unless some specific additional risk can be identified.

## Self-Test Questions

1. What are the differences between the certainty equivalent (CE) and risk-adjusted discount rate (RADR) methods for risk incorporation?
2. What assumptions about time and risk are inherent in the RADR method?
3. How do most businesses incorporate differential risk in the capital budgeting decision process?

## Final Risk Assessment and Incorporation for the MRI Project

In most project risk analyses, it is impossible to assess quantitatively the project's corporate or market risk, and, similar to Ridgeland Community Hospital's MRI project, managers are left with only an assessment of the project's stand-alone risk. However, like the MRI project, most projects being evaluated are in the same line of business as the firm's other projects, and the profitability of most firms is highly correlated with the overall economy. Thus, stand-alone, corporate, and market risk are usually highly correlated, which suggests that managers can get a feel for the relative risk of most projects on the basis of the quantitative and qualitative analyses conducted to assess the project's stand-alone risk. In Ridgeland's case, its managers concluded that the MRI project, with its above-average stand-alone risk, also has above-average corporate risk, which is the risk most relevant to not-for-profit organizations, and hence the project was categorized as a high-risk project.

The business's corporate cost of capital provides the basis for estimating a project's differential risk-adjusted discount rate—average-risk projects are discounted at the corporate cost of capital, high-risk projects are discounted at a higher cost of capital, and low-risk projects are discounted at a rate below the corporate cost of capital. Unfortunately, there is no good way of specifying exactly how much higher or lower these discounts rates should be; given the present state of the art, risk adjustments are necessarily judgmental and somewhat arbitrary.

Ridgeland's standard procedure is to add 4 percentage points to its 10 percent corporate cost of capital when evaluating high-risk projects, and to subtract 2 percentage points when evaluating low-risk projects. Thus, to estimate the high-risk MRI project's differential risk-adjusted NPV, the project's expected (base case) cash flows shown in Table 12.1 are discounted at  $10\% + 4\% = 14\%$ . This rate is called the *project cost of capital*, as opposed to the corporate cost of capital, because it reflects the risk characteristics of a specific project rather than the aggregate risk characteristics of the business. The resultant NPV is  $-\$200,017$ , so the project becomes unprofitable when the analysis is adjusted to reflect its high risk. Ridgeland's managers may still decide to go ahead with the MRI project, but at least they know that its expected profitability is not sufficient to make up for its riskiness.

**Self-Test  
Questions**

1. How did Ridgeland's managers translate the MRI project's stand-alone risk assessment into a corporate risk assessment?
2. How was risk incorporated into the MRI project decision process?

**Incorporating Debt Capacity into the Decision Process**

Just as different businesses have different optimal capital structures, so do individual projects. Within any business, the overall optimal capital structure, which is reflected by the weights used in the corporate cost of capital estimate, represents an aggregation of the optimal capital structures of the business's individual projects. However, some projects probably support only a little debt, while other projects support a high level of debt. The proportion of debt in a project's, or a business's, optimal capital structure is called the project's, or business's, *debt capacity*.

One mistake that is often made when considering a project's debt capacity is to look at how the project is actually financed. For example, even though Ridgeland Community Hospital may be able to obtain a secured loan for the entire cost of the MRI equipment, the MRI project does not have a debt capacity of 100 percent. The willingness of lenders to furnish 100 percent debt capital for the MRI project is based more on Ridgeland's overall creditworthiness than it is on the financial merits of the MRI project because all of the hospital's operating cash flow, less interest payments on embedded debt, is available to pay the lender. Think of it this way: Would lenders provide 100 percent financing if Ridgeland were a start-up business with the MRI project as its sole source of income?

The logical question that arises here is whether or not debt capacity differences should be taken into consideration in the capital budgeting process. In theory, if there are meaningful debt capacity differences between a project and the business, capital structure differentials, as well as risk differentials, should be taken into account in the capital budgeting process. For example, an academic health center might be evaluating two projects: (1) one involves research and development (R&D) of a new surgical procedure and (2) the other involves building a primary care clinic in a local upscale residential area. The R&D project would have relatively low debt capacity because it is a high business risk project with no assets suitable as loan collateral. Conversely, the clinic project would have relatively high debt capacity because it has low business risk and involves real estate that is suitable as collateral.

Incorporating capital structure differentials is mechanically easy. Merely change the weights used to compute the corporate cost of capital to reflect project debt capacity, as opposed to using the standard weights that reflect the business's target capital structure. Projects with higher-than-average debt capacity would use a relatively high value for the weight of debt and a relatively low value for the weight of equity, and vice versa. However, a problem arises



when attempting to make debt capacity adjustments. We know from Chapter 10 that increased debt usage raises capital costs, so both the cost of debt and the cost of equity must increase as more and more debt financing is used. This dependency of capital costs on capital structure means that as the weights are changed in the cost of capital calculation, so should the component costs. However, it is very difficult, if not impossible, to estimate individual project costs of debt and equity that correspond to the project's optimal capital structure. Thus, capital structure adjustments quickly become a somewhat futile guessing game, so most businesses do not make such adjustments unless there are specific benchmark values that can be used for both a project's unique debt capacity and the corresponding capital costs.<sup>7</sup>

### Self-Test Question

1. Discuss the advantages and disadvantages of incorporating debt capacity differences in the capital budgeting decision process.

### Adjusting Cash Outflows for Risk

Some projects are evaluated on the basis of minimizing the present value of future costs rather than on the basis of the projects' NPVs. This evaluation is done because it is often impossible to allocate revenues to a particular project, and it is easier to focus on comparative costs when two projects will produce the same revenue stream. For example, suppose that Ridgeland Community Hospital must choose one of two ways for disposing of its medical waste. There is no question about the need for the project, and the hospital's revenue stream is unaffected by which method is chosen. In this situation, the decision will be based on the present value of expected future costs; the method with the lower present value of costs will be chosen.

Table 12.5 contains the projected annual costs associated with each method. The in-house system would require a large expenditure at Year 0 to upgrade the hospital's current disposal system, but the yearly operating costs are relatively low. Conversely, if Ridgeland contracts for disposal services with an outside contractor, it will only have to pay \$25,000 up front to initiate the contract. However, the annual contract fee would be \$200,000 a year. Note that inflation effects are ignored in this illustration to simplify the discussion.

If both methods were judged to have average risk, then Ridgeland's corporate cost of capital, 10 percent, would be applied to the cash flows to obtain the present value (PV) of costs for each method. Because the PVs of costs for the two waste disposal systems—\$784,309 for the in-house system and \$783,157 for the contract method—are roughly equal, Ridgeland's managers would be indifferent as to which method should be chosen on the basis of financial considerations only.

However, Ridgeland's managers believe that the contract method is much riskier than the in-house method. The cost of modifying the current

**TABLE 12.5**  
Ridgeland  
Community  
Hospital: Waste  
Disposal Analysis

Year	Cash Flows	
	In-House System	Outside Contract
0	(\$500,000)	(\$ 25,000)
1	(75,000)	(200,000)
2	(75,000)	(200,000)
3	(75,000)	(200,000)
4	(75,000)	(200,000)
5	(75,000)	(200,000)
<i>Present Value of Costs at a Discount Rate of:</i>		
10%	(\$784,309)	(\$783,157)
14%	—	(\$ 711,616)
6%	—	(\$867,473)

system is known to the dollar, and operating costs can be predicted fairly well. Furthermore, with the in-house system, operating costs are under the control of Ridgeland's management. Conversely, if the hospital relies on the contractor for waste disposal, it is more or less stuck with continuing the contract because it will not have the in-house capability. Because the contractor was only willing to guarantee the price for the first year, perhaps the bid was low-balled and large price increases will occur in future years. The two methods have about the same PV of costs when both are considered to have average risk, so which method should be chosen if the contract method is judged to have high risk? Clearly, if the costs are the same under a common discount rate, the lower-risk in-house project should be chosen.

Now, try to incorporate this intuitive differential risk conclusion into the quantitative analysis. Conventional wisdom is to increase the corporate cost of capital for high-risk projects, so the contract cash flows would be discounted using a project cost of capital of 14 percent, which is the rate that Ridgeland applies to high-risk projects. But, at a 14 percent discount rate, the contract method has a PV of costs of only \$711,616, which is about \$70,000 lower than that for the in-house method. If the discount rate were increased to 20 percent on the contract method, it would appear to be \$161,000 cheaper than the in-house method. Thus, the riskier the contract method is judged to be, the better it looks.

Something is obviously wrong here! To penalize a cash outflow for higher-than-average risk, that outflow must have a **higher** present value, not a **lower** one. Therefore, a cash outflow that has higher-than-average risk must be evaluated with a **lower-than-average** cost of capital. Recognizing this, Ridgeland's managers actually applied a  $10\% - 4\% = 6\%$  discount rate to the high-risk contract method's cash flows. This produces a PV of costs for the

contract method of \$867,473, which is about \$83,000 more than the PV of costs for the average-risk in-house method.

The appropriate risk adjustment for cash outflows is also applicable in other situations. For example, the City of Detroit offered Ann Arbor Health Systems the opportunity to use a city-owned building in one of the city's blighted areas for a walk-in clinic. The city offered to pay to refurbish the building, and all profits made by the clinic would accrue to Ann Arbor. However, after ten years, Ann Arbor would have to buy the building from the city at the then-current market value. The market value estimate that Ann Arbor used in its analysis was \$2 million, but the realized cost could be much greater, or much less, depending on the economic condition of the neighborhood at that time. The project's other cash flows were of average risk, but this single outflow had high risk, so Ann Arbor lowered the discount rate that it applied to this one cash flow. This action created a higher present value on a cost (outflow) and hence lowered the project's NPV.

The bottom line here is that the risk adjustment for cash outflows is the opposite of the adjustment for cash inflows. When cash outflows are being evaluated, higher risk leads to a lower discount rate.<sup>8</sup>

### Self-Test Questions

1. Is there any difference between the risk adjustments applied to cash inflows and cash outflows? Explain your answer.
2. Can differential risk adjustments be made to single cash flows, or must the same adjustment be made to all of a project's cash flows?

### Real (Managerial) Options

According to traditional capital budgeting analysis techniques, a project's NPV is the present value of its expected future cash flows when discounted at a rate that reflects the riskiness of those flows. However, as we discussed in Chapter 11 in the section on strategic value, such valuations generally do not incorporate the value inherent in additional actions that can be taken by the business only if the project is accepted. In other words, traditional capital budgeting can be likened to playing roulette, where a bet is made (the project is accepted) and the wheel is spun, but there is nothing that can be done to influence the outcome of the game. In reality, capital projects are more like playing draw poker. Here, although chance does play a role, the players can influence the final result by discarding the right cards and by assessing the actions of the other players.

The opportunities that managers have to change a project in response to changing conditions or to build on a project are called *real*, or *managerial*, *options*. These terms denote the fact that such options arise from investments in real, rather than financial, assets and that the options are available to man-

agers of businesses, as opposed to individual investors. To help illustrate the concept of real options, we first introduce decision tree analysis.

### Decision Tree Analysis

Although risk analysis is an integral part of capital budgeting, managers are at least as concerned, or maybe more concerned, about managing risk than they are about measuring it. One way of managing risk is to structure large projects as a series of decision points that provide the opportunity to reevaluate decisions as additional information becomes available, and possibly to *cancel*, or once production begins, to *abandon*, the project if events take a turn for the worse.

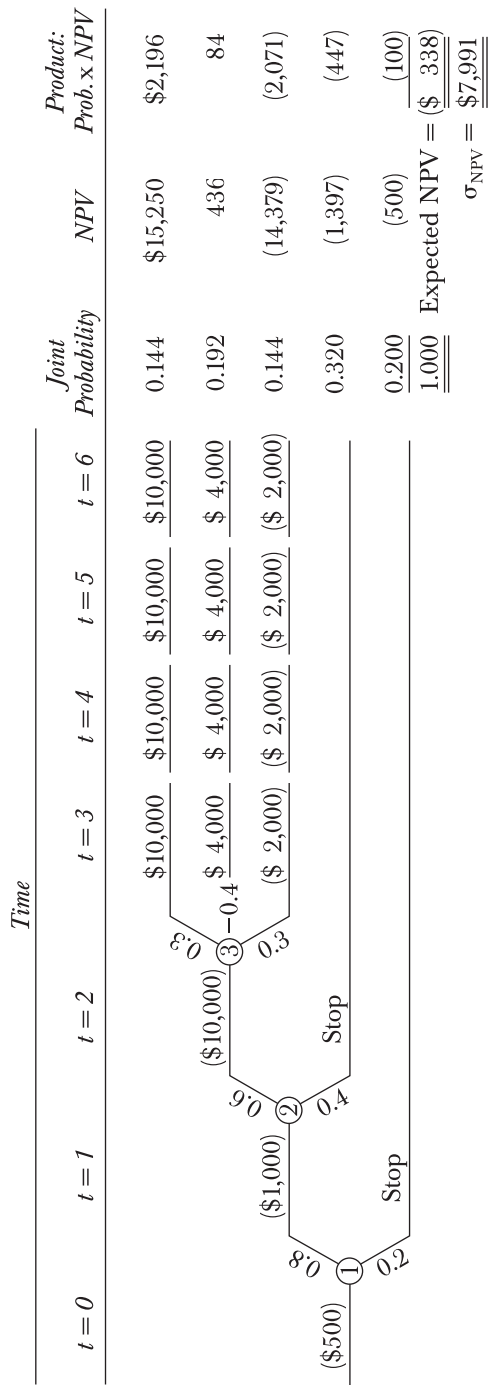
Projects that are structured as a series of decision points over time are evaluated using *decision trees*. For example, suppose Medical Equipment International (MEI) is considering the production of a totally new and innovative intensive care monitoring system. The net investment for this project is broken down into three stages, as set forth in Figure 12.3. If the go ahead is given for Stage 1 (Year 0), the firm will conduct a \$500,000 study of the market potential for the new monitoring system that will take about one year. If the results of the study are unfavorable, the project will be canceled, but if the results are favorable, MEI will (at Year 1) spend \$1 million to design and fabricate several prototype systems. These systems would then be tested at two hospitals, and the reactions of the hospital medical staffs would determine whether MEI will proceed with full-scale production.

If reaction at the test hospitals is positive, MEI will establish a production line for the monitoring systems at one of its plants at a net cost of \$10 million. If this stage were reached, then MEI's managers estimate that the project would generate net cash flows over the following four years. The size of these flows will depend on the vitality of the hospital industry at that time and the overall acceptance of the system.

A decision tree, such as the one in Figure 12.3, often is used to analyze such multistage, or sequential, decisions. Here, for simplicity, we assume that one year goes by between decisions. Each circle represents a decision point or stage. The dollar value to the left of each decision point represents the net investment required to go forward at that decision point, and the cash flows under the  $t = 3$  to  $t = 6$  headings represent the cash inflows if the project is carried to completion. Each diagonal line, which represents the beginning of a branch of the decision tree, has an estimated probability for moving along that branch based on information available to MEI's managers **today**. For example, management estimates that there is a probability of 0.8 that the initial study will produce favorable results, which leads to the expenditure of \$1 million at Stage 2, and a 0.2 probability that the initial study will produce unfavorable results, which would lead to cancellation after Stage 1.

The joint probabilities shown in Figure 12.3 give the probability of occurrence of each final outcome—that is, the probability of moving completely

**FIGURE 12.3**  
Decision Tree Analysis (thousands of dollars)



along each branch. Each joint probability is obtained by multiplying together all the probabilities along a particular branch. For example, the probability that MEI will, if Stage 1 is undertaken, move through Stages 2 and 3 and that a strong demand will produce \$10 million in net cash flows in each of the next four years is  $0.8 \times 0.6 \times 0.3 = 0.144 = 14.4\%$ .

The NPV of each final outcome is also given in Figure 12.3. MEI has a corporate cost of capital of 11.5 percent, and its management assumes initially that all projects have average risk. To illustrate branch NPVs, the NPV of the top branch (most favorable outcome) is about \$15,250 (in thousands of dollars):

$$\begin{aligned} \text{NPV} &= -\$500 - \frac{\$1,000}{(1.115)^1} - \frac{\$10,000}{(1.115)^2} + \frac{\$10,000}{(1.115)^3} + \frac{\$10,000}{(1.115)^4} \\ &\quad + \frac{\$10,000}{(1.115)^5} + \frac{\$10,000}{(1.115)^6} \\ &= \$15,250. \end{aligned}$$

Other NPVs are calculated similarly.

The last column in Figure 12.3 gives the product of the NPV for each branch times the joint probability of that branch occurring, and the sum of the NPV products is the expected NPV of the project. Based on the expectations set forth in Figure 12.3, and assuming a cost of capital of 11.5 percent, the monitoring equipment project's expected NPV is  $-\$338,000$ .

Because the expected NPV is negative, it would appear that this project is unprofitable and hence should be rejected by MEI unless other considerations prevail. However, this initial judgment may not be correct. MEI must now consider whether this project is more, less, or about as risky as the firm's average project. The expected NPV is a negative \$338,000, and the standard deviation of NPV is \$7,991,000, so the coefficient of variation of NPV is quite large. This suggests that the project is highly risky in terms of stand-alone risk. Note also that there is a  $0.144 + 0.320 + 0.200 = 0.664 = 66.4\%$  probability of incurring a loss. Based on all these findings, the project appears to be unacceptable financially unless it has some embedded real options that will increase its value and/or reduce its risk.

## The Real Option of Abandonment



*Abandonment*, which we discussed in Chapter 11 in connection with estimating a project's economic life, is one type of real option that many projects possess. To illustrate the impact of this real option, suppose that MEI is not contractually bound to continue the project once production has begun. Thus, if sales are poor during Year 3 ( $t = 3$ ) and MEI experiences a cash flow loss of \$2 million, and similar results are expected for the remaining three years, MEI can abandon the project at the end of Year 3 rather than continue to

suffer losses. In this situation, low first-year sales signify that the monitoring equipment is not selling well, so future sales will also be poor, and MEI has the opportunity to act on this new information when it becomes available.

The ability to abandon the project changes the branch of the decision tree in Figure 12.3 that contains the series of \$2 million losses. It now looks like this (in thousands of dollars):

		<i>Joint Probability</i>	<i>NPV</i>	<i>Product: Prob. <math>\times</math> NPV</i>
③	④ (\$2,000) Stop	0.144	(10,883)	(1,567)

Changing this branch to reflect abandonment eliminates the \$2 million cash losses in Years 4, 5, and 6 and thus causes the NPV for the branch to be higher, although still negative. This change increases the project's expected NPV from  $-\$338,000$  to about  $\$166,000$  and also lowers the project's standard deviation from  $\$7,991,000$  to  $\$7,157,000$ . Thus, the abandonment real option changes the project's expected NPV from negative to positive and also lowers its stand-alone risk as measured either by standard deviation or coefficient of variation of NPV.

We can use the data just developed to estimate the value of the abandonment option. The NPV with the abandonment option is  $\$166,000$ , while the NPV without this option is  $-\$338,000$ , so the value of the real option is  $\$166,000 - (-\$338,000) = \$504,000$ . However, this value understates the true value of the option because it also lowers the riskiness of the project. With lower risk, the difference between the two NPVs is greater than that calculated, although the added value of risk reduction would be relatively small in this illustration as well as difficult to quantify with any confidence. Because of this and similar complications, discounted cash flow (DCF) techniques, when they can be used to value real options, generally will not give an accurate estimate of the option's value.

Here are some additional points to note concerning decision tree analysis and abandonment:

- Managers can reduce project risk if they can structure the decision process to include several decision points rather than just one. If MEI were to make a total commitment to the monitoring equipment project at  $t = 0$ , and to sign contracts that would in effect require completion of the project, it might save some money and accelerate the project, but doing so would substantially increase the project's riskiness.
- Once production, or service, begins, the ability of the business to abandon a project can dramatically reduce the project's risk.
- The cost of abandonment generally is reduced if the firm has alternative uses for the project's assets. If MEI can convert the abandoned

monitoring equipment production line to a different, more productive use, the cost of abandonment would be reduced, so the attractiveness of the monitoring equipment project would be enhanced.

Finally, note that capital budgeting is a dynamic process. Virtually all inputs to a capital budgeting decision change over time, and firms must periodically review both their expenditure plans and their ongoing projects. In the MEI example, conditions might change between Decision Points 1 and 2; if so, this new information should be used to develop revised probability and cash flow estimates. If a capital budgeting decision can be structured with multiple decision points, including abandonment, and if the firm's managers have the fortitude to admit when a project is not working out as initially planned, then risks can be reduced and expected profitability can be increased.

### Other Real Options

The MEI monitoring system project demonstrates that the real option of abandonment can add value to a project. In addition to abandonment, there are many other types of real options.

The *flexibility option* allows managers to switch inputs between alternative production or service processes. For example, by training clinical personnel to perform multiple tasks, individuals hired for a new service can potentially be used productively in other parts of the business. Thus, labor costs associated with the new service can be easily reduced if demand estimates are not met. This flexibility option reduces costs under poor utilization scenarios and hence increases the value of the project.

#### Flexibility Options

The *capacity option* allows businesses to manage their productive capacity in response to changing market conditions. If a project can be structured so that its level of operations can be reduced, or even suspended, if warranted rather than completely shut down, the value of the project is enhanced. Additionally, the option to expand new services from a relatively small scale to a large scale has value.

#### Capacity Options

It is easy to envision a situation in which a negative NPV project is accepted because embedded in it is the option to add complementary services or successive "generations of services." An example of this is the first move by a managed care organization into a new geographic area or the introduction of transplant services at a hospital. In such situations, the first project may not be profitable, but it can lead to additional opportunities that are.

#### New Service Options

In our examples thus far, new projects brought with them embedded real options that could be exercised in the future and hence added value to the project. *Timing options* can be somewhat different in that in some circum-

#### Timing Options





stances they involve extinguishing existing real options. Timing options were first analyzed in situations involving natural resources, such as when to harvest a forested area or how much oil to pump out of a field. Producing now gives immediate cash flows, but it eliminates the opportunity to obtain future cash flows from the same resource.

Of most interest to healthcare businesses is the *option to delay*, which is another type of timing option. If a project can be postponed, it might be more valuable in the future because, say, the service is worth more because of diminishing managed care power, or because technology has advanced, or because more information becomes available that decreases the project's risk. Of course, the option to delay is valuable only if it is worth more than the costs of delaying, which include time value of money costs, costs associated with competitor actions, and patient satisfaction costs. Thus, in general, the option to delay is most valuable to businesses that have proprietary technology or some other barrier to entry that lessens the costs associated with postponement.

### **Valuation of Projects That Have Real Options**

In general, the true value of a project with real options can be thought of as the DCF NPV plus the value of the real options:

$$\text{True NPV} = \text{DCF NPV} + \text{Value of real options.}$$

In most healthcare situations, it is not possible to place a dollar value on any real options associated with a project. However, managers should still think about the value of many projects in terms of the above equation. Here are some points to consider:

- Real options can add considerable value to many projects, so failure to consider such options leads to downward-biased NPVs and thus to systematic underinvestment.
- In general, the longer a real option lasts before it must be “exercised,” the more valuable it is. For example, suppose the real option is to expand into related services, such as expanding rehabilitative services into sports medicine services. The longer the expansion can be delayed and still retain its value, the more valuable the option.
- The more volatile the value of the underlying source of the real option, the more valuable the option. Thus, the more return volatility there is in the return on sports medicine services, the greater the value of a real option to expand into such services.
- The higher the cost of capital (the higher the general level of interest rates), the more valuable the real option. This point is not very intuitive, but we explain the rationale in Chapter 18 in our discussion of stock options.

## Self-Test Questions

1. How can the possibility of abandonment affect a project's profitability and stand-alone risk?
2. What are the costs and benefits of structuring large capital budgeting decisions in stages rather than as a single decision?
3. Why might DCF valuation underestimate the true value of a project?
4. What are some different types of real options?
5. How does the presence of real options influence the capital budgeting decision?

## An Overview of the Capital Budgeting Decision Process

The discussion of capital budgeting thus far has focused on how managers evaluate individual projects. For capital planning purposes, healthcare managers also need to forecast the total number of projects that will be undertaken and the dollar amount of capital needed to fund these projects. The list of projects to be undertaken is called the *capital budget*, and the optimal selection of new projects is called the *optimal capital budget*.

While every healthcare provider estimates its optimal capital budget in its own unique way, some procedures are common to all businesses. The procedures followed by CALFIRST Health System are used to illustrate the process:

- The CFO estimates the system's corporate cost of capital. As discussed in Chapter 9, this estimate depends on market conditions, the business risk of CALFIRST's assets in the aggregate, and the systemwide optimal capital structure.
- The CFO then scales the corporate cost of capital up or down to reflect the unique risk and capital structure features of each division. To illustrate the concept, assume that CALFIRST has three divisions. For simplicity, the divisions are identified as LRD, ARD, and HRD, which stand for low-risk, average-risk, and high-risk divisions.
- Managers within each of the divisions evaluate the riskiness of the proposed projects within their divisions by categorizing each project as a low-risk project (LRP), an average-risk project (ARP), or a high-risk project (HRP). These project risk classifications are based on the riskiness of each project relative to the **other projects in the division**, not to the system in the aggregate.
- Each project is then assigned a project cost of capital that is based on the **divisional cost of capital** and the project's relative riskiness. As discussed previously, this *project cost of capital* is then used to discount the project's expected net cash flows. From a financial standpoint, all projects with positive NPVs are acceptable, while those with negative NPVs should be rejected. Subjective factors are also considered, and these factors may

result in a decision that differs from the one established solely on the basis of financial considerations.

Figure 12.4 summarizes CALFIRST’s overall capital budgeting process. Here, the corporate cost of capital, 10 percent, is adjusted upward to 14 percent in the high-risk division and downward to 8 percent in the low-risk division. The same adjustment—4 percentage points upward for high-risk projects and 2 percentage points downward for low-risk projects—is applied to differential risk projects within each division. The end result is a range of project costs of capital within CALFIRST that runs from 18 percent for high-risk projects in the high-risk division to 6 percent for low-risk projects in the low-risk division.

The final result is a financial analysis process that incorporates each project’s debt capacity, at least at the divisional level, and riskiness. However, managers also must consider other possible risk factors that may not have been included in the quantitative analysis. For example, can the project being evaluated significantly increase the business’s liability exposure? Conversely, does the project have any real option value or social value or other attributes that can affect its profitability or riskiness? Such additional factors must be considered, at least subjectively, before a final decision can be made. (A framework for considering multiple decision factors, the project scoring approach, is discussed in Chapter 11.) Typically, if the project involves new

**FIGURE 12.4**  
CALFIRST:  
Divisional and  
Project Costs of  
Capital

Corporate cost of capital = 10%	HRD cost of capital = 14%	High-risk project	18%
		Average-risk project	14%
		Low-risk project	12%
	ARD cost of capital = 10%	High-risk project	14%
		Average-risk project	10%
		Low-risk project	8%
	LRD cost of capital = 8%	High-risk project	12%
		Average-risk project	8%
		Low-risk project	6%

products or services and is large (in capital requirements) relative to the size of the business's average project, then the additional subjective factors will be very important to the final decision; one large mistake can bankrupt a firm, so "bet-the-firm" decisions are not made lightly. On the other hand, the decision on a small replacement project would be made mostly on the basis of numerical analysis.

Ultimately, capital budgeting decisions require an analysis of a mix of objective and subjective factors such as risk, debt capacity, profitability, medical staff (patient) needs, real option value, and social value. The process is not precise, and often there is a temptation to ignore one or more important factors because they are so nebulous and difficult to measure. Despite the imprecision and subjectivity, a project's risk, as well as its other attributes, should be assessed and incorporated into the capital budgeting decision process.

1. Describe a typical capital budgeting decision process.
2. Are decisions made solely on the basis of quantitative factors? Explain your answer.

## Self-Test Questions

### Capital Rationing

Standard capital budgeting procedures assume that businesses can raise virtually unlimited amounts of capital to meet capital budgeting needs. Presumably, as long as a business is investing the funds in profitable (i.e., positive NPV) projects, it should be able to raise the debt and equity needed to fund all such projects. Additionally, standard capital budgeting procedures assume that a business raises the capital needed to finance its optimal capital budget roughly in accordance with its target capital structure and at an average cost equal to the estimated corporate cost of capital.

This picture of a business's capital financing/capital investment process is probably appropriate for large investor-owned firms in most situations. However, not-for-profit firms and small investor-owned businesses typically do not have unlimited access to capital. Their ability to raise equity capital often is limited, and their debt capital is constrained to the amount supported by the equity capital base. Thus, it is likely that such businesses will face periods in which the capital needed for investment in new projects will exceed the amount of capital available. This situation is called *capital rationing*.

If capital rationing exists, and hence a business has more acceptable projects than capital, then, from a financial perspective, the business should accept that set of capital projects that maximizes aggregate NPV and still meets the capital constraint. This approach can be called "getting the most bang from the buck" because it picks projects that have the most positive impact on the business's financial condition.

Another ROI measure, the *profitability index (PI)*, is useful under capital rationing. The PI is defined as the PV of cash inflows divided by the

PV of cash outflows. Thus, for Ridgeland Community Hospital's MRI project discussed earlier in the chapter,  $PI = \$2,582,493 / \$2,500,000 = 1.03$ . The PI measures a project's dollars of profitability per dollar of investment, all on a present value basis. In other words, it measures the "bang for the buck." The MRI project promises 3 cents of profit for every dollar invested, which indicates it is not very profitable. (The PI of 1.03 is before adjusting for risk. After adjusting for risk, the project's PI is less than 1.00, indicating that the project is unprofitable.) Under capital rationing, the optimal capital budget is determined by first listing all profitable projects in descending order of PI. Then, projects are selected from the top of the list downward until the capital available is used up.

Of course, in healthcare businesses, priority may be assigned to some low or even negative NPV projects, which is fine as long as these projects are offset by the selection of profitable projects, which would prevent the low-profitability priority projects from eroding the business's financial condition.

## Self-Test Questions

1. What is capital rationing?
2. From a financial perspective, how are projects chosen when capital rationing exists?
3. What is the profitability index, and why is it useful under capital rationing?

## Key Concepts

This chapter discussed project risk definition, assessment, and incorporation. Here are its key concepts:

- Three separate and distinct *types of project risk* can be defined: (1) stand-alone risk, (2) corporate risk, and (3) market risk.
- A project's *stand-alone risk* is the risk the project would have if it were the sole project of a not-for-profit firm. It is measured by the variability of profitability, generally by the *standard deviation* or *coefficient of variation* of NPV. Stand-alone risk often is used as a proxy for both corporate and market risk because (1) corporate and market risk are often impossible to measure and (2) the three types of risk are usually highly correlated.
- *Corporate risk* reflects the contribution of a project to the overall riskiness of the business. It is measured conceptually by the project's *corporate beta*. Corporate risk ignores stockholder diversification, and it is the relevant risk for not-for-profit firms.
- *Market risk* reflects the contribution of a project to the overall riskiness of the owners' well-diversified investment portfolios. It is measured

conceptually by the project's *market beta*. In theory, market risk is the relevant risk for investor-owned firms, but many people argue that corporate risk is also relevant to owners, especially the owner/managers of small businesses, and it is certainly relevant to a business's other stakeholders.

- Three quantitative techniques are commonly used to *assess a project's stand-alone risk*: (1) sensitivity analysis, (2) scenario analysis, and (3) Monte Carlo simulation.
- *Sensitivity analysis* shows how much a project's profitability—say, as measured by NPV—changes in response to a given change in an input variable such as volume, other things held constant.
- *Scenario analysis* defines a project's best, most likely, and worst cases and then uses these data to measure its stand-alone risk.
- Whereas scenario analysis focuses on only a few possible outcomes, *Monte Carlo simulation* uses continuous distributions to reflect the uncertainty inherent in a project's component cash flows. The result is a probability distribution of NPV, or IRR, that provides a great deal of information about the project's riskiness.
- In addition to quantitative risk assessment techniques, the *qualitative approach* uses the answers to yes/no questions to assess project risk.
- Projects that require capital outlays in stages over time often are evaluated using *decision trees*. Here, the branches of the tree represent different outcomes, and, when subjective probabilities are assigned, the tree provides the profitability distribution for the project.
- In addition to the DCF-calculated NPV, some projects have additional value in the form of embedded *real options*.
- One type of real option is the ability to *abandon* a project once operations have begun. Such options can both increase a project's dollar return and decrease its riskiness, which has a twofold positive effect on value.
- There are two methods for incorporating project risk into the capital budgeting decision process: (1) the *certainty equivalent (CE) method*, in which a project's expected cash flows are adjusted to reflect project risk, and (2) the *risk-adjusted discount rate (RADR) method*, in which differential risk is dealt with by changing the cost of capital.
- Projects are generally classified as *high risk*, *average risk*, or *low risk* on the basis of their stand-alone risk assessment. High-risk projects are evaluated at a discount rate greater than the firm's corporate cost of capital, average-risk projects are evaluated at the corporate cost of capital, and low-risk projects are evaluated at a rate less than the corporate cost of capital. In a business with divisions, the risk-adjustment process often takes place at the divisional level.
- When evaluating *risky cash outflows*, the risk adjustment process is reversed; that is, lower rates are used to discount more risky cash flows.

- Ultimately, capital budgeting decisions require an analysis of a mix of objective and subjective factors such as risk, debt capacity, profitability, medical staff needs, real option value, and social value. The process is not precise, but good managers do their best to ensure that none of the relevant factors are ignored.
- When *capital rationing* exists, the business has more profitable projects than it has investment capital. In such situations, the profitability index (PI) is a useful profitability (ROI) measure.

This concludes our discussion of capital budgeting. In the next two chapters, we discuss financial and operating analyses and financial forecasting.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in capital budgeting risk analysis.

In addition, the chapter has six problems in spreadsheet format that focus on capital budgeting risk analysis issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

Here are two websites that pertain to this chapter.

- Ohio State University maintains a website with video clips by various finance professionals briefly discussing topics of relevance to this course. Unfortunately, the clips do not include healthcare executives. To access the clips, go to [www.cob.ohio-state.edu/fin/clips.htm](http://www.cob.ohio-state.edu/fin/clips.htm). Then, click on the clip of interest. For this chapter, try the clip by Steve Walsh titled "How We Do Capital Budgeting." Note that video clips are large files that are best accessed using a fast Internet link. Furthermore, player software is required to see the clips.
- There are several spreadsheet add-in software packages available that perform Monte Carlo simulation. A demonstration version of one, called @RISK, can be downloaded from [www.palisade.com](http://www.palisade.com). Click on the @Risk in English tab on the top left of the page and then click on → Download free trial.

## Selected Cases

After covering both chapters 11 and 12, the discussion of capital budgeting is complete. Thus, there are several cases in *Cases in Healthcare Finance* that can be used at this point:

- Case 19: Florida Keys Hospital, which focuses on a "bread and butter" capital budgeting analysis of a proposed ambulatory surgery center.
- Case 20: National Rehabilitation Centers, which requires a staged entry (decision tree) analysis.
- Case 21: New Orleans Health System, which involves a "make or buy" analysis regarding a health system's printing services.
- Case 26: Martha Washington Hospital, which focuses on the evaluation of competing technologies with backfill.



## Notes

1. The three types of risk relevant to capital budgeting decisions were first discussed in Chapter 4. A review of the applicable sections may be beneficial to some readers.
2. For an algebraic presentation of the relationships between the three types of risk, see Louis C. Gapenski, “Project Risk Definition and Measurement in a Not-For-Profit Setting,” *Health Services Management*, November 1992, 216–224.
3. Spreadsheet programs have Data Table functions that automatically perform sensitivity analyses. After the table is roughed in, the spreadsheet automatically calculates and records a project’s NPV, or some other value, in the appropriate cells in the table. This feature is explained in the Chapter 12 model that can be accessed on this book’s companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).
4. *Skewness* measures the degree of symmetry of a distribution. A skewness of zero indicates a symmetric distribution; positive skewness indicates a distribution that is skewed to the right, with a right tail longer than its left; and negative skewness indicates a distribution with a left tail that is longer than its right. The absolute value of the number indicates the degree of skewness—the larger the number, the more skewed the distribution.
5. Utility theory is used by economists to explain how individuals make choices among risky alternatives.
6. The risk-free rate does **not** incorporate the tax advantage of debt financing, so such benefits to taxable firms should be incorporated directly into the cash flows when the certainty equivalent method is used. Alternatively, the discount rate can be determined using the corporate cost-of-capital formula, but with the risk-free rate in place of the costs of debt and equity. The discount rate calculated in this way is the risk-free rate with the tax advantage included, so it can be applied to the certainty equivalent cash flows without tax adjustments.
7. One example where debt capacity adjustments are often made involves *project financing*. In project financing, lenders provide debt capital solely on the basis of the earnings power of the project because they have limited, or no, recourse against the business’s other cash flows. In this situation, there is a readily identifiable cost of debt and debt capacity for the project.
8. What happens when the cash flows being discounted include both inflows and outflows so that the proper risk adjustment is not obvious? The solution is to try an adjustment and see what happens. For example, if the corporate cost of capital is 10 percent and the mixed cash flow project is judged to have high risk, discount the cash flows at 14 percent. If the NPV of the project **increases**, the adjustment clearly is wrong because an adjustment for high risk should penalize the project. Thus, the correct adjustment is to decrease the cost of capital—say, to 6 percent.

# Financial Condition Analysis and Forecasting

In Part VI, we change our focus from capital acquisition and allocation decisions to financial condition analysis and forecasting. Of all the knowledge needed to effectively manage a healthcare organization, perhaps the two most important are (1) understanding the business's current financial condition and (2) having a financial road map in place to move the business into the future.

Chapter 13 discusses the tools used to assess a business's financial condition. Chapter 14 covers the basic techniques used to forecast the financial future of a business.



## FINANCIAL CONDITION ANALYSIS

### Learning Objectives

After studying this chapter, readers should be able to:

- Explain the purposes of financial statement and operating indicator analyses.
- Describe the primary techniques used in financial statement and operating indicator analyses.
- Describe the problems associated with financial statement and operating indicator analyses.
- Explain the economic value added (EVA) model and its relevance to healthcare businesses.
- Describe how key performance indicators (KPIs) and dashboards can be used to monitor financial condition.
- Conduct basic financial condition analyses to assess the financial performance of a business.

### Introduction

Financial condition analysis is of vital concern to healthcare managers, security analysts, investors, and lenders who use such analyses to make judgments about the financial soundness of businesses. The purposes of such analyses are to assess the financial condition of a business and, perhaps more importantly, to identify the operating factors that led to that condition. In general, financial condition analysis is composed of three pieces. *Financial statement analysis* focuses on the data contained in a firm's financial statements, such as revenues, operating costs, accounts receivable, and total assets. *Operating indicator analysis*, on the other hand, focuses on operating factors such as occupancy (census), patient mix, length of stay, and labor productivity. Finally, other analysis techniques, such as economic value added (EVA), provide supplementary information about a business's financial condition.

In this chapter, we discuss several techniques that extract information from a firm's financial statements and elsewhere and combine it in a form that facilitates making judgments about a business's financial condition and opera-

tions. Often, the end result of such analyses is a list of corporate strengths and weaknesses. In addition, some related topics, such as the problems inherent in such analyses, are discussed. For the most part, financial condition analysis is applied to historical data, and hence the judgments made reflect the results of past managerial decisions. However, the more interesting question is what the business will do in the future. Therefore, managers invariably use the types of analysis discussed in this chapter as a springboard to predicting and planning for the future, which is the subject of the next chapter.

You will discover that financial condition analysis generates a great deal of data. A significant problem in assessing financial condition is presenting the results in a simple, easy-to-monitor format. Thus, we close the chapter with some ideas about data presentation.

## Financial Reporting in the Health Services Industry

Financial reporting in all industries follows standards set forth by the accounting profession called *generally accepted accounting principles (GAAP)*. The purpose of such standards is to ensure, to the extent possible, that financial information reported to outsiders is consistent across businesses and presented in a manner that facilitates interpretation and judgments. Because the health services industry has many unique features, including a high proportion of not-for-profit businesses, there are many organizations involved in setting reporting standards. Although the detail of establishing accounting standards is beyond the scope of this text, it should be noted that such standards are constantly being reviewed and modified as necessary to reflect changing economic conditions.<sup>1</sup>

Accounting standards require businesses to prepare several *financial statements*, including three basic financial statements: (1) the *income statement*, (2) the *balance sheet*, and (3) the *statement of cash flows*. Taken together, these statements give an accounting picture of the firm's operations and its financial position. Detailed data are provided for the two or three most recent periods, plus brief historical summaries of key operating statistics for longer periods often are included.

Depending on size and ownership, a business's financial statements usually are made available to outside interested parties. Most large businesses prepare an *annual report*, which provides both the financial statements and a verbal description of the business's operating results during the past year, along with a discussion of developments that will affect its future operations. In addition, large investor-owned firms must file even more detailed reports on an annual (called a 10-K) and a quarterly (called a 10-Q) basis with the Securities and Exchange Commission (SEC). Finally, many larger firms also publish *statistical supplements*, which give financial statement data and key ratios going back about ten years. These reports, and similar reports that may

be filed with state regulatory agencies, are often available from online sources, including the business itself.

### Income Statement

Table 13.1 contains simplified forms of the 2005 and 2006 income statements (also called statements of operations or statements of revenues and expenses) for Bayside Memorial Hospital, a 450-bed, not-for-profit, acute care hospital. Although a hospital is being used to illustrate financial condition analysis techniques, such techniques can be applied to any health services setting. Bayside had an excess of revenues over expenses, or net income, of \$8,572,000 in 2006. Of course, being not-for-profit, the hospital paid no dividends, so it retained all of its net income. When looking at an income statement, it is also possible to get a rough idea of the organization's cash flow, which is approximately equal to its net income plus any noncash expenses. In 2006, Bayside's cash flow was \$8,572,000 net income plus \$4,130,000 depreciation expense, for a total estimated net cash flow of \$12,702,000. Depreciation does not really *provide* funds; it is simply a noncash charge that is added back to net income to obtain an estimate of the business's net cash flow. Later in this section, we will discuss the statement of cash flows, which provides a better insight into Bayside's cash flows.

Note that the income statement reports on transactions *over a period of time*—for example, during Fiscal Year 2006. (Note that Bayside's fiscal year coincides with the calendar year.) The balance sheet, which we discuss next,

	2006	2005	
Net patient service revenue	\$ 108,600	\$ 97,393	<b>TABLE 13.1</b> Bayside Memorial Hospital Statements of Operations (Income Statements) Years Ended December 31, 2006 and 2005 (thousands of dollars)
Premium revenue	5,232	4,622	
Other revenue	3,644	6,014	
Total revenues	<u>\$ 117,476</u>	<u>\$108,029</u>	
Expenses:			
Nursing services	\$ 58,285	\$ 56,752	
Dietary services	5,424	4,718	
General services	13,198	11,655	
Administrative services	11,427	11,585	
Employee health and welfare	10,250	10,705	
Provision for uncollectibles	3,328	3,469	
Provision for malpractice	1,320	1,204	
Depreciation	4,130	4,025	
Interest expense	1,542	1,521	
Total expenses	<u>\$108,904</u>	<u>\$105,634</u>	
Net income	<u>\$ 8,572</u>	<u>\$ 2,395</u>	

may be thought of as a snapshot of the firm's asset, liability, and equity position *at a single point in time*—for example, on December 31, 2006.

### Balance Sheet

Table 13.2 contains Bayside's 2005 and 2006 balance sheets. Although the assets are all stated in terms of dollars, only cash represents actual money. We see that Bayside can, if it liquidated its short-term investment securities, write checks at the end of 2006 for a total of \$6,263,000 (versus total current liabilities of \$13,332,000 due during 2006). The noncash current assets will presumably be converted to cash within a year, but they do not represent cash on hand.

The claims against assets are of two types: (1) liabilities, or money the firm owes, and (2) equity, also called net assets or fund capital.<sup>2</sup> Equity is a residual, so for 2006:

$$\begin{array}{rclcl} \text{Assets} & - & \text{Liabilities} & = & \text{Equity} \\ \$151,278,000 & - & (\$13,332,000 + \$30,582,000) & = & \$107,364,000. \end{array}$$

Liabilities consist of \$13,332,000 of current liabilities plus \$30,582,000 of long-term liabilities. If assets decline in value—suppose some of Bayside's fixed

**TABLE 13.2**

Bayside  
Memorial  
Hospital  
Balance Sheets  
December 31,  
2006 and 2005  
(thousands of  
dollars)

	2006	2005
Cash	\$ 4,263	\$ 5,095
Short-term investments	2,000	0
Accounts receivable	21,840	20,738
Inventories	3,177	2,982
Total current assets	<u>\$ 31,280</u>	<u>\$ 28,815</u>
Gross plant and equipment	\$ 145,158	\$ 140,865
Accumulated depreciation	25,160	21,030
Net plant and equipment	<u>\$ 119,998</u>	<u>\$ 119,835</u>
Total assets	<u>\$ 151,278</u>	<u>\$ 148,650</u>
Accounts payable	\$ 4,707	\$ 5,145
Accrued expenses	5,650	5,421
Notes payable	825	4,237
Current portion of long-term debt	2,150	2,000
Total current liabilities	<u>\$ 13,332</u>	<u>\$ 16,803</u>
Long-term debt	\$ 28,750	\$ 30,900
Capital lease obligations	1,832	2,155
Total long-term liabilities	<u>\$ 30,582</u>	<u>\$ 33,055</u>
Net assets (equity)	<u>\$ 107,364</u>	<u>\$ 98,792</u>
Total liabilities and net assets	<u>\$ 151,278</u>	<u>\$ 148,650</u>

assets were sold at less than book value—liabilities remain constant, so the value of the equity capital declines.

A business's equity account is built up over time by retentions (retained earnings). In 2006, Bayside's income statement reported a net income of \$8,572,000. As a not-for-profit organization, none of the net income can be paid out in dividends, so the entire amount must be retained in the business. Barring any asset sales or revaluations, Bayside's equity account should increase from year to year by the amount of net income. Thus,

$$\begin{array}{rclcl} 2006 \text{ Equity balance} & = & 2005 \text{ Equity balance} & + & 2006 \text{ Net income} \\ \$107,364,000 & = & \$98,792,000 & + & \$8,572,000. \end{array}$$

Note that accumulated depreciation reported on the balance sheet is a *contra asset* account; that is, it is subtracted from gross fixed assets, so the larger a firm's accumulated depreciation, all else the same, the smaller its total assets. However, as noted earlier, the larger the amount of depreciation in any year, the greater the firm's cash flow because depreciation is a noncash expense. Accumulated depreciation on the balance sheet increases each year by the amount of depreciation expense reported on the income statement. For example,

$$\begin{array}{rclcl} 2006 \text{ Accumulated} & = & 2005 \text{ Accumulated} & + & 2006 \text{ Depreciation} \\ \text{depreciation} & = & \text{depreciation} & + & \text{expense} \\ \$25,160,000 & = & \$21,030,000 & + & \$4,130,000. \end{array}$$

### Statement of Cash Flows

Some time ago, annual reports contained a statement called the "sources and uses of funds statement." The purpose of the statement was to report where the business had obtained funds during the past year and how it had used them. For example, had the business obtained most of its funds from such sources as bank loans and bond issues or as retained earnings? Had it used those funds to retire debt, to build new facilities, to build up inventories, or to pay dividends? One could look at the statement and see the total sources and total uses, which were equal, and how funds were obtained and used, but there was no summary figure that could be used to judge whether the firm ended the year in a stronger or weaker financial position.

After several format revisions, organizations now report fund flows in the *statement of cash flows*, which typically is organized into three sections: (1) cash flow from operating activities, (2) cash flow from investing activities, and (3) cash flow from financing activities. Accountants adopted the new format because it provides fund flow information in a more useful way.

Table 13.3 contains Bayside's statement of cash flows, which focuses on the sources and uses of overall cash flow, for 2006. In the statement, cash coming into the hospital (inflows) is shown as positive numbers, while cash being spent (outflows) is shown as negative numbers (shown in parentheses).



The top part lists cash generated by and used in operations. For Bayside, operations provided \$11,196,000 in net cash flow. The income statement reported a rough cash flow estimate of  $\text{Net income} + \text{Depreciation} = \$8,572,000 + \$4,130,000 = \$12,702,000$ , but as part of its operations, Bayside invested \$1,297,000 in current assets (receivables and inventories) and lost \$209,000 in spontaneous liabilities (payables and accruals). The end result, *net cash flow from operations*, was  $\$12,702,000 - \$1,297,000 - \$209,000 = \$11,196,000$ .

The next section of the statement of cash flows focuses on investments in fixed assets (plant and equipment), as opposed to investments in financial assets (securities). As noted in the statement, Bayside spent \$4,293,000 on capital expenditures in 2006. Bayside's financing activities, as shown in the third section, highlight the fact that the hospital used cash to pay off previously incurred debt and to invest in marketable securities. The net effect of the hospital's financing activities was a *net cash outflow from financing* of \$7,735,000.

When the three major sections are totaled, Bayside had a  $\$11,196,000 - \$4,293,000 - \$7,735,000 = \$832,000$  *net decrease in cash* (i.e., net cash outflow) during 2006. The very bottom of Table 13.3 reconciles the net

**TABLE 13.3**

Bayside  
Memorial  
Hospital  
Statement of  
Cash Flows  
Year Ended  
December 31,  
2006  
(thousands of  
dollars)

<b>Cash Flows from Operating Activities:</b>		
Net income		\$ 8,572
Adjustments:		
Depreciation		4,130
Increase in accounts receivable		(1,102)
Increase in inventories		(195)
Decrease in accounts payable		(438)
Increase in accrued expenses		229
Net cash flow from operations		<u>\$ 11,196</u>
<b>Cash Flows from Investing Activities:</b>		
Investment in plant and equipment		<u>(\$ 4,293)</u>
<b>Cash Flows from Financing Activities:</b>		
Investment in short-term securities		(\$ 2,000)
Repayment of long-term debt		(2,150)
Repayment of notes payable		(3,412)
Capital lease principal repayment		(323)
Change in current portion of long-term debt		150
Net cash flow from financing		<u>(\$ 7,735)</u>
Net increase (decrease) in cash		<u>(\$ 832)</u>
Beginning cash		\$ 5,095
Ending cash		<u>\$ 4,263</u>

cash flow with the ending cash balance shown on the balance sheet. Bayside began 2006 with \$5,095,000 in cash, experienced a net cash outflow of \$832,000 during the year, and ended the year with  $\$5,095,000 - \$832,000 = \$4,263,000$  in its cash account, as verified by the value reported on Table 13.2.

Bayside's statement of cash flows shows nothing unusual or alarming. It does show that the hospital's operations are inherently profitable (generated a positive cash flow), at least in 2006. Had the statement showed an operating cash drain, Bayside's managers would have had something to worry about; if it continued, such a drain could bleed the hospital to death. The statement of cash flows also provided easily interpreted information about Bayside's financing and fixed-asset-investing activities for the year. For example, Bayside's cash flow from operations was used primarily to purchase new fixed assets, to invest in short-term securities, and to pay off notes payable and long-term debt. Such uses of operating cash flow do not raise any red flags regarding the hospital's financial actions. In fact, Bayside's ability to both increase securities investments and pay off debt indicates that 2006 was a very good year financially.

Managers and investors must pay close attention to the statement of cash flows. Financial condition is driven by cash flows, and the statement gives a good picture of the annual cash flows generated by the business.<sup>3</sup> An examination of Table 13.3, or, better yet, a series of such tables going back the last five years and projected five years into the future, would give Bayside's managers and creditors an idea of whether or not the hospital's operations are self-sustaining—that is, does the business generate the cash flows necessary to pay the expenses, including those associated with raising capital? Although the statement of cash flows is filled with valuable information, the bottom line tells little about the business's financial condition because operating losses can be covered by financing transactions such as borrowing or selling new common stock (if investor owned), at least in the short run.

### **Notes to the Financial Statements**

The notes to the financial statements often contain information that can significantly affect a business's financial condition. For healthcare providers, these notes contain information on the firm's pension plan, its malpractice insurance, its noncapitalized lease agreements, the amount of charity care it provides, its accounting policies, and so forth. Clearly, the information contained in the notes to the financial statements has a bearing on the business's financial condition, and it should be considered, either directly or indirectly, in any financial statement analysis. Indeed, professional analysts occasionally use the footnote information to recast financial statements before they even begin an analysis, and to such analysts the notes are especially vital.

## Self-Test Questions

1. What governs financial reporting requirements in the health services industry?
2. Briefly, describe these three basic financial statements: (1) income statement, (2) balance sheet, and (3) statement of cash flows.
3. What type of information is provided by each type of statement?
4. What is the difference between net income and cash flow, and which is more meaningful to a firm's financial condition?
5. What types of information are contained in the notes to a business's financial statements?

## Financial Statement Analysis

The first step in most financial condition analyses is to examine the business's financial statements. *Financial statement analysis* involves a number of techniques that extract information contained in a business's financial statements and combine it in a form that facilitates making judgments about the firm's financial condition. In the next sections, we discuss some common analytical techniques along with some problems inherent in such analyses.

## Self-Test Question

1. What is financial statement analysis?

## Ratio Analysis



Although a business's income statement and balance sheet contain a wealth of financial information, it is often difficult to make meaningful judgments about financial performance by merely examining the raw data. To illustrate the concept, consider that one managed care plan may have \$5,248,760 in long-term debt and interest charges of \$419,900, while another may have \$52,647,980 in debt and interest charges of \$3,948,600. The true burden of these debts, and each managed care plan's ability to pay the interest and principal due on them, cannot be easily assessed without additional comparisons, such as those provided by *ratio analysis*. In essence, ratio analysis combines data from the balance sheet and the income statement to create single numbers that have easily interpreted financial significance (i.e., numbers that measure various aspects of financial performance). In the case of debt and interest payments, ratios can be constructed that relate each plan's debt to its assets and the interest it pays to the income it has available for payment.

Unfortunately, an almost unlimited number of financial ratios can be constructed, and the choice of ratios depends in large part on the nature of the business being analyzed, the purpose of the analysis, and the availability of comparative data. Generally, ratios are grouped into categories to make

them easier to interpret. In the paragraphs that follow, the data presented in Tables 13.1 and 13.2 are used to calculate an illustrative sampling of financial ratios for 2006 for Bayside Memorial Hospital, which are then compared with hospital industry average ratios.<sup>4</sup> Note that in a real analysis, many more ratios would be calculated and analyzed. Also, although a hospital is used to illustrate ratio analysis, the specific ratios used in any analysis depend on the type of healthcare provider. Some ratios are more meaningful for hospitals, some for managed care organizations, some for group practices, and so on.

### Profitability Ratios

Profitability is the net result of a large number of managerial policies and decisions, so *profitability ratios* provide one measure of the aggregate financial performance of a business.

The *total margin*, often called the *total profit margin* or just *profit margin*, is defined as net income divided by total revenues:

#### Total Margin

$$\text{Total margin} = \frac{\text{Net income}}{\text{Total revenues}} = \frac{\$8,572}{\$117,476} = 0.073 = 7.3\%.$$

$$\text{Industry average} = 5.0\%.$$

Bayside's total margin of 7.3 percent shows that the hospital makes 7.3 cents on every dollar of total revenues. The total margin measures the ability of the organization to control expenses. With all else the same, the higher the total margin, the lower the expenses relative to revenues. Bayside's total margin is above the industry average of 5.0 percent, which indicates relatively good expense control. How good? The industry data source also reports quartiles; for total margin, the upper quartile was 8.4 percent, which means that 25 percent of hospitals had total margins higher than 8.4 percent. Thus, although Bayside's total margin was better than average, it was not as good as the top hospitals'.

Bayside's relatively high total margin may mean that the hospital's gross charges are relatively high, its allowances are relatively low, its costs are relatively low, it has relatively high other (nonoperating) income, or some combination of these factors. A thorough operating indicator analysis would help pinpoint the cause, or causes, of Bayside's high total margin.

When data are available, another useful margin ratio is the *operating margin*, which is defined as operating income divided by operating revenues. (Operating revenues are equal to net patient service revenue plus premium revenue.) The advantage of this margin measure is that it focuses on core business operations and hence removes the influence of nonoperating revenues and costs, which often are transitory and unrelated to core operations. However, the current format of healthcare financial statements makes this ratio difficult to determine without additional information.

With only the data given in the financial statements, Bayside's operating margin can be estimated as follows. First, Bayside's operating revenue for 2006 was  $\$108,600,000 + \$5,232,000 = \$113,832,000$ . If the assumption is made that all expenses are operating expenses, Bayside's 2006 operating margin would be  $(\$113,832 - \$108,904) / \$113,832 = \$4,928 / \$113,832 = 0.043 = 4.3\%$ . Removing nonoperating revenue from the calculation lowers the profit margin.

**Return on Assets** The ratio of net income to total assets measures the *return on total assets*, usually just called *return on assets (ROA)*:

$$\text{Return on assets} = \frac{\text{Net income}}{\text{Total assets}} = \frac{\$8,572}{\$151,278} = 0.057 = 5.7\%.$$

$$\text{Industry average} = 4.8\%.$$

Bayside's 5.7 percent ROA, which means that each dollar of total assets generated 5.7 cents in profit, is well above the 4.8 percent average for the hospital industry. ROA tells managers how productively, in a financial sense, a business is using its assets. The higher the ROA, the greater the net income for each dollar invested in assets, and hence the more productive the assets. ROA measures both a firm's ability to control expenses, as expressed by the total margin, and its ability to use its assets to generate revenue.

**Return on Equity** The ratio of net income to total equity (net assets) measures the *return on equity (ROE)*:

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total equity}} = \frac{\$8,572}{\$107,364} = 0.080 = 8.0\%.$$

$$\text{Industry average} = 8.4\%.$$

Bayside's 8.0 percent ROE is slightly below the 8.4 percent industry average. The hospital was able to generate 8.0 cents of income for each dollar of equity investment, while the average hospital produced 8.4 cents. ROE is especially meaningful for investor-owned businesses because owners are concerned with how well the business's managers are utilizing owner-supplied capital, and ROE gives the answer to this question. For not-for-profit businesses such as Bayside, ROE tells its board of trustees and managers how well, in financial terms, its community-supplied capital is being utilized.

Bayside's 2006 total margin and ROA were above the industry averages, yet the hospital's ROE is below the average. As will be shown when Du Pont analysis is discussed, this seeming inconsistency is a result of Bayside's relatively low use of debt financing.

### Liquidity Ratios

One of the first concerns of most managers, and the major concern of a firm's creditors, is the business's *liquidity*. Will the business be able to meet its cash

obligations as they become due? Bayside has debts totaling over \$13 million (i.e., its current liabilities) that must be paid off within the coming year. Will the hospital be able to make these payments? A full liquidity analysis requires the use of a cash budget, which we will discuss in Chapter 14. However, by relating the amount of cash and other current assets to current obligations, ratio analysis provides a quick, easy-to-use, rough measure of liquidity.

The *current ratio* is calculated by dividing current assets by current liabilities: **Current Ratio**

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = \frac{\$31,280}{\$13,332} = 2.3.$$

$$\text{Industry average} = 2.0.$$

The current ratio tells managers that the liquidation of Bayside's current assets at book value would provide 2.3 dollars of cash for every one dollar of current liabilities. If a business is getting into financial difficulty, it will begin paying its accounts payable more slowly, building up short-term bank loans (i.e., notes payable), and so on. If these current liabilities rise faster than current assets, the current ratio will fall, and this can spell trouble. Because the current ratio is an indicator of the extent to which short-term claims are covered by assets that are expected to be converted to cash in the near term, it is one commonly used measure of liquidity.

Bayside's current ratio is slightly above the average for the hospital industry. Because current assets should be converted to cash in the near future, it is highly probable that these assets could be liquidated at close to their stated values. With a current ratio of 2.3, the hospital can liquidate current assets at only 43 percent of book value and still pay off current creditors in full.<sup>5</sup>

Although industry average figures are discussed in detail later, it should be stated here that the industry average is not a magic number that all businesses should strive to achieve. In fact, some very well managed businesses will be above the average, while other good firms will be below it. However, if a firm's ratios are far removed from the average for the industry, its managers should be concerned about why this difference occurs.

The current ratio measures liquidity on the basis of balance sheet accounts, as opposed to income statement items. However, the true measure of a business's liquidity is whether or not it can meet its payments as they become due, and so liquidity is more related to cash flows than it is to assets and liabilities. The *days-cash-on-hand ratio* moves closer to those factors that truly determine liquidity: **Days Cash on Hand**

$$\begin{aligned} \text{Days cash on hand} &= \frac{\text{Cash} + \text{Short-term investments (Marketable securities)}}{(\text{Expenses} - \text{Depreciation} - \text{Provision for uncollectibles})/365} \\ &= \frac{\$4,263 + \$2,000}{(\$108,904 - \$4,130 - \$3,328)/365} = \frac{\$6,263}{\$277.93} = 22.5 \text{ days.} \end{aligned}$$

$$\text{Industry average} = 30.6 \text{ days.}$$

The denominator of the equation **estimates** average daily cash expenses by stripping out noncash expenses from reported total expenses. The numerator is the cash and securities that are available to make those cash payments. Because Bayside's days cash on hand is lower than the industry average, its liquidity position as measured by days cash on hand is worse than that of the average hospital.

For Bayside, the two measures of liquidity—(1) current ratio and (2) days cash on hand—give conflicting results. Perhaps the average hospital has a greater proportion of cash and marketable securities in its current assets than does Bayside. More analysis would be required to make a supportable judgment concerning Bayside's liquidity position. Remember, though, that the cash budget is the primary tool used by managers to assess liquidity.

### **Debt Management (Capital Structure) Ratios**

The extent to which a firm uses debt financing, or *financial leverage*, is an important measure of financial performance for several reasons. First, by raising funds through debt, owners of for-profit businesses can maintain control of the firm with a limited investment. For not-for-profit firms, debt financing allows the organization to provide more services than it could if it were solely financed with contributed and earned capital. Next, creditors look to owner-supplied funds to provide a margin of safety; if the owners have provided only a small proportion of total financing, the risks of the enterprise are borne mainly by its creditors. Finally, if the firm earns more on investments financed with borrowed funds than it pays in interest, the ROE capital is magnified, or leveraged up.

Two types of ratios are used to assess debt management:

1. Balance sheet data are used to determine the extent to which borrowed funds have been used to finance assets. Such ratios are called *capitalization ratios*.
2. Income statement data are used to determine the extent to which fixed financial charges are covered by reported profits. Such ratios are called *coverage ratios*.

The two sets of ratios are complementary, so most financial statement analyses examine both types.

#### **Capitalization Ratio 1: Total Debt to Total Assets (Debt Ratio)**

The ratio of total debt to total assets, generally called the *debt ratio*, measures the percentage of total funds provided by creditors:

$$\text{Debt ratio} = \frac{\text{Total debt}}{\text{Total assets}} = \frac{\$43,914}{\$151,278} = 0.290, \text{ or } 29.0\%.$$

$$\text{Industry average} = 42.3\%.$$

In this definition, debt is defined as **all debt** and includes current liabilities, long-term debt, and capital lease obligations—everything but equity. How-



ever, this ratio has many variations, all of which use different definitions of what constitutes debt. Creditors prefer low debt ratios because the lower the ratio, the greater the cushion against creditors' losses in the event of bankruptcy and liquidation. Conversely, owners of for-profit firms may seek high leverage either to leverage up returns or because selling new stock would mean giving up some degree of control. In not-for-profit firms, managers may seek high leverage to offer more services.

Bayside's debt ratio is 29.0 percent. This means that its creditors have supplied somewhat less than one-third of the firm's total financing. Put another way, each dollar of assets was financed with 29 cents of debt and, consequently, 71 cents of equity. (The *equity ratio* is  $1 - \text{Debt ratio}$ , so Bayside's equity ratio is 71 percent.) Because the average debt ratio for the hospital industry is over 40 percent, Bayside uses significantly less debt than the average hospital. The low debt ratio indicates that the hospital would find it relatively easy to borrow additional funds, presumably at favorable rates.

Another commonly used capitalization ratio is the *debt to equity ratio*. The debt ratio and debt to equity ratios are transformations of each other and hence provide the same information, but with a slightly different twist:

### Capitalization Ratio 2: Debt to Equity Ratio

$$\text{Debt to equity ratio} = \frac{\text{Total debt}}{\text{Total equity}} = \frac{\$43,914}{\$107,364} = 0.409, \text{ or } 40.9\%.$$

$$\text{Industry average} = 73.3\%.$$

This ratio tells analysts that Bayside's creditors have contributed 40.9 cents for each dollar of equity capital, while the industry average is 73.3 cents per dollar. Both the debt ratio and debt to equity ratio increase as a business uses a greater proportion of debt financing, but the debt ratio rises linearly and approaches a limit of 100 percent, while the debt to equity ratio rises exponentially and approaches infinity.

Lenders, in particular, prefer the debt to equity ratio to the debt ratio. Their preference is based on the fact that it tells them how much capital creditors have provided to the business **per dollar of equity capital**. The higher this ratio, the riskier the creditors' position.

The *times-interest-earned (TIE) ratio* is calculated by dividing earnings before interest and taxes (EBIT) by the interest charges. EBIT is used in the numerator because it represents the amount of income that is available to pay interest expense. For a not-for-profit business, which does not pay taxes,  $\text{EBIT} = \text{Net income} + \text{Interest expense}$ . For Bayside:

### Coverage Ratio 1: Times-Interest-Earned Ratio

$$\text{TIE ratio} = \frac{\text{EBIT}}{\text{Interest expense}} = \frac{\$8,572 + \$1,542}{\$1,542} = \frac{\$10,114}{\$1,542} = 6.6.$$

$$\text{Industry average} = 4.0.$$



The TIE ratio measures the number of dollars of income available to pay each dollar of interest expense. In essence, it is an indicator of the extent to which income can decline before the business's earnings are less than its annual interest costs. Failure to pay interest can bring legal action by the firm's creditors, which can possibly result in bankruptcy.

Bayside's interest is covered 6.6 times, so it has 6.6 dollars of accounting income to pay each dollar of interest expense. Because the industry average TIE ratio is four times, the hospital is covering its interest charges by a relatively high margin of safety. Thus, the TIE ratio reinforces the previous conclusion based on the capitalization ratios—namely, that the hospital can easily expand its use of debt financing.

Coverage ratios are often better measures of a firm's debt utilization than capitalization ratios because coverage ratios discriminate between low-interest-rate debt and high-interest-rate debt. For example, a group practice might have \$10 million of 4 percent debt on its balance sheet, while another might have \$10 million of 8 percent debt. If both practices have the same income and assets, both would have the same debt ratio. However, the group paying 4 percent interest would have the lower interest charges and hence would be in a better financial condition than the group paying 8 percent. This difference in financial condition is captured by the TIE ratio.

### Coverage Ratio 2: Cash Flow Coverage Ratio

Although the TIE ratio is easy to calculate, it has two major deficiencies. First, leasing has become widespread in recent years. Also, many debt contracts require that principal payments be made over the life of the loan, rather than only at maturity. Thus, most businesses must meet fixed financial charges other than interest payments. Second, the TIE ratio ignores the fact that accounting income, whether measured by EBIT or net income, does not indicate the actual cash flow available to meet fixed charge payments. These deficiencies are corrected in the *cash flow coverage (CFC) ratio*, which shows the margin by which cash flow covers fixed financial requirements:

$$\begin{aligned} \text{CFC ratio} &= \frac{\text{EBIT} + \text{Lease payments} + \text{Depreciation expense}}{\text{Interest expense} + \text{Lease payments} + \text{Debt principal}/(1 - T)} \\ &= \frac{\$10,114 + \$1,368 + \$4,130}{1,542 + \$1,368 + \$2,000/(1 - 0)} = \frac{\$15,612}{\$4,910} = 3.2. \end{aligned}$$

Industry average = 2.3.

Although not shown directly on Bayside's financial statements, the hospital had \$1,368,000 of lease payments and \$2 million of debt principal repayments in 2006.

What is the purpose of the  $(1 - T)$  term applied to the debt principal? For investor-owned firms, the debt principal repayments, because they are paid with after-tax dollars, must be *grossed up* by dividing by  $1 - T$ . This gives

the amount of pretax dollars, which are contained in the numerator, that are required to cover the principal repayments.

Like its TIE ratio, Bayside's CFC ratio exceeds industry standard, which indicates that Bayside is better at covering its total fixed payments with cash flow than is the average hospital. This fact should be reassuring both to creditors and management and reinforces the view that Bayside has untapped debt capacity.

### Asset Management (Activity) Ratios

The next group of ratios, the *asset management*, or *activity, ratios*, is designed to measure how effectively a business's assets are being managed. These ratios help to answer whether or not the total amounts of each type of asset as reported on the balance sheet seem reasonable, too high, or too low in view of current operating levels. Bayside and other hospitals must borrow or raise equity capital to acquire assets. If they have too many assets, then their capital costs will be too high and their profits will be depressed. Conversely, if assets are too low, then profitable patient volume may be lost or vital services not offered.

The *fixed asset turnover ratio*, also called the *fixed asset utilization ratio*, measures the utilization of plant and equipment, and it is the ratio of total revenues to net fixed assets:

### Fixed Asset Turnover Ratio

$$\text{Fixed asset turnover} = \frac{\text{Total revenues}}{\text{Net fixed assets}} = \frac{\$117,476}{\$119,998} = 0.98.$$

$$\text{Industry average} = 2.2.$$

Bayside's ratio of 0.98 indicates that each dollar of fixed assets generated 98 cents in revenue. This value compares poorly with the industry average of 2.2 times, which indicates that Bayside is not using its fixed assets as productively as the average hospital. (The lower quartile value for the industry is 1.8; thus, Bayside falls well into the bottom 25 percent of all hospitals in its fixed asset utilization.)

Before condemning Bayside's management for poor performance, it should be pointed out that a major problem exists with the use of the fixed asset turnover ratio for comparative purposes. Recall that all assets except cash and accounts receivable reflect historical costs rather than current value. Inflation and depreciation have caused the values of many assets that were purchased in the past to be seriously understated. Therefore, if an old hospital that had acquired much of its plant and equipment years ago is compared to a new hospital with the same physical assets, the old hospital, because of a much lower book value of assets, would report a much higher fixed asset turnover ratio. Such a difference is more reflective of the inability of financial statements

to deal with inflation than of any inefficiency on the part of the new hospital's managers.

**Total Asset Turnover Ratio** The *total asset turnover ratio* measures the turnover, or utilization, of all of the firm's assets. It is calculated by dividing total revenues by total assets:

$$\text{Total asset turnover} = \frac{\text{Total revenues}}{\text{Total assets}} = \frac{\$117,476}{\$151,278} = 0.78.$$

$$\text{Industry average} = 0.97.$$

Thus, each dollar of total assets generated 78 cents in total revenue. Bayside's total asset turnover ratio is below the industry average, but not as far below as its fixed asset turnover ratio. Thus, relative to the industry, the hospital is utilizing its current assets better than its fixed assets. Such judgments can be confirmed by examining Bayside's current asset turnover.<sup>6</sup>

**Days in Patient Accounts Receivable** *Days in patient accounts receivable* is used to measure effectiveness in managing receivables. This measure of financial performance, which is sometimes classified as a liquidity ratio rather than an asset management ratio, has many names, including *days in receivables*, *average collection period*, and *days' sales outstanding*. It is computed by dividing net patient accounts receivable by average daily patient revenue to find the number of days that it takes an organization, on average, to collect its receivables:

$$\begin{aligned} \text{Days in patient accounts receivable} &= \frac{\text{Net patient accounts receivable}}{\text{Net patient service revenue} / 365} \\ &= \frac{\$21,840}{\$108,600 / 365} \\ &= 73.4 \text{ days.} \end{aligned}$$

$$\text{Industry average} = 64.0 \text{ days.}$$

In the calculation for Bayside, premium revenue has not been included because such revenue is collected before services are provided and hence does not affect receivables.<sup>7</sup>

Bayside is not doing as well as the average hospital in collecting its receivables. The lower quartile value is 78.7 days, so a relatively large number of hospitals are doing worse. Still, as we will emphasize in Chapter 16, it is important that businesses collect their receivables as soon as possible. Clearly, Bayside's managers should strive to increase the hospital's performance in this key area.

### Other Ratios

The final group of ratios examines other facets of a business's financial condition. For investor-owned firms with publicly traded stock, some ratios can be developed that relate the firm's stock price to its earnings and book value per

share. Such *market value ratios* give managers an indication of what investors think of the firm's past performance and future prospects. If the firm's liquidity, asset management, debt management, and profitability ratios are all good, its stock price, and hence market value ratios, will be high.

The *average age of plant* gives a rough measure of the average age in years of a business's fixed assets:

### Average Age of Plant

$$\text{Average age of plant} = \frac{\text{Accumulated depreciation}}{\text{Depreciation expense}} = \frac{\$25,160}{\$4,130} = 6.1 \text{ years.}$$

Industry average = 9.1 years.

Bayside's physical assets are newer than those of the average hospital. Thus, the hospital offers more up-to-date facilities than average and hence will probably have lower capital expenditures in the near future. On the other hand, Bayside's net fixed asset valuation will be relatively high, which, as pointed out earlier, biases the hospital's fixed asset and total asset turnover ratios downward. This fact raises serious questions about the validity of the turnover ratios calculated previously.

For investor-owned firms, the *price/earnings (P/E) ratio* shows how much investors are willing to pay per dollar of reported profits. Suppose that the stock of General Home Care, an investor-owned home health care business, sells for \$28.50, while the firm had 2006 earnings per share (EPS) of \$2.20. Then, its P/E ratio would be 13.0:

### Price/Earnings Ratio

$$\text{P/E ratio} = \frac{\text{Price per share}}{\text{Earnings per share}} = \frac{\$28.50}{\$2.20} = 13.0.$$

Industry average = 15.2.

P/E ratios are higher for firms with high growth prospects, other things held constant, but they are lower for riskier firms. General's P/E ratio is slightly below the average of other investor-owned home health care businesses, which suggests that the business is regarded as being somewhat riskier than most, as having poorer growth prospects, or both.

The ratio of a stock's market price to its book value gives another indication of how investors regard the firm. Firms with relatively high rates of return on equity generally sell at higher multiples of book value than those with low returns. General reported \$80 million in total equity on its 2006 balance sheet, and the firm had 5 million shares outstanding, so its book value per share is  $\$80 / 5 = \$16.00$ . Dividing the price per share by the book value per share gives a *market/book (M/B) ratio* of 1.8:

### Market/Book Ratio

$$\text{M/B ratio} = \frac{\text{Price per share}}{\text{Book value per share}} = \frac{\$28.50}{\$16.00} = 1.8.$$

Industry average = 2.1.

Investors are willing to pay slightly less for each dollar of General's book value than for that of an average home health care business.

### Comparative and Trend Analysis

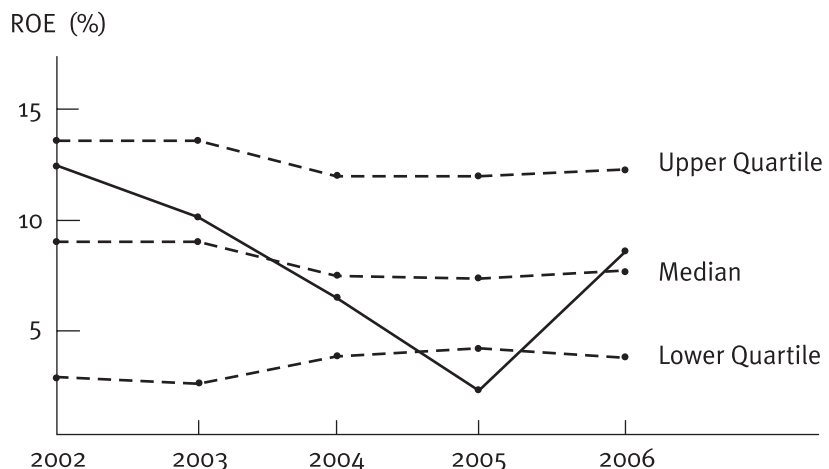


When conducting ratio analysis, the value of a particular ratio, in the absence of other information, reveals almost nothing about financial condition. For example, if it is known that a nursing home business has a current ratio of 2.5, it is virtually impossible to say whether this is good or bad. Additional data are needed to help interpret the results of this ratio analysis. In the discussion of Bayside's ratios, the focus was on *comparative analysis*; that is, the hospital's ratios were compared with the average ratios for the industry. Another useful ratio analysis tool is *trend analysis*, in which the trend of a single ratio is analyzed over time. Trend analysis gives clues about whether a business's financial condition is improving, holding constant, or deteriorating.

It is easy to combine comparative and trend analyses in a single graph such as the one shown in Figure 13.1. Here, Bayside's ROE (the solid line) and industry average ROE data (the dashed lines) are plotted for the past five years. The graph shows that the hospital's ROE has been declining faster than the industry average from 2002 through 2005, but that it rose above the industry in 2006. Other ratios can be analyzed in a similar manner.

**FIGURE 13.1**

Bayside Memorial Hospital: ROE Analysis, 2002–2006



Year	ROE			
	Bayside	Industry		
		Lower Quartile	Median	Upper Quartile
2002	12.5%	2.6%	8.6%	13.3%
2003	10.0	2.5	8.6	13.3
2004	6.7	2.8	7.2	12.1
2005	2.4	4.1	7.2	12.1
2006	8.0	3.8	7.4	12.3

## Self-Test Questions

1. What is the purpose of ratio analysis?
2. What are two ratios that measure profitability?
3. What are two ratios that measure liquidity?
4. What are two ratios that measure debt management?
5. What are two ratios that measure asset management?
6. What are two ratios that measure market value?
7. How can comparative and trend analyses be used to help interpret ratio results?

## Tying the Ratios Together: Du Pont Analysis



A complete ratio analysis provides a great deal of information about a business's financial condition, but it does not provide an overview nor does it tie any of the ratios together. *Du Pont analysis* provides an overview of a business's financial condition and helps managers and investors understand the relationships among several ratios. Essentially, Du Pont analysis, so named because managers at the Du Pont Company developed it, combines basic financial ratios in a way that provides valuable insights into a firm's financial condition. The analysis decomposes return on equity (ROE), which is one of the most important measures of a business's profitability, into the product of three other ratios, each of which has an important economic interpretation. The result is the *Du Pont equation*:

$$\begin{aligned} \text{ROE} &= \text{Total margin} \times \text{Total asset turnover} \times \text{Equity multiplier} \\ &= \text{Return on assets} \times \text{Equity multiplier.} \end{aligned}$$

Note that the Du Pont equation actually has two forms. One form has three factors on the right side of the equation, while the other recognizes that the product of the total margin and total asset turnover is ROA. By combining these ratios, the second form has only two factors on the right side.

The mathematical validity of the Du Pont equation can easily be seen by expressing it in ratio form:

$$\begin{aligned} \frac{\text{Net income}}{\text{Total equity}} &= \frac{\text{Net income}}{\text{Total revenues}} \times \frac{\text{Total revenues}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Total equity}} \\ &= \frac{\text{Net income}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Total equity}} \end{aligned}$$

By canceling like terms in the numerator and denominator, we see that the left side of the equation is equal to the right side.

Bayside's 2006 data are used to illustrate the Du Pont equation:

$$\begin{aligned} \frac{\$8,572}{\$107,364} &= \frac{\$8,572}{\$117,476} \times \frac{\$117,476}{\$151,278} \times \frac{\$151,278}{\$107,364} \\ 7.98\% &= 7.30\% \times 0.78 \times 1.41 \\ &= 5.69\% \times 1.41. \end{aligned}$$

Bayside's 2006 total margin was 7.3 percent, so the hospital made 7.3 cents profit on each dollar of total revenue. Furthermore, assets were turned over, or created revenues, 0.78 times during the year, so the hospital earned a return of  $7.30\% \times 0.78 = 5.69\%$  on its assets. This value for ROA, when rounded, is the same as was calculated previously in the ratio analysis section.

If the hospital used only equity financing, its 5.69 percent ROA would equal its ROE. However, creditors supplied 29 percent of Bayside's capital, while the equityholders (i.e., the community) supplied the rest. Because the 5.69 percent ROA belongs exclusively to the suppliers of equity capital, which makes up only 29 percent of total capital, Bayside's ROE is higher than 5.69 percent. Specifically, ROA must be multiplied by the *equity multiplier*, which shows the amount of assets working for each dollar of equity capital, to obtain the ROE of 7.98 percent. This 7.98 percent ROE can be calculated directly:  $\text{ROE} = \text{Net income} / \text{Total equity} = \$8,572 / \$107,364 = 7.98\%$ . However, the Du Pont equation shows how total margin, which measures expense control; total asset turnover, which measures asset utilization; and financial leverage, which measures debt utilization, interact to determine ROE.

Bayside's managers use the Du Pont equation to suggest how to improve the hospital's financial performance. To influence the profit margin (i.e., expense control), the hospital's marketing staff can study the effects of raising charges, or lowering them to increase volume, moving into new services or markets with higher margins, entering into new contracts with managed care plans, and so on. Furthermore, management accountants can study the expense items and, while working with department heads and clinical staff, can seek ways to reduce costs.

Regarding total asset turnover (i.e., asset utilization), Bayside's analysts, while working with both clinical and marketing staffs, can investigate ways of reducing investments in various types of assets. Finally, the hospital's financial staff can analyze the effects of alternative financing strategies on the equity multiplier (i.e., debt utilization), seeking to hold down interest expenses and the risks of debt while still using debt to leverage up ROE.

The Du Pont equation provides a useful comparison between a business's performance as measured by ROE and the performance of an average hospital. For example, here is the comparative analysis for 2006:

Bayside:	ROE	=	$7.3\% \times 0.78$	$\times$	1.41
		=	5.69%	$\times$	$1.41 \approx 8.0\%$ .
Industry average:	ROE	=	$5.0\% \times 0.97$	$\times$	1.73
		=	4.85%	$\times$	$1.73 \approx 8.4\%$ .

The Du Pont analysis tells managers and creditors that Bayside has a significantly higher profit margin, and thus better control over expenses, than does the average hospital. However, the average hospital has a better total asset

turnover, and thus Bayside is getting below-average utilization from its assets. In spite of the average hospital's advantage in asset utilization, Bayside's superior expense control outweighs its utilization disadvantage because its ROA of 5.69 percent is higher than the industry average ROA of 4.85 percent. Finally, the average hospital has offset Bayside's advantage in ROA by using more financial leverage, although Bayside's lower use of debt financing decreases its risk. The end result is that Bayside gets somewhat less return on its equity capital than does the average hospital.

One potential problem with Du Pont and ratio analyses applied to not-for-profit organizations, especially hospitals, is that a large portion of their net income may come from other (nonoperating) sources rather than from operations. If the nonoperating income is highly variable and unpredictable, ROE and the ratios, as previously defined, may be a poor measure of the hospital's inherent profitability. All applicable ratios, as well as the Du Pont analysis, can be recast to focus on operations by using net operating revenue in lieu of total revenues and net operating income in lieu of net income.

1. Explain how the Du Pont equation combines several ratios to obtain an overview of a business's financial condition.
2. Why may a focus on operating revenue and operating income be preferable to a focus on total revenues and net income?

## Self-Test Questions

### Common Size Analysis



There are analytical techniques other than ratio analysis that are used to help interpret financial statements. In *common size analysis*, all income statement items are divided by total revenues, and all balance sheet items are divided by total assets. Thus, a common size income statement shows each item as a percentage of revenues, and a common size balance sheet shows each account as a percentage of total assets. The significant advantage of common size statements is that they facilitate comparisons of income statements and balance sheets over time and across firms because they compensate for scale (size) differentials.

Table 13.4 contains Bayside's common size income statement for 2006, along with the common size statement for the hospital industry. A lower percentage of Bayside's revenue comes from capitated contracts and a higher percentage from nonoperating sources than is true of the average hospital. In addition, Bayside overall is doing a better job of controlling expenses, which results in a higher profit margin.

Table 13.5 contains Bayside's common size balance sheet for 2006, along with industry average data. Three striking differences are revealed: (1) Bayside's current assets are significantly lower than the industry average, (2) its net plant and equipment are significantly higher, and (3) it uses far less debt financing than the average hospital.



**TABLE 13.4**

	<i>Bayside</i>	<i>Industry Average</i>
Bayside Memorial Hospital: Common Size Income Statement for 2006		
Net patient service revenue	92.4%	90.4%
Premium revenue	4.5	7.2
Other revenue	3.1	2.4
Total revenues	<u>100.0%</u>	<u>100.0%</u>
Expenses:		
Nursing services	49.6%	50.7%
Dietary services	4.6	4.7
General services	11.2	11.5
Administrative services	9.7	10.2
Employee health and welfare	8.7	9.2
Provision for uncollectibles	2.8	2.8
Provision for malpractice	1.1	1.0
Depreciation	3.5	3.0
Interest expense	1.3	1.9
Total expenses	<u>92.7%</u>	<u>95.0%</u>
Net income	<u>7.3%</u>	<u>5.0%</u>

*Note:* This table contains inconsistencies because values are rounded to the nearest tenth percent.

## Self-Test Questions

1. How are common size statements created?
2. What advantage do common size statements have over regular statements when conducting a financial statement analysis?

## Percentage Change Analysis



Another frequently used technique when analyzing financial statements is percentage change analysis. Here, the percentage changes in the individual accounts on the balance sheet and items on the income statement over some time period are calculated and compared. In this format, it is easy to see which items are growing faster or slower than others and hence to see which of them are under control and which are out of control. For example, Bayside's net patient service revenue plus premium revenue, which is the hospital's net operating revenue, grew at an 11.6 percent rate from 2005 to 2006. At the same time, nursing services expenses grew by only 2.7 percent. This information tells Bayside's managers that revenues associated with patients grew faster than nursing expenses, which is a positive trend for the hospital. Other items and accounts would be analyzed in a similar manner.

The conclusions reached in a percentage change analysis, as well as in a common size analysis, generally parallel those derived from ratio analysis. However, occasionally a serious deficiency is highlighted only by one of the

TABLE 13.5

Bayside  
Memorial  
Hospital:  
Common Size  
Balance Sheet  
for 2006

	<i>Bayside</i>	<i>Industry Average</i>
Cash and equivalents	2.8%	3.7%
Short-term investments	1.3	2.0
Accounts receivable	14.4	17.2
Inventories	2.1	2.5
Total current assets	<u>20.7%</u>	<u>25.4%</u>
Gross plant and equipment	96.0%	90.1%
Accumulated depreciation	16.6	15.5
Net plant and equipment	<u>79.3%</u>	<u>74.6%</u>
Total assets	<u>100.0%</u>	<u>100.0%</u>
Accounts payable	3.1%	3.9%
Accrued expenses	3.7	4.1
Notes payable	0.5	3.2
Current portion of long-term debt	1.4	2.1
Total current liabilities	<u>8.8%</u>	<u>13.3%</u>
Long-term debt	19.0%	36.5%
Capital lease obligations	1.2	0.9
Total long-term liabilities	<u>20.2%</u>	<u>37.4%</u>
Net assets (equity)	<u>71.0%</u>	<u>49.3%</u>
Total liabilities and net assets	<u>100.0%</u>	<u>100.0%</u>

Note: This table contains inconsistencies because values are rounded to the nearest tenth percent.

three analytical techniques, while the other two techniques fail to bring the deficiency to light. Thus, a thorough financial statement analysis will include a Du Pont analysis to provide an overview and will then include ratio, common size, and percentage change analyses.

1. What is percentage change analysis?
2. Why is it useful?
3. Which analytical techniques should be used in a complete financial statement analysis?

## Self-Test Questions

## Operating Indicator Analysis

*Operating indicator analysis* goes one step beyond financial statement analysis in that operating indicator analysis examines operating variables with the goal of **explaining** a business's financial condition. Like the financial ratios, *operating indicators* are typically grouped into major categories to make interpretation easier. For hospitals, the most commonly used categories are

- profit indicators,
- price indicators,
- volume (utilization) indicators,
- length of stay indicators,
- service intensity indicators,
- efficiency indicators, and
- unit cost indicators.

Because of the large number of operating indicators used in a typical analysis, it cannot be discussed in detail here. However, to give you an appreciation for this type of analysis, we will discuss seven commonly used hospital operating indicators, one from each category. Note that much of the data needed to calculate operating indicators are not contained in a business's financial statements. Thus, more complete data are required for this type of analysis, and hence the analysis is used more by managers than by outside analysts.

### **Profit per Discharge**

*Profit per discharge*, a profit indicator, provides a measure of the amount of profit, as measured by net income, earned per discharge. Note that this is a “raw” measure in the sense that it is not adjusted for case mix, which we discuss later, or local wage conditions. Often, operating indicators are calculated in both raw and adjusted forms. In 2006, Bayside's managerial accounting system reported \$93,740,000 of inpatient service revenue, \$84,865,000 of inpatient costs, and 18,281 patient discharges. Thus, Bayside's profit per discharge was \$485:

$$\begin{aligned} \text{Profit per discharge} &= \frac{\text{Inpatient profit}}{\text{Total discharges}} = \frac{\$93,740,000 - \$84,865,000}{18,281} \\ &= \frac{\$8,875,000}{18,281} = \$485. \end{aligned}$$

Industry average = \$73.

Compared to the industry average, Bayside's inpatient services are highly profitable. It is not uncommon in today's tight reimbursement environment for hospitals to lose money (as measured by accounting profit) on inpatient services. In fact, with such a low median profit (\$73), many hospitals are losing money on inpatient services. Most, however, make up the losses with profits either from other services or from nonoperating income.

### **Net Price per Discharge**

*Net price per discharge*, which is one of many price indicators, measures the average revenue collected on each inpatient discharge. Based on the data presented in the discussion of the previous indicator, Bayside's net price per discharge for 2006 was \$5,128:

$$\text{Net price per discharge} = \frac{\text{Net inpatient revenue}}{\text{Total discharges}} = \frac{\$93,740,000}{18,281} = \$5,128.$$

$$\text{Industry average} = \$5,556.$$

Bayside collects less per discharge than the average hospital, ignoring bad debt losses. However, we have already seen that Bayside makes a profit on each discharge, so its inpatient services cost structure must be proportionally even lower than the industry average. This can be caused by a lower-than-average case mix, which measures the average intensity of services provided, or to a very aggressive cost management program.

### Occupancy Percentage (Rate)

*Occupancy rate*, one of many volume indicators, measures the extent of utilization of a hospital's **licensed** beds and hence fixed assets. Because overhead costs are incurred on all assets, whether used or not, higher occupancy spreads fixed costs over more patients and hence increases per patient profitability. Based on 95,061 inpatient days in 2006, Bayside's occupancy rate was 57.9 percent:

$$\text{Occupancy rate} = \frac{\text{Inpatient days}}{\text{Number of licensed beds} \times 365} = \frac{95,061}{450 \times 365} = 57.9\%.$$

$$\text{Industry average} = 45.4\%.$$

Bayside has a higher occupancy rate and hence is using its **inpatient** fixed assets more productively than the average hospital. It is interesting to note that this conclusion is contrary to the financial statement analysis interpretation of the hospital's 2006 fixed asset turnover ratio. While that ratio is affected by inflation, accounting convention, and the amount of assets devoted to other functions, the occupancy percentage is not. Hence, it is a superior measure of pure asset utilization, at least regarding inpatient utilization. On this basis, it appears that Bayside's managers are doing a good job, relative to the industry, of utilizing the hospital's inpatient fixed assets. Note that this measure can also be applied to **staffed** beds. In Bayside's case, the two measures of capacity are the same, but many hospitals have fewer staffed beds than licensed beds.

### Length of Stay or Average Length of Stay

*Average length of stay (ALOS)*, or just *length of stay (LOS)*, is the number of days that an average inpatient is hospitalized with each admission. ALOS and an alternative version that is adjusted for case mix are the sole length of stay indicators. Bayside's 2006 LOS was 5.2 days:

$$\text{LOS} = \frac{\text{Inpatient days}}{\text{Total discharges}} = \frac{95,061}{18,281} = 5.2 \text{ days.}$$

$$\text{Industry average} = 4.7 \text{ days.}$$

On average, Bayside keeps its patients in the hospital slightly longer than the average hospital does. In general, that longer stay is considered to have a negative impact on inpatient profitability because most hospitals have a reimbursement mix heavily weighted toward prospective (episodic) payment. With payment being fixed per discharge, lower LOS typically leads to lower costs and hence higher profitability.

### **All Patient Case Mix Index**

The *all patient case mix index* is one of several intensity-of-service indicators. The concept of measuring case mix was first applied to Medicare patients, and hence many hospitals calculate both a Medicare case mix index and an all patient case mix index. Case mix is based on diagnosis, with those diagnoses requiring more complex treatments assigned a higher value. The idea here is to be able to differentiate (on average) between hospitals that provide relatively simple, and hence low cost, services from those that provide highly complex and costly services. Case mix values assigned to diagnoses are periodically recalibrated, with the intent of forcing the average hospital to have a case mix index of 1.0. In general, case mix is related to size because large hospitals typically offer a more complex set of services than do small hospitals. Furthermore, case mix values tend to be very high at teaching hospitals (> 1.5) because the most complex cases often are transferred to such hospitals.

Bayside's all patient case mix index was 1.12 for 2006, which is slightly below the industry average of 1.15. Thus, the patients that Bayside admits to the hospital require about the same intensity of services as do patients at the average hospital, which tells us that inpatient revenues and costs are not influenced by having a patient mix that is either relatively simple to treat or relatively complex.

### **Inpatient FTEs per Occupied Bed**

The number of *inpatient full-time equivalent (FTE) employees per occupied bed* is a measure of workforce productivity and hence is an efficiency indicator. The lower the number, the more productive the workforce. When the focus is on inpatient productivity, inpatient FTEs are used. The measure can also be adapted to outpatient productivity. Needless to say, there are many situations within a hospital setting in which it is difficult to allocate FTEs to the type of service provided. With an inpatient workforce of 2,005 FTEs, Bayside's inpatient FTEs per occupied bed was 4.8 in 2006:

$$\begin{aligned} \text{Inpatient FTEs per occupied bed} &= \frac{\text{Inpatient FTEs}}{\text{Average daily census}} \\ &= \frac{2,005}{0.579 \times 450} = \frac{1,251}{260.55} = 4.8. \end{aligned}$$

Industry average = 5.6.

Note that the average daily census (the number of patients hospitalized on an average day) was calculated by multiplying Bayside's occupancy rate (57.9 percent = 0.579) by the number of licensed beds (450). With higher-than-average labor productivity, it is no surprise that Bayside's inpatient services are profitable.

### Salary per FTE

*Salary per FTE*, one of the unit cost indicators, provides a simple measure of the relative cost of the largest resource item used in the hospital industry—labor. With total salaries of \$83,038,613 in 2006 and 2,681 total FTEs, Bayside's salary per FTE in 2006 was \$30,973:

$$\text{Salary per FTE} = \frac{\text{Total salaries}}{\text{Total FTEs}} = \frac{\$83,038,613}{2,681} = \$30,973.$$

Industry average = \$32,987.

Now, we can see that Bayside's profitability likely is a result of both worker productivity and control over wages and benefits.

In a full operating indicator analysis, many more indicators would be examined in an attempt to identify the operating strengths and weaknesses that underlie a business's financial condition. Although operating indicator analysis has been illustrated using the hospital industry, the concepts can be applied to any healthcare business, although the indicators selected would differ. Also, operating indicators are interpreted in the same way as financial ratios (i.e., by using comparative and trend analysis).

1. What is the difference between financial statement and operating indicator analyses?
2. Why is operating indicator analysis important?
3. Describe four indicators that are commonly used in operating indicator analysis.

### Self-Test Questions

## Limitations of Financial Statement and Operating Indicator Analyses

While financial statement and operating indicator analyses can provide a great deal of useful information concerning a business's operations and financial condition, such analyses have limitations that necessitate care and judgment. In this section, some of the problem areas are highlighted:

- Many large healthcare businesses operate a number of different divisions in quite different lines of business, and in such cases, it is difficult to develop meaningful comparative data. This problem tends to make

financial statement and operating indicator analyses more useful for firms with single product or service lines than for large, multidivisional firms.

- Most businesses want to be better than average, although half will be above and half will be below average. Merely attaining average performance is not necessarily good. However, as was demonstrated earlier, compilers of industry data often report ratios in quartiles or other percentiles. Also, it is useful for managers to compare their firms not only with the industry average but also with the top firms in the industry as well as their leading competitors. In the end, it is extremely important that senior managers establish their own standards of performance and ensure that all other managers are aware of these goals and are taking actions on a daily basis to achieve them; that is the purpose of the financial planning and control process.
- Generalizing about whether or not a particular ratio or indicator is good or bad is often difficult. For example, a high current ratio may show a strong liquidity position, which is good, or an excessive amount of receivables, which is bad. Similarly, a high asset-turnover ratio may denote either a business that uses its assets efficiently or one that is undercapitalized and simply cannot afford to buy enough assets.
- Businesses often have some ratios and indicators that look good and others that look bad, which make the firm's financial position—strong or weak—difficult to determine. For this reason, significant judgment is required when analyzing financial and operating indicator performance. Several methodologies have been proposed to reduce the information contained in a financial statement analysis to a single value and hence make interpretation much easier. One method applied is *multiple discriminant analysis*, which attempts to divide firms into two groups on the basis of their probabilities of going bankrupt. Another method merely combines ratios selected judgmentally into a composite index, which is then compared to the industry average index. In spite of such attempts, the distillation of the wide variety of information contained in a ratio analysis into a single measure of financial condition has not proved very effective.<sup>8</sup>
- Different accounting practices can distort financial statement ratio comparisons. For example, firms can use different accounting conventions to value cost of goods sold and ending inventories. During inflationary periods these differences can lead to ratio distortions. Other accounting practices, such as those related to leases, can also create distortions.
- Inflation effects can distort both firms' balance sheets and income statements. Numerous reporting methods have been proposed to adjust accounting statements for inflation, but no consensus has been reached either on how to do this or even on the practical usefulness of the resulting data. Nevertheless, accounting standards encourage, but do not require, businesses to disclose supplementary data to reflect the effects of general inflation. Inflation effects tend to make ratio comparisons over

time for a given firm, and across firms at any point in time, less reliable than would be the case in the absence of inflation.

1. Briefly, describe some of the problems encountered when performing financial statement and operating indicator analyses.
2. Explain how inflation effects created problems in the Bayside illustration.

## Self-Test Questions

### Economic Value Added

Up to this point, we have focused on using different techniques to evaluate the financial condition of a business. In many situations, it is useful to have a single measure that provides information on both financial condition and managerial performance. That measure is *economic value added (EVA)*, which focuses on managerial effectiveness in a given year.<sup>9</sup> The basic formula for EVA is

$$\begin{aligned} \text{EVA} &= \text{Net operating profit after taxes (NOPAT)} \\ &\quad - (\text{Total capital} \times \text{Corporate cost of capital}) . \end{aligned}$$

In the EVA equation, NOPAT can be thought of as revenues minus all operating costs, including taxes (if applicable) but excluding interest expense. It is actually calculated as  $\text{EBIT} \times (1 - T)$ . Total capital is the sum of the book values of debt and equity and hence total assets, while the corporate cost of capital is the business's cost of financing. In essence, EVA measures the dollar profit above the economic dollar cost of creating that profit. Because the calculation of EVA does not require market value data, it can be applied to both for-profit and not-for-profit businesses.<sup>10</sup>

To illustrate the EVA concept, consider Birmingham Health Providers, a medical group practice. The group had \$1 million in NOPAT in 2006 generated from \$5 million of investor-supplied debt and equity capital. The firm's corporate cost of capital was 10 percent. With these assumptions, Birmingham Health Providers' 2006 EVA was \$500,000:

$$\text{EVA} = \$1 - (\$5 \times 0.10) = \$1 - \$0.5 = \$0.5 \text{ million.}$$

EVA is an estimate of a business's true economic profit for the year, and it differs substantially from accounting profitability measures such as net income. EVA represents the residual income that remains after **all costs**, including the opportunity cost of the employed equity capital, have been recognized. Conversely, accounting profit is formulated without imposing a charge for equity capital. EVA depends on both operating efficiency and balance sheet management: without operating efficiency, profits will be low, and without efficient balance sheet management, there will be too many assets and hence too much capital, which results in higher-than-necessary dollar capital costs.



For investor-owned businesses, there is a direct link between EVA and the value of the business—the higher the EVA, the greater the value to owners. For not-for-profit firms, equity capital is a scarce resource that must be managed well to ensure the financial viability of the organization and hence its ability to continue to perform its stated mission. EVA lets managers know how well they are doing in managing this scarce resource because the higher the EVA in any year, the better job managers are doing in using the organization's contributions and earnings to create value for the community. Of course, EVA measures only economic value; any social value created by the equity capital is ignored and therefore must be subjectively considered.

EVA can be applied to divisions as well as to entire businesses, and the charge for capital should reflect the riskiness and capital structure of the business unit, whether it is the aggregate business or an operating division. The specific calculation of EVA is much more complex than presented here because many accounting issues, such as inventory valuation, depreciation, amortization of research and development costs, and the like, must be addressed properly when estimating a firm's NOPAT.

Nevertheless, the brief discussion here illustrates that a business's true economic profitability depends on both income statement profitability and effective use of balance sheet assets. Specifically, EVA is improved by (1) increasing revenues and decreasing costs, and hence increasing NOPAT; (2) decreasing the amount of assets used to create the NOPAT; and (3) decreasing the business's capital costs. Of course, all of this is easier said than done, and there are potential negative consequences associated with these actions. Still, the EVA model provides a good (but perhaps overly simple) road map to financial excellence.

### Self-Test Questions

1. What is economic value added (EVA), and how is it measured?
2. Why is EVA a better measure of financial performance than are accounting measures such as earnings per share and return on equity?
3. What does EVA tell managers about how to achieve good financial performance?

### Benchmarking

Ratio analysis, as well as other financial-condition evaluation techniques, requires comparisons to make meaningful judgments. In the previous examination of selected ratios, Bayside's ratios were compared to industry average ratios. However, similar to most businesses, Bayside's managers go one step further—they compare their ratios not only with industry averages but also with industry leaders and primary competitors. The technique of comparing ratios against selected standards is called *benchmarking*, while the comparative

ratios are called *benchmarks*. Bayside's managers benchmark against industry averages; against National/GFB Healthcare and Pennant Healthcare, which are two leading for-profit hospital businesses; and against Woodbridge Memorial Hospital and St. Anthony's, which are its primary local competitors.

To illustrate the concept, consider how Bayside's analysts present total margin data to the firm's board of trustees:

	<u>2006</u>		<u>2005</u>
National/GFB	9.8%	National/GFB	9.6%
<i>Industry top quartile</i>	<i>8.4</i>	<i>Industry top quartile</i>	<i>8.0</i>
St. Anthony's	8.0	St. Anthony's	7.9
<b>Bayside</b>	<b>7.3</b>	Pennant Healthcare	5.0
<i>Industry median</i>	<i>5.0</i>	<i>Industry median</i>	<i>4.7</i>
Pennant Healthcare	4.8	<b>Bayside</b>	<b>2.2</b>
<i>Industry lower quartile</i>	<i>1.8</i>	<i>Industry lower quartile</i>	<i>2.1</i>
Woodbridge Memorial	0.5	Woodbridge Memorial	(1.3)

Benchmarking permits Bayside's managers to easily see where the firm stands relative to its competition both in any given year and over time. As the data show, Bayside was roughly in the middle of the pack in 2006 with respect to its primary competitors and two large investor-owned hospital chains, although its showing was better than that of the average hospital. Its 2005 performance was significantly worse, so it improved substantially from 2005 to 2006. Although benchmarking is illustrated with one ratio, other ratios can be analyzed similarly. Also, for presentation purposes, charts are often used with comparative data color coded for ease of recognition and interpretation.

All comparative analyses require comparative data. Such data are available from a number of sources, including commercial suppliers, federal and state governmental agencies, and various industry trade groups. Each of these data suppliers uses a somewhat different set of ratios designed to meet its own needs. Thus, the comparative data source selected in a very real sense dictates the ratios that will be used in the analysis. Also, there are minor and sometimes major differences in ratio definitions between data sources—for example, one source may use a 365-day year, while another uses a 360-day year. Or, one source might use operating values as opposed to total values when constructing ratios. It is **very important** to know the specific definitions used in the comparative data because definitional differences between the ratios being calculated and the comparative ratios can lead to erroneous interpretations and conclusions. Thus, the first task in a ratio analysis is to identify the comparative data set and the ratios to be used. Then, make sure that the ratio definitions used in the analysis match those from the comparative data set.

1. What is benchmarking?
2. Why is it important to be familiar with the comparative data set?

## Key Performance Indicators and Dashboards

Financial statements and operating indicator data are usually created on an annual (or perhaps quarterly) basis. Financial condition analyses produced from this information may include literally hundreds of *metrics* (ratios and other measures). Although annual (and quarterly) financial condition analyses are almost always performed, managers need to monitor financial condition on a more regular basis so that problem areas can be identified and corrective action can be taken in a timely manner. However, the type of financial condition analyses described above with, say, weekly data, would overload managers and, as a result, important findings could be missed.

To help solve the data overload and timeliness problems, many health-care businesses use key performance indicators and dashboards. *Key performance indicators (KPIs)* are a **limited number** of financial (and nonfinancial) metrics that measure performance critical to the success of an organization. In essence, they assess the current state of the business, measure progress toward organizational goals, and prompt managerial action to correct deficiencies.

The KPIs chosen by any business depend on the line of business and its mission, objectives, and goals. In addition, KPIs usually differ by timing. For example, a hospital might have a daily KPI of number of net admissions (admissions minus discharges), while the corresponding quarterly and annual KPI might be occupancy rate. Clearly, the number of KPIs used must be kept to a minimum to allow managers to focus on the most important aspects of financial performance.

*Dashboards* are a common way to present an organization's KPIs. The term stems from an automobile's dashboard, which presents key information (for example, speed, engine temperature, and oil pressure) about the car's performance. Often, the KPIs are shown as gauges, which allow managers to quickly interpret the indicators. The basic idea here is to allow managers to monitor the business's most important financial metrics on a regular basis (daily for some metrics) in a form that is easy to read and interpret.

### Self-Test Questions

1. What is a key performance indicator (KPI)? A dashboard?
2. How are KPIs and dashboards used in financial condition analysis?

### Key Concepts

The primary purpose of this chapter is to present the techniques used by managers and investors to assess a business's financial condition. The main focus is on financial condition as reflected in a business's financial statements, although operating data were also introduced to try to explain financial performance. Here are its key concepts:

- *Financial statement analysis*, which is the primary method used to assess a business's financial condition, focuses on the data contained in a business's financial statements. *Operating indicator analysis* provides insights into why a firm is in a strong or weak financial condition.
- *Ratio analysis* is designed to reveal the relative strengths and weaknesses of a firm as compared to other firms in the same industry and to show whether the firm's position has been improving or deteriorating over time.
- The *Du Pont equation* indicates how the total margin, the total asset turnover ratio, and the use of debt interact to determine the rate of return on equity. It provides a good overview of a business's financial performance.
- *Liquidity ratios* indicate the business's ability to meet its short-term obligations.
- *Asset management ratios* measure how effectively managers are utilizing the business's assets.
- *Debt management ratios* reveal the extent to which the firm is financed with debt and the extent to which operating cash flows cover debt service and other fixed-charge requirements.
- *Profitability ratios* show the combined effects of liquidity, asset management, and debt management on operating results.
- Ratios are analyzed using *comparative analysis*, in which a firm's ratios are compared with industry averages, or those of another firm, and *trend analysis*, in which a firm's ratios are examined over time.
- In a *common size analysis*, a business's income statement and balance sheet are expressed in percentages. This facilitates comparisons between firms of different sizes and for a single firm over time.
- In *percentage change analysis*, the differences in income statement items and balance sheet accounts over time are expressed in percentages. In this way, it is easy to identify those items and accounts that are growing appreciably faster or slower than average.
- Financial statement analysis is hampered by some serious problems, including *development of comparative data*, *interpretation of results*, and *inflation effects*.
- *Economic value added (EVA)* is a financial performance measure that focuses directly on management's ability to create value. EVA can be used to assess the economic performance of any business, regardless of ownership.
- *Benchmarking* is the process of comparing the performance of a particular firm with a group of benchmark firms, often industry leaders and primary competitors.
- *Key performance indicators (KPIs)* are a limited number of *metrics* that focus on those measures that are most important to an organization's

mission success. Often, KPIs are presented in a format that resembles a *dashboard*.

Although financial condition analysis clearly has its limitations, when used with care it can provide a sound picture of a healthcare business's financial condition as well as identify those operating factors that contribute to that condition.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in financial condition analysis.

In addition, the chapter has six problems in spreadsheet format that focus on financial condition analysis issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

There are a multitude of websites that pertain to this chapter.

- One of the best ways to access corporate SEC filings by publicly traded investor-owned companies is by using the 10K Wizard page found at [www.tenkwizard.com](http://www.tenkwizard.com). Then, enter the firm's ticker symbol or name to access the filings.
- The Stern Stewart and Company website contains information on EVA and MVA; see [www.sternstewart.com](http://www.sternstewart.com).
- The American Hospital Directory has summary information, including financial data, on a large number of individual hospitals; see [www.ahd.com](http://www.ahd.com). Then, click on Free Hospital Information.
- The Cleverley & Associates website contains information on the financial data products that it sells; see [www.cleverleyassociates.com](http://www.cleverleyassociates.com).
- InterStudy publications is the largest compiler and seller of HMO data. For more information on their range of publications, see [www.hmodata.com](http://www.hmodata.com).

## Selected Cases

There are two cases in *Cases in Healthcare Finance* that are applicable to this chapter:

- Case 1: Creekside Memorial Hospital (A), which focuses on conducting financial and operating analyses in a hospital setting.
- Case 2: Old Dominion Health Plans, which has the same focus but applied to an HMO.

If time permits, both cases should be assigned because they illustrate how industry-specific factors affect financial statement and operating indicator analyses.

## Notes

1. For more information on the various organizations involved in setting accounting principles for the healthcare industry, see Woodrin Grossman and William Warshauer, Jr., "An Overview of the Standard Setting Process," *Topics in Health Care Financing*, Summer 1990, 1–8.



2. One can divide liabilities into (1) interest-bearing debt owed to specific firms or individuals and (2) non-interest-bearing debt owed to suppliers; employees; and, in the case of taxable firms, governments. We do not make this distinction, so the terms *debt* and *liabilities* are used synonymously. Also, note that an investor-owned firm would show common equity rather than net assets on its balance sheet.
3. Takeover specialists at investment banking firms always focus on an organization's cash flows. To them, cash flows are the primary determinant of a business's value. We will have more to say about this issue in Chapter 16.
4. Industry average ratios are available from many sources. For example, Ingenix publishes an annual almanac that provides hospital industry data on 76 financial and operating indicators (ratios). The ratios are reported in several groupings, such as by hospital size and geographic location. See [www.ingenixonline.com](http://www.ingenixonline.com), then click on All Products. Note that the industry average ratios presented in this chapter are for **illustrative use only** and should not be used for making real-world comparisons. Also, note that in accordance with standard practice, we are calling the comparative data *averages*, but in reality they are *median* values. Median values are better for comparisons because they are not biased by extremely high or low values in the industry data set.
5. To determine the minimum proportion of current assets that must be converted to cash to meet current obligations, divide the number 1 by the current ratio. For Bayside,  $1 / 2.3 = 0.43$ , or 43 percent. This proportion is confirmed by noting that  $0.43 \times \$31,280,000 = \$13,332,000$ , the amount of current liabilities.
6. Bayside's 2006 current asset turnover ratio (Total revenues / Total current assets) is 3.8, compared to the industry average of 3.6, so the hospital is slightly above average in its utilization of current assets.
7. Because information on credit sales generally is not available from a business's financial statements, the assumption that all sales are on credit is typically used. Although almost all hospital services are provided on credit because of the third-party-payer system, other healthcare businesses might have a much lower proportion of credit sales than do hospitals. As the proportion of cash sales increases, the days in accounts receivable measure loses its usefulness. Also, note that it would be better to use **average** receivables in the calculation, either measured as an average of monthly receivables or by adding beginning and end-of-year receivables and then dividing by two.
8. See William O. Cleverley, "Predicting Hospital Failure with the Financial Flexibility Index," *Healthcare Financial Management*, May 1985, 29–37, for a discussion of one composite index.
9. The EVA concept was developed in detail and popularized by the consulting firm of Stern Stewart and Company. For a much more complete discussion of the concept, see G. Bennett Stewart III, *The Quest for Value* (New York: HarperBusiness, 1991). Also, note that another potential measure of managerial performance for publicly traded investor-owned businesses is *market value added (MVA)*, which is the difference between the market value of equity and book value of equity. The larger the MVA, the greater the wealth created for shareholders.



10. For an excellent discussion of the application of EVA in setting managerial compensation within not-for-profit businesses, see William O. Cleverley and Roger K. Harvey, “Economic Value Added—A Framework for Health Care Executive Compensation,” *Hospital & Health Services Administration*, Summer 1993, 215–228.

## FINANCIAL FORECASTING

### Learning Objectives

After studying this chapter, readers should be able to:

- Describe in general terms the overall planning process for businesses.
- Explain how the constant growth method can be used to forecast a business's financial statements.
- Describe the various methods used in practice to forecast income statement items and balance sheet accounts.
- Construct a cash budget for a business and explain its usefulness.

### Introduction

In the last chapter, we saw how managers conduct analyses to assess a business's financial condition. Now, we consider the planning actions managers can take to exploit a business's strengths and to overcome its weaknesses to meet its goals and objectives. As we shall see, managers are vitally concerned with a business's projected financial statements and with the effects of alternative operating policies on these statements. An analysis of such effects is the key ingredient of financial planning. However, a good financial plan cannot by itself ensure that a business's goals will be met; the plan must be backed up by a financial control system for monitoring the situation, both to make sure that the plan is carried out properly and to facilitate rapid adjustments if economic and operating conditions change from those built into the plan.

### Strategic Planning

Financial plans, which have financial forecasts as their foundation, are developed within the framework of the business's overall *strategic plan*. Thus, we begin our discussion with an overview of strategic planning.

### Mission Statement

The strategic plan of any business should begin with a statement, called the *mission statement*, which defines the overall purpose of the organization. The mission can be defined either specifically or in general terms. For example, an investor-owned medical equipment manufacturer might state that its corporate mission is "to increase the intrinsic value of the firm's common

stock.” Another might say that its mission is “to maximize the growth rate in earnings and dividends per share while avoiding excessive risk.” Yet another might state that its principal goal is “to provide our customers with state-of-the-art diagnostic systems at the lowest attainable cost, which in our opinion will also maximize benefits to our employees and stockholders.”

Mission statements for not-for-profit businesses normally are stated in different terms; but the reality of competition in the health services industry forces all businesses, regardless of ownership, to operate in a manner consistent with financial viability. To illustrate a not-for-profit mission statement, consider the following statement of Bayside Memorial Hospital, a not-for-profit acute care hospital:

Bayside Memorial Hospital, along with its medical staff, is a recognized, innovative healthcare leader dedicated to meeting the needs of the community. We strive to be the best comprehensive healthcare provider in our service area through our commitment to excellence.

This mission statement provides Bayside’s managers with an overall framework for establishing the hospital’s goals and objectives.<sup>1</sup>

### **Corporate Goals**

The mission statement contains the general philosophy and approach of the business, but it does not provide managers with specific operational goals. *Corporate goals* set forth specific goals that management strives to attain. Corporate goals generally are qualitative in nature, such as “keeping the firm’s research and development efforts at the cutting edge of the industry.” Multiple goals are established, and they should be changed over time as conditions change. Furthermore, a firm’s corporate goals should be challenging yet realistically attainable.

Bayside Memorial Hospital divides its corporate goals into five major areas as listed below:

#### *1. Quality and Customer Satisfaction*

- To make quality performance the goal of each employee.
- To be recognized by our patients as the provider of choice in our market area.
- To identify and resolve as rapidly as possible areas of patient dissatisfaction.

#### *2. Medical Staff Relations*

- To identify and develop timely channels of communication among all members of the medical staff, management, and board of directors.
- To respond in a timely manner to all medical staff concerns brought to the attention of management.
- To make Bayside Memorial Hospital a more desirable location to practice medicine.

- To develop strategies to enhance the mutual commitment of the medical staff, administration, and board of directors for the benefit of the hospital's stakeholders.
  - To provide the highest-quality, most cost-effective medical care through a collaborative effort of the medical staff, administration, and board of directors.
3. *Human Resources Management*
- To be recognized as the customer service leader in our market area.
  - To develop and manage human resources to make Bayside Memorial Hospital the most attractive location to work in our market area.
4. *Financial Performance*
- To maintain a financial condition that permits us to be highly competitive in our market area.
  - To develop the systems necessary to identify inpatient and outpatient costs by unit of service.
5. *Health Systems Management*
- To be a leader in applied technology based on patient needs.
  - To establish new services and programs in response to patient needs.
  - To be in the forefront of electronic medical records (EMR) technology.

Of course, these goals occasionally conflict, and when they do Bayside's senior managers have to make judgments regarding which one takes precedence.

### **Corporate Objectives**

Once a business has defined its mission and goals, it must develop objectives designed to help it achieve its stated goals. *Corporate objectives* are generally quantitative in nature, such as specifying a target market share, a target return on equity (ROE), a target earnings per share growth rate, or a target EVA (economic value added). Furthermore, the extent to which corporate objectives are met is commonly used as a basis for managers' compensation. To illustrate corporate objectives, consider Bayside's financial performance goal of maintaining a financial condition that permits the hospital to be highly competitive in its market area. These objectives are tied to that goal:

- To maintain or exceed the hospital's current 4.3 percent operating margin.
- To maintain or exceed the hospital's current 7.3 percent total margin.
- To increase the hospital's debt ratio to the range of 35 to 40 percent.  
However, this objective will not be attained by accepting new projects that will lower the hospital's profit margin.
- To maintain the hospital's liquidity as measured by the current ratio in the range of 2.0 to 2.5.
- To increase fixed asset utilization as measured by the fixed asset turnover ratio to 1.5.

Corporate objectives give managers precise targets to shoot for. But the objectives must support the business's mission and goals and must be chosen carefully so that they are challenging yet attainable.

### Self-Test Questions

1. Briefly, describe the nature and use of the following corporate planning tools:
  - a. Mission
  - b. Goals
  - c. Objectives
2. Why do financial planners need to be familiar with the business's strategic plan?

## Operational Planning

Whereas strategic planning provides general guidance, along with specific goals and objectives, operational planning provides a road map for executing a business's strategic plan. The key document in operational planning is the business's *operating plan*, which contains the detailed guidance necessary to meet corporate objectives. Operating plans can be developed for any time horizon, but most firms use a five-year horizon, and thus the term *five-year plan* has become common. In a five-year plan, the plans are most detailed for the first year, with each succeeding year's plan becoming less specific.

To get a better feel for operational planning, Table 14.1 contains Bayside Memorial Hospital's annual planning schedule. This schedule illustrates the fact that for most organizations, the planning process is essentially continuous. Next, Table 14.2 outlines the key elements of the hospital's five-year plan, with an expanded section for finance. A full outline would require several pages, but the outline given provides some insight into the format and content of a five-year plan. It should be noted that for Bayside, much of the planning function takes place at the department level, with technical assistance from the marketing, planning, and financial staffs. Larger businesses, with divisions, would begin the planning process at the divisional level. Thus, each division has its own mission and goals as well as objectives designed to support its goals, and these plans are then consolidated to form the corporate plan.

### Self-Test Questions

1. What is the purpose of a business's operating plan?
2. What is the most common time horizon for operating plans?
3. Briefly, describe the contents of a typical operating plan.

## Financial Planning

One of the key elements of operational planning is financial planning, which includes financial forecasting, the focus of this chapter.

<i>Months</i>	<i>Action</i>
April–May	Marketing department analyzes national and local economic factors likely to influence Bayside’s patient volume and reimbursement rates. At this time, a preliminary volume forecast is prepared for each service line.
June–July	Operating departments prepare new project (capital budgeting) requirements as well as operating-cost estimates based on the preliminary volume forecast.
August–September	Financial analysts evaluate proposed capital expenditures and department operating plans. Preliminary forecasted financial statements and cash budgets are prepared with emphasis on Bayside’s sources and uses of funds and forecasted financial condition.
October–November	All previous input is reviewed, and the hospital’s five-year plan is drafted by the planning, financial, and departmental staffs. Any new information developed during the planning process “feeds back” into earlier actions.
December	The five-year plan is approved by the hospital’s executive committee and then submitted to the board of directors for final approval.

**TABLE 14.1**

Bayside  
Memorial  
Hospital: Annual  
Planning  
Schedule

### **Financial Planning Process**

The financial planning process can be broken down into the following five steps:

1. Set up a system for creating projected financial statements that can be used to analyze the effects of alternative operating assumptions on the firm’s financial condition. This system can also be used to monitor operations after the plan has been finalized and put into effect. Rapid awareness of deviations from plans is essential to a good control system, and such a system in turn is essential to organizational success in a changing world.
2. Determine the specific financial requirements needed to support each alternative set of operating assumptions. These financial requirements must include funds for plant and equipment as well as for inventory and receivables buildups, for research and educational programs, and for major marketing campaigns.
3. Forecast the financing sources to be used over the next five years to support the alternative assumptions. This forecast involves estimating the funds that will be generated internally (primarily retentions) as well as those that must be obtained from external sources. Any constraints on planned operations imposed by financial limitations should be

**TABLE 14.2**

Bayside  
Memorial  
Hospital:  
Five-Year Plan  
Outline

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Chapter 1	Corporate mission and goals
Chapter 2	Corporate objectives
Chapter 3	Projected business environment
Chapter 4	Corporate strategies
Chapter 5	Summary of projected business results
Chapter 6	Functional area plans
	A. Marketing
	B. Operations
	C. Finance
	1. Working capital
	a. Overall working capital policy
	b. Cash and marketable securities management
	c. Inventory management
	d. Credit policy and receivables management
	2. Financial forecast
	a. Current condition and forecast assumptions
	b. Capital budget
	c. Cash budget
	d. Pro forma financial statements
	e. External financing requirements
	f. Financial condition analysis
	3. Accounting budgets
	4. Control plan
	D. Administration and human resources

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incorporated into the plan; examples include restrictions in debt covenants that limit the debt ratio, the current ratio, and coverage ratios.

4. Assess the projected financial results under each alternative set of operating assumptions. Here, financial condition analysis, as described in Chapter 13, is applied but now to forecasted data as opposed to historical data.
5. Choose the operating alternative that will best meet the business's strategic plan. The assumptions inherent in this alternative provide the basis for the firm's base case *financial plan*, which constitutes Chapter 6.C of Bayside's operating (five-year) plan (see Table 14.2). The most critical part of the financial plan is based on forecasted financial statements, but the plan also contains guidance relative to accounting operations and other financial functions.

Although our focus in this section is on financial planning, note that it is equally, or more, important to monitor the financial status of the business over time to make sure that the base case plan is working out as expected. Of course, procedures must be in place for adjusting the base case plan if the forecasted economic conditions do not materialize. For example, if Bayside's forecast on Medicare and Medicaid reimbursement used to develop the base case five-year plan proves to be too high or too low, the correct amounts

must be recognized and reflected in operational and financial plans as rapidly as possible. We will have more to say about financial controls in a later section.

### Financial Forecasting

The most important part of a business's financial plan is the *financial forecast*. As listed in Table 14.2, the principal components of the *financial forecast* are (1) an analysis of the business's current financial condition; (2) a revenue (volume and reimbursement) forecast; (3) the capital budget; (4) the cash budget; (5) a set of pro forma, or projected, financial statements; (6) the external financing plan; and (7) an analysis of the firm's projected financial condition. In previous chapters, we discussed the capital budget and financial statement analysis.

In the remainder of this chapter, we focus on some of the plan's elements—the revenue forecast, pro forma financial statements, the external financing plan, and the cash budget.

1. What are the five steps of the financial planning process?
2. What are the principal components of the financial forecast?

### Self-Test Questions

### Revenue Forecasts



The starting point, and most critical element, in the financial forecast is the *revenue forecast*. The reason why revenue forecasts play such an important role is that all other elements of the financial forecast stem from the revenue forecast. If the revenue projection is erroneous, the rest of the financial forecast will be suspect.

Revenue forecasts can be done in two ways: (1) from the top or (2) from the bottom. When forecasted from the top, historical trends in aggregate (organizational) revenues are examined and used as the basis for forecasting future revenues. When forecasting from the bottom, revenues are forecasted for individual services and then aggregated to create the organization forecast. Most large organizations use both methods, with the last step in the process being to resolve inconsistencies. In this way, the best possible forecasts are made.

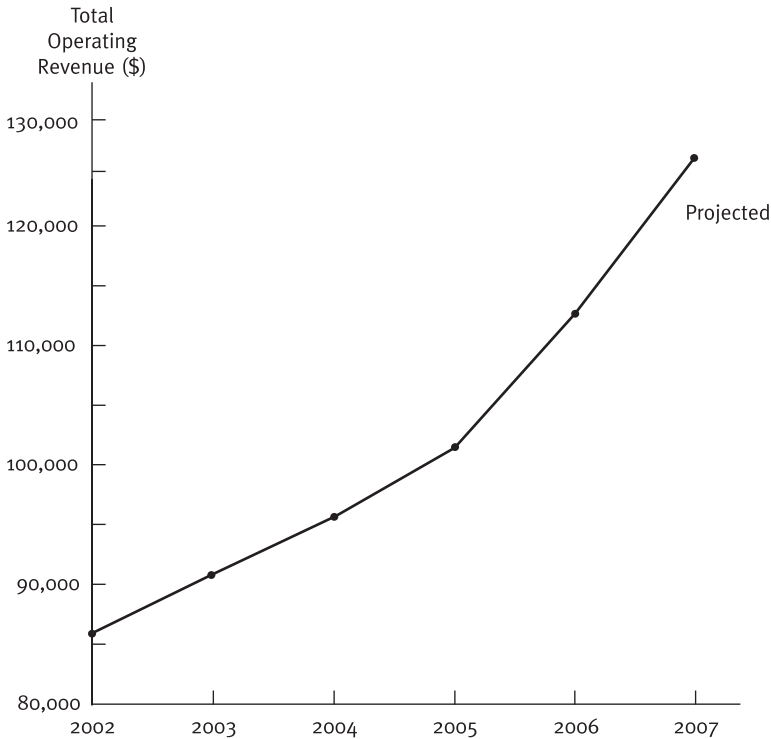
### Forecasting from the Top

When forecasting from the top, the revenue forecast generally starts with a review of organizational revenues over the past five to ten years, often expressed in graph form such as that in Figure 14.1. The first part of the graph shows actual total operating revenues for Bayside Memorial Hospital from 2002 through 2006. Over these five years (four growth periods), total operating revenue (net patient service revenue plus premium revenue) grew from \$86,477,000 to \$113,832,000, or at a compound annual growth rate



**FIGURE 14.1**

Bayside Memorial Hospital: Historical and Projected Revenues (thousands of dollars)



<i>Year</i>	<i>Total Operating Revenue</i>
2002	\$ 86,477
2003	90,568
2004	95,351
2005	102,015
2006	113,832
2007 (Projected)	126,354

of 7.1 percent. Alternatively, a time-series regression can be applied to total operating revenue. We used a spreadsheet to perform a log-linear regression on all five years of operating revenue data, with a resulting annual growth rate of 6.9 percent.<sup>2</sup> However, Bayside's revenue growth rate accelerated in the second half of the historical period, primarily as a result of new capacity that came online in 2004. Furthermore, a new, aggressive marketing program was instituted in late 2005 that resulted in a growth rate in operating revenues in 2006 of more than 11 percent.

On the basis of the recent trends in operating revenues, on anticipated service introductions, and on forecasts of local competition and reimburse-

ment trends, Bayside's planning group projects a growth rate of 11 percent for 2007, which produces a total operating revenue forecast of \$126,354,000.

It is **very important** to recognize that the operating revenue forecast is driven by two elements: (1) changes in volume (utilization) and (2) changes in reimbursement rates. Whereas volume changes tend to have a large impact on plant and staffing requirements, and hence costs, reimbursement rate changes, unless substantial, do not have much of an effect on operating variables. Thus, it is important for managers to recognize whether operating revenue changes are a result of changes in volume, which indicates that the business is experiencing real changes in output, or a result of reimbursement effects, which may have no impact on volume.

If Bayside's volume forecast is off, the consequences can be serious. First, if the market for any particular service expands more than Bayside has expected and planned for, then the hospital will not be able to meet its patients' needs. Potential customers will end up going elsewhere, and Bayside will lose market share and perhaps miss a major opportunity. On the other hand, if its projections are overly optimistic, Bayside could end up with too much capacity, which means excess equipment, inventory, and staff. This excess would mean low turnover ratios, high costs for labor and depreciation, and possibly layoffs. All of these factors would result in low profitability, which could degrade the hospital's ability to compete in the future. If Bayside had financed the unneeded expansion primarily with debt, its problems would, of course, be compounded. Thus, an accurate volume forecast is critical to the well being of any healthcare provider.

Finally, note that the operating revenue forecast, like virtually any forecast, is actually the expected value of a probability distribution of possible revenues. Because any forecast is subject to a greater or lesser degree of uncertainty, for financial forecasting purposes we are often just as interested in the degree of uncertainty inherent in the forecast (for example, its standard deviation) as we are in the expected value.

### ***Forecasting from the Bottom***

To begin the process of forecasting operating revenue from the bottom, Bayside divides its services into four major groups: (1) inpatient, (2) outpatient, (3) ancillary, and (4) other. Each of these categories is broken down into individual services; for example, one of the services that is part of the overall inpatient services revenue forecast is neurosurgery.

Next, the level of population growth and disease trends is forecasted; for example, analysts predict the population growth in the hospital's service area and any trend in disease patterns or technology that will affect the number of neurosurgeries performed. To illustrate the concept, consider the data obtained from a state health agency, which show that 523 neurosurgeries were performed in Bayside's service area in 2006. With a service area population

of 756,508 in 2006, the neurosurgery rate in the service area was 69.1 per 100,000 people. With a population forecast of 788,700 for 2007, Bayside's managers predict that  $(788,700 / 100,000) \times 69.1 = 545$  neurosurgeries will be performed in its service area.

Bayside's managers then look at the competitive environment. Consideration is given to such factors as the hospital's inpatient and outpatient capacities, its competitors' capacities, and new services or service improvements that either Bayside or its competitors might institute. For example, Bayside performed 127 neurosurgeries in 2006, so it had 24.3 percent of the neurosurgery market in that year. With an additional neurosurgeon now on the staff, increased marketing, and new managed care contracts, the hospital expects to increase its market share to 30 percent. Thus, Bayside's forecast for neurosurgeries in 2007 is  $0.30 \times 545 = 164$ .

Bayside's managers must then consider its pricing strategy and trends in reimbursement. Of course, pricing strategy may have an impact on Bayside's demand for services. For example, does the hospital have plans to raise neurosurgery charges to boost profit margins or to lower charges to gain market share and utilize excess capacity. Any potential impact of such pricing changes on neurosurgery volume must be worked into the forecasts. Because Bayside has reimbursement and utilization data on its neurosurgeries, it can easily convert the estimate of the number of procedures into a revenue estimate. The end result is a utilization and revenue forecast for neurosurgeries.

Bayside creates a volume and revenue forecast for each individual service and then aggregates these forecasts by service group. Independently, the hospital forecasts operating revenues by service group using the procedures discussed in the previous section. The aggregate forecast based on individual service forecasts are then compared with the service group forecasts. Differences are reconciled, and the resultant revenue forecast for the hospital is then compared to the organizational forecast. Further refinement is often necessary, but the end result is a total operating revenue forecast for the hospital, with breakdowns by major groups and by individual services.

### Self-Test Questions

1. What are two approaches to the total operating revenue forecast?
2. Discuss some factors that must be considered when developing an operating revenue forecast.
3. Why is it necessary for planners to distinguish between volume changes and reimbursement changes?

## Creating Forecasted Financial Statements

The revenue forecast provides the starting point for creating a business's projected financial statements, which sometimes are called *pro forma financial*

*statements*, or just *pro formas*. There are many techniques used to create the pro formas, most of which are either too complex or too detailed to discuss here. Thus, we will focus our attention more on concepts than on providing a cookbook approach to financial statement forecasting. We begin by discussing a conceptual framework for financial statement forecasting. Then, we consider some issues inherent in the forecasting process.

1. What is the starting point for creating forecasted financial statements?

**Self-Test  
Question**

## Constant Growth Forecasting



The *constant growth method*, also called the *percentage of revenues method* or, more commonly, *percentage of sales method*, is a simple technique for creating pro forma financial statements. Although this method has limited value in practice, it provides an excellent introduction to the forecasting process and lays the groundwork for understanding the more complex methods that are used in practice.

### Assumptions

The constant growth method is based on two assumptions: (1) most income statement items and balance sheet accounts are tied directly to revenues, and (2) the current levels of most income statement items and balance sheet accounts are optimal for the current volume of services provided. The basic premise is that as revenues either increase or decrease, so will most income statement items and balance sheet accounts. Furthermore, the changes in items and accounts will be *proportional* to the change in revenues. These assumptions create a situation wherein most income statement items and balance sheet accounts are assumed to grow at the same rate—the rate of revenue growth.

Of course, revenue changes can be a result of either volume changes or reimbursement rate changes, which typically are driven by inflation. In most situations, revenue changes are a result of both factors. For example, Bayside's 11 percent increase in total operating revenues projected for 2007 might be a result of a projected 6 percent increase in the volume of services provided and a 5 percent inflationary increase in reimbursement rates. Because many of the income statement items and balance sheet accounts are affected by both volume and inflation changes, many financial statement variables would be expected to also increase by 11 percent. Those variables that are tied only to volume or to inflation would be expected to increase at a lower rate. However, the constant growth method as illustrated here assumes that all financial statement variables related to revenues are influenced by both volume and inflationary changes.

### Illustration

We will illustrate the constant growth method with Bayside Memorial Hospital, whose 2006 financial statements are given in Column 1 of Tables 14.3 and 14.4. We will explain the other columns of these tables as we discuss the forecast for 2007.

To begin the process, we will assume (contrary to fact) that Bayside operated its fixed assets at full capacity to support the \$113,832,000 in total operating revenue in 2006; that is, the hospital had no excess beds or out-patient facilities.<sup>3</sup> Because we are assuming no excess capacity, if volume is to increase in 2007, Bayside will need to increase its fixed assets along with its current assets.

If, as projected, Bayside's total operating revenue increases to \$126,354,000, what will its pro forma 2007 income statement and balance sheet look like, and how much external financing will the hospital require to support operations in 2007? The first step in using the constant growth method to forecast the business's financial statements is to identify those income statement items and balance sheet accounts that are assumed to vary directly with revenues. For illustrative purposes, the increased operating revenue forecast for 2007 is expected to bring corresponding increases in all of the income statement items except interest expense; that is, operating costs and administrative expenses are assumed to be tied directly to total operating revenue, but interest expense is a function of financing decisions. Furthermore, other (nonoperating) revenue is also assumed to grow at the same rate.

Under such naïve assumptions, the first-pass forecasted, or pro forma, 2007 income statement is constructed as follows:

- Place the forecasted constant growth rate, 11.0 percent, in Column 2 in Table 14.3 for all items expected to increase with revenues. Those items calculated within the forecasted income statement, such as total operating costs, as well as those items not expected to increase proportionally with revenues, such as interest expense, have an NA (not applicable) in Column 2.
- Forecast the first-pass 2007 pro forma amounts by multiplying each applicable 2006 value by the growth rate. To illustrate the technique, note that the 2007 forecast for nursing services expenses is  $\$58,285,000 \times 1.11 = \$64,696,000$ .<sup>4</sup>
- Some items marked NA, such as interest expense, are carried over into 2007 at their 2006 values. We know that the interest expense in 2007 will be larger than in 2006 if Bayside will have to borrow additional funds, but we cannot predict the amount of interest increase until the first-pass financial statements have been completed. The remaining income statement items marked NA, such as total expenses, are calculated by merely adding or subtracting other forecasted items.

**TABLE 14.3**  
 Bayside Memorial Hospital: Historical and Projected Income Statements (thousands of dollars)

	2007 Projections				
	2006 (1)	Growth Rate (2)	First Pass (3)	Second Pass (4)	Third Pass (5)
Total operating revenue	\$ 113,832	11.0%	\$ 126,354	\$ 126,354	\$ 126,354
Other revenue	3,644	11.0	4,045	4,045	4,045
Total revenues	<u>\$ 117,476</u>	NA	<u>\$ 130,398</u>	<u>\$ 130,398</u>	<u>\$ 130,398</u>
Expenses:					
Nursing services	\$ 58,285	11.0%	\$ 64,696	\$ 64,696	\$ 64,696
Dietary services	5,424	11.0	6,021	6,021	6,021
General services	13,198	11.0	14,650	14,650	14,650
Administrative services	11,427	11.0	12,684	12,684	12,684
Employee health and welfare	10,250	11.0	11,378	11,378	11,378
Provision for uncollectibles	3,328	11.0	3,694	3,694	3,694
Provision for malpractice	1,320	11.0	1,465	1,465	1,465
Depreciation	4,130	11.0	4,584	4,584	4,584
Interest expense	1,542	NA	1,542	1,820	1,842
Total expenses	<u>\$ 108,904</u>	NA	<u>\$ 120,714</u>	<u>\$ 120,992</u>	<u>\$ 121,014</u>
Net income	<u>\$ 8,572</u>	NA	<u>\$ 9,685</u>	<u>\$ 9,407</u>	<u>\$ 9,385</u>

TABLE 14-4

Bayside Memorial Hospital: Historical and Projected Balance Sheets (thousands of dollars)

	2007 Projections				
	2006 (1)	Growth Rate (2)	First Pass (3)	Second Pass (4)	Third Pass (5)
Cash	\$ 4,263	11.0%	\$ 4,732	\$ 4,732	\$ 4,732
Short-term investments	2,000	11.0	2,220	2,220	2,220
Accounts receivable	21,840	11.0	24,242	24,242	24,242
Inventories	3,177	11.0	3,526	3,526	3,526
Total current assets	\$ 31,280	NA	\$ 34,721	\$ 34,721	\$ 34,721
Gross plant and equipment	\$ 145,158	11.0%	\$ 161,125	\$ 161,125	\$ 161,125
Accumulated depreciation	25,160	NA	29,744	29,744	29,744
Net plant and equipment	\$ 119,998	NA	\$ 131,381	\$ 131,381	\$ 131,381
Total assets	\$ 151,278	NA	\$ 166,102	\$ 166,102	\$ 166,102
Accounts payable	\$ 4,707	11.0%	\$ 5,225	\$ 5,225	\$ 5,225
Accrued expenses	5,650	11.0	6,272	6,272	6,272
Notes payable	825	11.0	916	916	916
Current portion of long-term debt	2,150	11.0	2,387	2,387	2,387
Total current liabilities	\$ 13,332	NA	\$ 14,799	\$ 14,799	\$ 14,799
Long-term debt	\$ 28,750	NA	\$ 28,750	\$ 32,221	\$ 32,499
Capital lease obligations	1,832	11.0	2,034	2,034	2,034
Total long-term liabilities	\$ 30,582	NA	\$ 30,784	\$ 34,255	\$ 34,555
Net assets (equity)	\$ 107,364	NA	\$ 117,049	\$ 116,771	\$ 116,749
Total liabilities and net assets	\$ 151,278	NA	\$ 162,631	\$ 165,824	\$ 166,080

- When the first-pass income statement is completed (Column 3 in Table 14.3), we see that the projected net income is \$9,685,000. Note that an 11 percent increase in net income would be  $\$8,572,000 \times 1.11 = \$9,515,000$ . The forecasted amount is somewhat greater than an 11 percent increase because interest expense was held at its 2006 level.

Turning to the balance sheet, because we assumed that Bayside was operating at full capacity in 2006, fixed assets as well as current assets must increase if revenues are to increase. More cash will be needed for transactions, receivables will be higher, additional inventory must be stocked, new plant must be added, and so on.<sup>5</sup>

To construct the first-pass pro forma balance sheet contained in Column 3 in Table 14.4, we proceed as follows:

- All balance sheet accounts that are expected to increase with revenues are forecast in the same way as on the income statement. To illustrate the concept, consider the cash account. The 2007 forecast is created by multiplying the 2006 value by the growth rate, so  $\$4,263,000 \times 1.11 = \$4,732,000$ , which is shown in Column 3 of Table 14.4.
- The forecasted 2007 depreciation expense from the income statement is added to the 2006 accumulated depreciation account on the balance sheet to obtain the 2007 accumulated depreciation forecast:  $\$4,584,000 + \$25,160,000 = \$29,744,000$ .
- The long-term debt value **initially** is held at its 2006 value, \$28,750,000. However, as explained in the next section, we assume that any external financing required in 2007 will be obtained by issuing more long-term debt. Alternatively, any excess funds generated would be used to retire long-term debt. In effect, long-term debt is the “plug” variable in this illustration. It will be adjusted in the second and third passes to make the balance sheet balance.
- To forecast the equity amount, add the net income projected for 2007, which must all be retained within the business, to the 2006 balance sheet equity amount to obtain the projected amount:  $\$9,685,000 + \$107,364,000 = \$117,049,000$ .
- Finally, fill in the missing values in Column 3 by merely adding or subtracting as necessary.

The projected 2007 asset accounts sum to \$166,102,000. This sum is less than an 11 percent increase because accumulated depreciation, which is a contra (negative) asset account, increased by about 18 percent. Thus, to support a revenue increase of 11 percent, Bayside must increase its assets from \$151,278,000 to \$166,102,000. The projected liability and equity accounts sum to \$162,631,000. Again, this sum is less than an 11 percent increase



because (1) long-term debt was held at its 2006 level and (2) the equity account increased by less than 11 percent.

At this point, the balance sheet **does not balance**: Assets total \$166,102,000, while only \$162,631,000 of liabilities and equity is projected. Thus, we have a shortfall, or *external financing requirement*, of \$3,471,000. This is the amount that will have to be raised externally by bank borrowings and/or by selling securities or by changing operating variables—such as charges—to generate more revenue and hence more retained earnings.

### **The External Financing Plan**

Assuming no change in operating variables, Bayside can use short-term notes payable, long-term debt, increased solicitations, or a combination of these sources to make up the \$3,471,000 shortfall. Ordinarily, Bayside would base this choice on its target capital structure, the relative costs of different types of securities, maturity matching considerations, its ability to increase contributions above the forecasted level, and so on. The decision as to how this shortfall will be financed is called the *external financing plan*.

However, our simplistic forecast assumes that Bayside will raise the required external funds by issuing additional long-term debt. Because Bayside is financing permanent assets, its use of long-term debt to meet external financing needs indicates that it is following the matching approach for its debt maturity structure (see Chapter 10). However, the use of additional debt capital will change the first approximation income statement for 2007 as set forth in Column 3 of Table 14.3 because more debt will lead to higher interest expense. Bayside's managers are forecasting that new long-term debt will carry an interest rate of 8 percent. Thus, \$3,471,000 of new long-term debt will increase the interest expense projected for 2007 by  $0.08 \times \$3,471,000 = \$278,000$ .

The projected income statement and balance sheet, including financing feedback effects, are shown in Column 4 (Second Pass) of Tables 14.3 and 14.4. We see that although \$3,471,000 was added to Bayside's liabilities, the hospital is still  $\$166,102,000 - \$165,824,000 = \$278,000$  short in meeting its external financing requirement. This new, but much smaller, shortfall is a result of the added interest expense; \$278,000 of new interest decreases net income by a like amount, and hence the equity balance falls to  $\$117,049,000 - \$278,000 = \$116,771,000$ .

The process can be repeated yet again by adding an additional \$278,000 of external (long-term debt) financing to create a third-pass income statement and balance sheet. As shown in Column 5 of Tables 14.3 and 14.4, the projected equity balance would be further reduced by additional interest requirements, but the balance sheet would be closer to being in balance because more long-term debt is added to the liabilities side. Successive iterations would continue to reduce the discrepancy. If the budget process were computerized, as would be true for all businesses, an exact solution could be

reached very rapidly. Even if the process is stopped after just a few iterations, the projected statements would generally be very close to being in balance, and they would certainly be close enough for practical purposes, given the great deal of uncertainty inherent in the projections themselves.

The base case pro forma financial statements, along with the corresponding financial condition analysis that we discussed in Chapter 13, are then reviewed by Bayside's executive committee for consistency with the hospital's financial objectives. Generally, they will make changes in the initial assumptions that will result in a new set of pro forma financial statements, which are then analyzed and reviewed, until the forecast is finalized.

The forecasting process undertaken by Ann Arbor Health Systems, a for-profit hospital, is very similar to that used by Bayside. The only real difference is that a for-profit business has to deal with the fact that it uses stock rather than fund financing. This fact presents three complications. First, the firm may pay dividends, so net income must be reduced by the forecasted dividend payment to find the amount of capital that is retained within the firm, and hence which flows to the balance sheet. Second, the firm has the option of issuing common stock to meet its external financing needs. Third, the financing feedback effect must be expanded to include dividend payments, if the business is paying dividends, on any new common stock that is issued.

Finally, note that forecasted financial statements must be checked for internal consistency; that is, accumulated depreciation on the balance sheet must be consistent with the depreciation expense shown on the income statement, and the equity reported on the balance sheet must be consistent with the retentions shown on the income statement. It is imperative that pro forma statements recognize the dependencies between the income statement items and balance sheet accounts.

1. Briefly, describe the mechanics of the constant growth forecasting method.
2. Why is the external financing requirement so important to the planning process?
3. Do you think that most healthcare businesses use the constant growth method to develop pro forma financial statements, or do they use some other methodology?

## Self-Test Questions

## Factors That Influence the External Financing Requirement

The external financing requirement is one of the key pieces of information that stems from the forecasted financial statements. If the business is unable to fund this requirement, then its plans for the future must be altered. The five factors that have the greatest influence on the external financing requirement

are: (1) projected revenue growth rate; (2) initial fixed asset utilization rate, or excess capacity situation; (3) capital intensity; (4) profit margin; (5) for investor-owned businesses, dividend policy; and (6) for not-for-profit firms, ability to attract contribution capital. In this section, we discuss each of these factors in some detail.

### Revenue Growth Rate

The faster Bayside's revenues are forecasted to grow, the greater its need for external financing will be. At growth rates less than 8.7 percent, Bayside will need no external financing; indeed, all required funds can be obtained by spontaneous increases in current liability accounts plus retained earnings, and the hospital will even generate surplus capital. However, if Bayside's projected revenue growth rate is 8.7 percent or higher, then it must seek outside financing, and the greater the projected growth rate, the greater will be its external financing requirement.<sup>6</sup>

The reasoning here is that increases in revenues normally require increases in assets. If revenues are not projected to grow, no new assets will be needed. Any projected asset increases require financing of some type. Some of the required financing will come from spontaneously generated liabilities. Also, assuming a positive profit margin (and for investor-owned firms, a payout ratio of less than 100 percent), the firm will generate some retained earnings. If the revenue growth rate is low enough, spontaneously generated funds plus retained earnings will be sufficient to support the asset growth. However, if the growth rate exceeds a certain level, then external financing will be needed. If management foresees difficulties in raising this capital—perhaps because it has no more debt capacity—then the feasibility of the firm's expansion plans may have to be reconsidered.

### Capacity Utilization

In determining Bayside's external financing requirement for 2007, we assumed that the hospital's fixed assets were being fully utilized. Thus, any significant increase in revenues would require an increase in fixed assets. What would be the effect if Bayside had been operating its fixed assets at less than full capacity? Assume that Bayside's managers consider 90 percent occupancy to be full capacity. Because the hospital had 57.9 percent occupancy in 2006, it was actually operating at  $57.9 / 90 = 64\%$  of capacity. Under this condition, fixed assets could remain constant until revenues reach that level at which fixed assets are being fully utilized, defined as *capacity sales*, which is calculated as follows:

$$\text{Utilization rate (\% of capacity)} = \frac{\text{Actual revenue}}{\text{Capacity sales}},$$

so

$$\text{Capacity sales} = \frac{\text{Actual revenue}}{\text{Utilization rate}}.$$

Because Bayside had been operating at 64 percent of capacity, its capacity sales *without any new fixed assets* would be  $\$113,832,000 / 0.64 = \$177,862,000$ . In reality, Bayside can easily increase its revenue to  $\$126,354,000$  with no increase in fixed assets. Thus, its external financing requirement would decrease by  $\$161,125,000 - \$145,158,000 = \$15,967,000$  (the projected increase in gross plant and equipment), and hence, when Bayside's actual utilization rate is considered, its forecast would show surplus capital in 2007.

### Capital Intensity

The amount of assets required per dollar of sales (total assets/sales) is often called the *capital intensity ratio*, which is the reciprocal of the total asset turnover ratio. Capital intensity has a major effect on capital requirements to support any level of sales growth. If the capital intensity ratio is low, such as for home health care businesses, then revenues can grow rapidly without much outside capital. However, if the firm is capital intensive, such as a hospital, then even a small growth in volume might require a great deal of outside capital if the firm is operating at full capacity.

### Profitability

Profitability is also an important determinant of external financing requirements—the higher the profit margin, the lower the external financing requirement, other factors held constant. Bayside's profit (total) margin in 2006 was 7.3 percent. Now, suppose its profit margin increased to 10 percent through higher reimbursements and better expense control. This would increase net income, and hence retained earnings, which in turn would decrease the requirement for external financing.

### Dividend Policy

For investor-owned firms, dividend policy also affects external capital requirements. When Ann Arbor Health Systems projects its 2007 financial statements, if it foresees difficulties in raising capital, it might want to consider a reduction in its dividend payout ratio. However, before making this decision, management should consider the possible effects of a dividend cut on stock price.<sup>7</sup>

### Ability to Attract Contribution Capital

One of the major sources of equity financing for not-for-profit businesses is contribution capital. Unrestricted contributions are listed as revenues on the income statement in the year that they become available for use in the organization, and hence they increase forecasted equity and decrease the need for external financing. Clearly, organizations that are able to raise large amounts of contribution capital are able to grow without using as much external debt financing as organizations that are contribution poor. Note that

the earnings on some restricted contributions (endowments) typically are also available to help fund a business's asset growth.

### Self-Test Question

1. How do the following factors affect the external financing requirement?
  - a. Revenue growth rate
  - b. Capacity utilization
  - c. Capital intensity
  - d. Profitability
  - e. For investor-owned firms, dividend policy
  - f. For not-for-profit firms, ability to attract contribution capital

## Problems with the Constant Growth Approach

For the constant growth method to produce accurate forecasts, each item and account that is assumed to grow with revenues must increase at the same rate as revenues. Unfortunately, such a situation rarely exists. Here are some of the problems with the constant growth approach that are encountered in “real-world” forecasting.

### *Revenue Growth Is Due to Pricing Rather Than Volume Changes*

Earlier we emphasized that revenue growth can be due to changes in either volume or pricing (reimbursement). If revenue growth is a result solely of reimbursement rate changes that are **not** caused by inflation, then there will be no direct impact on some income statement items, such as labor expenses, or on some balance sheet items, such as inventories, payables, and fixed asset requirements. Because the constant growth method ties most items and accounts directly to dollar revenues, it can give very misleading forecasts when noninflationary reimbursement rate changes, rather than volume changes, are driving the revenue forecast.

Of course, if the reimbursement changes are due to inflation effects, it is likely that there will be an inflationary impact on costs. However, in most cases, inflation will not be *neutral*; that is, the impact will differ across items and accounts.

### *Economies of Scale*

There are economies of scale in the use of many kinds of assets, and when they occur, the asset growth rates are less than volume growth rates. For example, healthcare businesses typically need to maintain base stocks of different inventory items, even when volume levels are quite low. Then, as volume expands, inventories tend to grow less rapidly than volume, so the use of a constant growth rate would overstate the amount of inventories required.

### Lumpy Assets

In many industries, technological considerations dictate that if a business is to be competitive, it must add fixed assets in large, discrete units. For example, in the hospital industry, it is not economically feasible to add, say, five beds, so when hospitals expand capacity, they typically do so in relatively large increments. In such a situation, when capacity volume is reached, even a small increase in volume would require a hospital to significantly increase its fixed assets, so a small projected volume increase can bring with it a very large increase in fixed asset requirements.

### Suboptimal Relationships

All of the asset projections in a forecast should be based on target, or optimal, relationships between revenues and assets, and not the relationships that actually exist. For example, in 2006 Bayside had \$3,177,000 in inventories. Our constant growth forecast projected inventories to be \$3,526,000 in 2007. The projection assumed that the current inventory level was optimal for the actual revenues realized. However, if the 2006 inventory level was suboptimal—say, too large—it might be possible to grow revenues by 11 percent with no increase in inventories at all. Conversely, if the inventory level was too small in 2006, then the actual level of inventories required in 2007 would be greater than the forecast.

If any of the problems noted here are encountered in practice, and generally many of them are, then the simple constant growth method should not be used. Rather, other techniques must be used to forecast asset and liability levels and the resulting external financing requirement. Some of these methods are discussed in the following section.

1. Describe several conditions under which the constant growth method can give questionable results.
2. Do these conditions happen often in “real-world” forecasting?

### Self-Test Questions

### Real-World Forecasting

We have emphasized that the constant growth method is not used in actual forecasting situations. The overall approach of first forecasting the firm’s income statement, then its balance sheet, then its external financing requirement, and so on, is used, but techniques other than constant growth are used to forecast the specific income statement items and balance sheet accounts. In this section, we discuss four forecasting techniques that are commonly used in practice: (1) simple linear regression, (2) curvilinear regression, (3) multiple regression, and (4) specific item forecasting.

### Simple Linear Regression

Simple linear regression often is used to estimate asset requirements. To illustrate the concept, consider Bayside's inventories and total operating revenue over the last five years, which are given in the lower section of Figure 14.2, and the regression plot, which is shown in the upper section. The estimated regression equation, as found using a spreadsheet, is as follows (in thousands of dollars):

$$\text{Inventories} = \$1,459 + (0.0150 \times \text{Total operating revenue}).$$

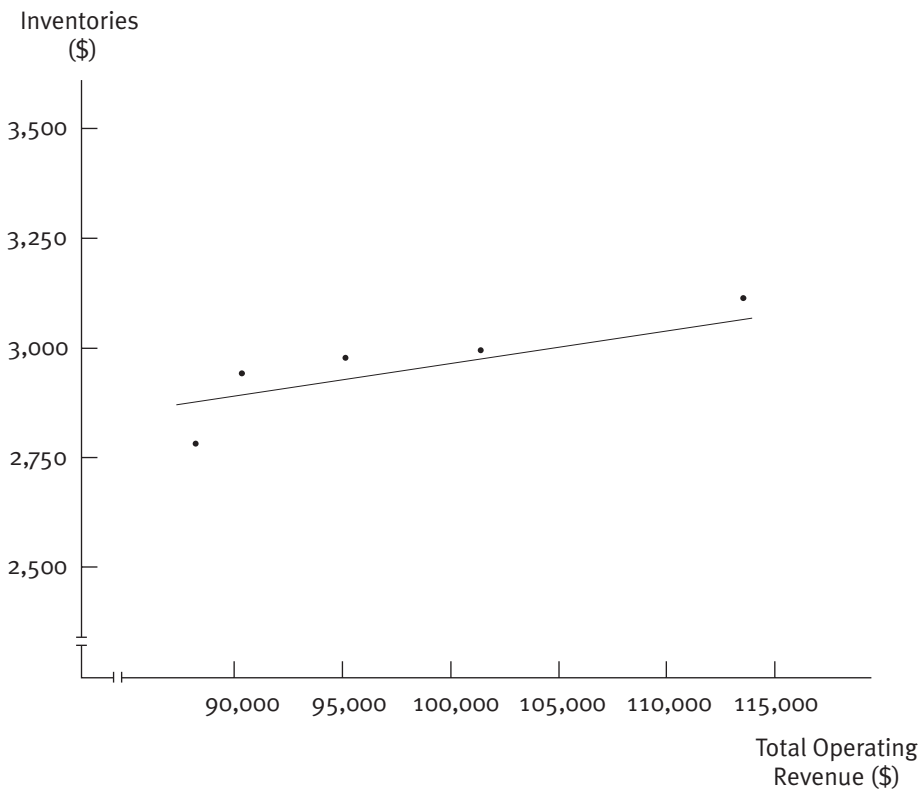
The plotted points are quite close to the regression line. In fact, the correlation coefficient between inventories and sales is +0.99, which indicates that there is a very strong linear relationship between these two variables. Why might this be the case for Bayside? According to the *economic ordering quantity* (EOQ) model, which we will discuss in Chapter 15, inventories should increase with the square root of revenues, which would cause the regression to be nonlinear—the true regression line would rise at a decreasing rate. However, Bayside has greatly expanded its number of service lines over the last decade, and the base stocks associated with these new services have caused inventories to rise. Also, inflation has had a similar impact on both revenues and inventory levels. These three influences—(1) economies of scale in existing services, (2) base stocks for new services, and (3) inflationary effects—are offsetting, resulting in the observed linear relationship between inventories and sales.

We can use the estimated relationship between inventories and revenues to forecast the 2007 inventory level. Because 2007 total operating revenue is projected at \$126,354,000, 2007 inventories should be \$3,354,000:

$$\begin{aligned} \text{Inventories} &= \$1,459 + (0.0150 \times \$126,354) \\ &= \$1,459 + \$1,895 = \$3,354. \end{aligned}$$

This is \$3,526,000 – \$3,354,000 = \$172,000 less than our earlier forecast based on the constant growth method. The difference occurs because the constant growth method assumes that the ratio of inventories to revenues remains constant, or, in other words, the regression line passes through the origin. But, as seen in Figure 14.2, the ratio actually declines because the inventory regression line does not pass through the origin.

We can run linear regressions on all the items on the income statement and all the accounts on the balance sheet that need to be forecasted to determine those that might be forecasted using this technique. Those items and accounts that produce a high correlation (those for which there is a strong linear relationship) may then be forecasted in this way. Then, we can use these relationships in Tables 14.3 and 14.4, in place of the constant growth rates, to create new pro forma financial statements based on linear regressions.



**FIGURE 14.2**  
Bayside Memorial Hospital:  
Linear Regression on Inventories (thousands of dollars)

Year	Total Operating Revenue	Inventories
2002	\$ 86,477	\$2,752
2003	90,568	2,838
2004	95,351	2,896
2005	102,015	2,981
2006	113,832	3,177

$$\text{Inventories} = \$1,459 + (0.0150 \times \text{Total operating revenue})$$

### Curvilinear Regression

Simple linear regression is based on the assumption that a straight-line relationship exists between a particular variable and revenues, or some other variable. Although linear relationships between financial statement variables and revenue frequently do exist, these relationships often assume other forms. For example, if the EOQ relationship had dominated the inventory-revenue relationship, the correct plot of inventory versus revenue would be a concave curve rather than the straight line shown in Figure 14.2. If we forecasted the inventory level needed to support revenue growth using a linear relationship, our forecast would be too high.



Businesses have in their databases historical data on their own firms by divisions, by product lines, and by individual services. They also have or can easily obtain certain types of data for other firms in their industry. These data can be analyzed using computer programs based on advanced statistical techniques (1) to help determine whether a relationship is curvilinear or linear and (2) to estimate the curvilinear relationship should one exist. Once the best-fit relationship has been estimated, it can be used to project future levels of items such as inventories, given the revenue forecast.<sup>8</sup>

### ***Multiple Regression***

If the relationship between a variable, such as inventories, and revenues is such that the individual points are widely scattered about the regression line (and hence the correlation coefficient is low), but a curvilinear relationship does not appear to exist, then there is a good chance that other factors in addition to revenue affect the level of that variable. For example, inventory levels might be a function of both revenue level and the number of different services offered (or products sold). In this case, we would obtain the best forecast for inventory level by using multiple regression techniques, where inventories would be regressed against both revenue and the number of services offered. Then the projected inventories would be based on forecasts of number of services in addition to total revenue. Most computer installations now have complete regression software packages, which makes it easy to apply multiple and curvilinear regression techniques. One can even do multiple regression analysis with many spreadsheet programs.

### ***Specific Item Forecasting***

A final technique, and the one that is often most useful in practice, is to develop a specific model for each income statement item and balance sheet account that must be forecasted. For example, salaries can be projected using payroll records and expected salary increases; receivables can be forecasted by using the payments pattern approach; gross fixed assets can be forecasted on the basis of the firm's capital budget; and depreciation can be forecasted on the basis of the firm's aggregate depreciation schedule.<sup>9</sup> Of course, projected volume typically remains an important element behind each of these specific item forecasts.

Specific item forecasting is especially useful when revenues and costs are affected by different forces and hence are expected to grow at different rates. In today's healthcare environment, this is probably the rule rather than the exception.

### ***Comparison of Forecasting Methods***

The constant growth method assumes that most financial statement variables are directly related to revenue. It is the easiest method, but often its forecasts are of questionable value. Simple linear regression differs from the constant

growth method in that regression does not assume a constant relationship to revenue. This technique can improve the forecasts for many financial statement variables. Note, too, that curvilinear and multiple regression techniques can provide especially accurate forecasts when relationships either (1) are not linear or (2) depend on other variables in addition to sales. Finally, specific item forecasting that utilizes various decision models can be used.

As we move down the list of forecasting methods, accuracy may or may not increase, but forecast costs are sure to increase. The need to employ more complicated, and consequently more costly, methods varies from situation to situation. As in all situations, the costs of using more refined techniques must be balanced against the benefits obtained. Unfortunately, there is no assurance that the use of more sophisticated forecasting methods will lead to better forecasts. Furthermore, the use of more complicated forecasting methods often hides the assumptions inherent in the forecast. As with much of healthcare financial management, judgment and common sense are necessities in the forecasting process.

1. Identify several techniques that can be used instead of constant growth forecasting.
2. Which techniques do you think would be the most accurate? The most costly?

## Self-Test Questions

### Computerized Financial Forecasting Models

Although the types of financial forecasting described thus far in the chapter can be done with a hand calculator, even the smallest healthcare businesses now have at least a personal computer and can employ some type of computerized financial forecasting model. Such models can be programmed to show the effects of different volume and reimbursement rates, different relationships between volume and operating assets, and even different assumptions about reimbursement rates and input costs (labor, materials, and so forth). Plans are then made regarding how any projected external financing requirements are to be met—through short-term bank loans; selling long-term bonds; or, in the case of investor-owned firms, selling new common stock. Pro forma balance sheets, income statements, and statements of cash flows are generated under the different financing plans, and key risk-and-return ratios, such as the current ratio, debt/assets ratio, times-interest-earned ratio, return on assets, and return on equity, are calculated.

Depending on how these projections look, management may need to modify the initial forecast. For example, management might conclude that the projected volume growth rate must be cut because external financing requirements exceed the firm's ability to raise money, or management might decide to raise more funds internally, if possible. Alternatively, the firm might investigate

service processes that require fewer fixed assets, or it might consider the possibility of contracting out some services rather than offering them in-house.

The most important benefit of a computerized forecasting model is that it permits managers to see the effects of changing both basic assumptions and specific financial policies. The forecasting process can be repeated over and over, each time creating a new scenario that changes one or more of the basic operating assumptions inherent to the model. For example, what if there is a significant reduction in Medicare reimbursement rates? What if we lose a large managed care contract to a competitor? What if we experience a nurses' strike during the coming year? What if a competitor opens a new outpatient surgery center? Changes in basic assumptions about Medicare reimbursement, labor costs, or competitors' actions have a significant effect on volume, reimbursement rates, cost relationships, profit margins, and so on. A computerized forecasting model permits managers to quickly develop forecasts to match numerous different assumptional scenarios, although the forecasts are only as good as the managers' ability to predict the impact of each scenario on key forecasting parameters.

Forecasting models also permit managers to assess the impact of changes in financial variables, such as changing the source of external financing or interest rate forecasts. It is important, however, to note (1) that managers still must interpret the results of all the forecasts and (2) that the analysis can encompass virtually hundreds of combinations of operating assumptions and financial policies, and thus hundreds of different sets of pro forma financial statements can easily be created.

One way to reduce the number of possible scenarios is to perform a sensitivity analysis to determine the effect of each assumption; assumptions that have little effect on the key financial condition ratios need not be changed from their base case levels. Another approach to reducing the number of scenarios is to perform a Monte Carlo simulation analysis. For example, instead of specifying volume, reimbursement levels, labor costs, and so on at discrete levels, probability distributions can be specified. Then, the key results would be presented as distributions rather than as point estimates.<sup>10</sup>

### Self-Test Question

1. Why are computerized forecasting models playing an increasingly important role in corporate management?

## Financial Controls

Financial forecasting and planning are vital to corporate success, but planning is for naught unless the firm has a control system that both (1) ensures implementation of the planned policies and (2) provides an information feedback loop that permits rapid adjustments if the assumed market conditions change. In a financial control system, the key question is not “How is the firm doing in

2007 as compared with 2006?” Rather, it is “How is the firm doing in 2007 as compared with the forecasts, and if actual results differ from those expected, what can we do to get back on track?”

The basic tools of financial control are *budgets* and *forecasted financial statements*. These documents set forth expected performance, and hence they express management’s target. These targets are then compared with actual corporate performance—on a daily, weekly, or monthly basis—to determine the *variances*, which in this context are the differences between realized values and target values. Thus, the control system identifies those areas where performance is not meeting target levels. If a business’s actuals are better than its targets, this could signify that its managers are doing a great job, but it could also mean that the targets were set too low and, thus, should be raised in the future. Conversely, failure to meet the financial targets could mean that market conditions are changing, that some managers are not performing up to par, or that the targets were set initially at unrealistic, unattainable levels. In any event, some action should be taken, and perhaps quickly if the situation is deteriorating rapidly. By focusing on variances, managers can “manage by exception,” concentrating on those operations most in need of improvement and leaving alone those operations that are running smoothly.

Of course, entire textbooks have been written on financial controls, and much of the subject of financial control overlaps with managerial accounting. Here, we want only to emphasize that financial controls are as critical to financial performance as are financial planning and forecasting. We must also add that financial control systems are not costless. Thus, the control system must balance its costs against the savings it is intended to produce.

1. What are the purposes of a financial control system?
2. What are the basic financial control tools and how do they work?

## Self-Test Questions

### The Cash Budget

Thus far, our discussion of financial planning and forecasting has focused on projecting a business’s financial statements. However, financial statements are prepared in accordance with accounting convention and hence may not provide much information about a business’s cash position. Furthermore, when a pro forma statement of cash flows is created, the information provided focuses on a business’s annual, or perhaps quarterly, position, whereas managers need to have a feel for the cash position throughout the year. This situation is corrected by the *cash budget*.

To create a cash budget, managers forecast both fixed asset and inventory requirements, along with the times when such payments must be made. This information is combined with projections about the delay in collecting accounts receivable, wage payment dates, interest payment dates, and so on.

All this information is then combined to show the organization's projected cash inflows and outflows over some specified period. Generally, businesses use a monthly cash budget forecasted over the next year, plus a more detailed daily or weekly cash budget for the coming month. The monthly cash budget is used for liquidity planning purposes and the daily or weekly budget for actual cash control.

Creating a cash budget does not require the application of a complex set of accounting rules. Rather, all the entries in a cash budget represent the actual movement of cash into or out of the organization. Table 14.5 contains a monthly cash budget that covers six months of 2007 for Madison Homecare, a small, for-profit home health care business. Madison's cash budget, which is broken down into four sections, is typical, although there is a great deal of variation in formats used by different organizations.

The first section of the cash budget contains the *collections worksheet*, which translates the billing for services provided into cash revenues. Because of its location in a summer resort area, Madison's patient volume, and hence billings, peak in July. However, like most health services organizations, Madison rarely collects when services are provided. What is relevant from a cash budget perspective is not when services are provided or when billings occur but rather when cash is collected. Based on previous experience, Madison's managers know that most collections occur 30 to 60 days after billing. In fact, Madison's managers have a collections table that allows them to forecast, with some precision, the timing of collections. This table was used to convert the billings shown on Line 1 of Table 14.5 into the collection amounts shown on Lines 2 and 3.

The next section of Madison's cash budget is the *supplies worksheet*, which accounts for timing differences between when supplies are ordered and when they are paid for. Madison's patient volume forecasts, which are used to predict the billing amounts shown on Line 1, are also used to forecast the supplies (primarily medical) needed to support patient services. These supplies are ordered and received one month prior to expected usage, as shown on Line 4. However, Madison's suppliers do not demand immediate payment. Rather, Madison has, on average, 30 days to pay for supplies after they are received. Thus, the actual payment occurs one month after purchase, as shown on Line 5.

The next section combines data from the collections and supplies worksheets with other projected cash outflows to show the *net cash gain (loss)* for each month. Cash from collections is shown on Line 6. Lines 7 through 12 list cash payments that are expected to be made during each month, including payments for supplies. Then, all payments are summed, with the total shown on Line 13. The difference between expected cash receipts and cash payments, Line 6 minus Line 13, is the net cash gain or loss during the month, which is shown on Line 14. For May, there is a forecasted net cash outflow of \$13,900, where the parentheses indicate a negative cash flow (or loss).

**TABLE 14-5**

## Madison Homecare: May Through October Cash Budget

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Collections Worksheet:</i>								
1. Billed charges	\$50,000	\$ 50,000	\$100,000	\$150,000	\$200,000	\$100,000	\$100,000	\$ 50,000
2. Collections:								
a. Within 30 days			19,600	29,400	39,200	19,600	19,600	9,800
b. 30–60 days			35,000	70,000	105,000	140,000	70,000	70,000
c. 60–90 days			5,000	5,000	10,000	15,000	20,000	10,000
3. Total collections			<u>\$ 59,600</u>	<u>\$104,400</u>	<u>\$154,200</u>	<u>\$174,600</u>	<u>\$109,600</u>	<u>\$ 89,800</u>
<i>Supplies Worksheet:</i>								
4. Amount of supplies ordered			\$ 10,000	\$ 15,000	\$ 20,000	\$ 10,000	\$ 10,000	\$ 5,000
5. Payments made for supplies			<u>\$ 10,000</u>	<u>\$ 15,000</u>	<u>\$ 20,000</u>	<u>\$ 10,000</u>	<u>\$ 10,000</u>	<u>\$ 5,000</u>
<i>Net Cash Gain (Loss):</i>								
6. Total collections (from Line 3)			<u>\$ 59,600</u>	<u>\$104,400</u>	<u>\$154,200</u>	<u>\$174,600</u>	<u>\$109,600</u>	<u>\$ 89,800</u>
7. Total purchases (from Line 5)			<u>\$ 10,000</u>	<u>\$ 15,000</u>	<u>\$ 20,000</u>	<u>\$ 10,000</u>	<u>\$ 10,000</u>	<u>\$ 5,000</u>
8. Wages and salaries			60,000	70,000	80,000	60,000	60,000	60,000
9. Rent			2,500	2,500	2,500	2,500	2,500	2,500
10. Other expenses			1,000	1,500	2,000	1,000	1,000	500
11. Taxes					20,000		20,000	
12. Payment for capital assets						50,000		
13. Total payments			<u>\$ 73,500</u>	<u>\$109,000</u>	<u>\$104,500</u>	<u>\$123,500</u>	<u>\$ 93,500</u>	<u>\$ 68,000</u>
14. Net cash gain (loss)			<u>(\$ 13,900)</u>	<u>(\$ 4,600)</u>	<u>\$ 49,700</u>	<u>\$ 51,100</u>	<u>\$ 16,100</u>	<u>\$ 21,800</u>
<i>Borrowing/Surplus Summary:</i>								
15. Cash at beginning with no borrowing			\$ 15,000	\$ 1,100	(\$ 3,500)	\$ 46,200	\$ 97,300	\$ 113,400
16. Cash at end with no borrowing			\$ 1,100	(\$ 3,500)	\$ 46,200	\$ 97,300	\$ 113,400	\$ 135,200
17. Target cash balance			10,000	10,000	10,000	10,000	10,000	10,000
18. Cumulative surplus cash (loan balance)			<u>(\$ 8,900)</u>	<u>(\$ 13,500)</u>	<u>\$ 36,200</u>	<u>\$ 87,300</u>	<u>\$103,400</u>	<u>\$125,200</u>

Although Line 14 contains the meat of the cash budget, Lines 15 through 18 (the *Borrowing/Surplus Summary*) extend the basic budget data to show Madison's forecasted cash position for each month. Line 15 shows the forecasted cash on hand at the beginning of each month, assuming that no borrowing takes place. Madison is expected to enter the budget period—the beginning of May—with \$15,000 of cash on hand. For each succeeding month, Line 15 is merely the value shown on Line 16 for the previous month. The values on Line 16, which are obtained by adding Lines 14 and 15, show the cash on hand at the end of each month, assuming no borrowing takes place. For May, Madison expects a cash loss of \$13,900 on top of a starting balance of \$15,000, for an ending cash balance of \$1,100, in the absence of any borrowing. This amount is the cash at beginning with no borrowing amount for June shown on Line 15.

To continue, note that Madison's target cash balance (i.e., the amount that it wants on hand at the beginning of each month) is \$10,000, which is shown on Line 17. The target cash balance is subtracted from the forecasted ending cash with no borrowing amount to determine the firm's borrowing requirements (shown in parentheses), or surplus cash (shown without parentheses). Because Madison expects to have ending cash, as shown on Line 16, of only \$1,100 in May, it will have to borrow  $\$10,000 - \$1,100 = \$8,900$  to bring the cash account up to the target balance of \$10,000. Assuming that this amount is indeed borrowed, the total loan outstanding will be \$8,900 at the end of May. (The assumption is that Madison will not have any loans outstanding on May 1 because the beginning cash balance exceeds the firm's target balance.)

The cumulative cash surplus or required loan balance is shown on Line 18; a positive value indicates a cash surplus, while a negative value indicates a loan requirement. The surplus cash or loan requirement shown on Line 18 is a **cumulative amount**. Thus, Madison is projected to borrow \$8,900 in May; it has a cash shortfall during June of \$4,600, as reported on Line 14, so its total loan requirement projected for the end of June is  $\$8,900 + \$4,600 = \$13,500$ , as shown on Line 18.

The same procedures are followed in subsequent months. Patient volume and billings are projected to peak in July, accompanied by increased payments for supplies, wages, and other items. However, collections are projected to increase by a greater amount than costs, and Madison expects a \$49,700 net cash inflow during July. This amount is sufficient to pay off the cumulative loan of \$13,500 and have a \$36,200 cash surplus on hand at the end of the month.

Patient volume, and the resulting operating costs, is expected to fall sharply in August, but collections will be the highest of any month because they will reflect the high June and July billings. As a result, Madison would normally be forecasting a healthy \$101,100 net cash gain during the month. However, the firm expects to make a cash payment of \$50,000 to purchase



a new computer system during August, so the forecasted net cash gain is reduced to \$51,100. This net gain adds to the surplus, so August is projected to end with \$87,300 in surplus cash. If all goes according to the forecast, later cash surpluses will enable Madison to end this budget period with a surplus of \$125,200.

The cash budget is used by Madison's managers for liquidity planning purposes. For example, the Table 14.5 cash budget indicates that Madison will need to obtain \$13,500 in total to get through May and June. Thus, if the firm does not have any marketable securities to convert to cash, it will have to arrange for some type of financing to cover this period. Furthermore, the budget indicates a \$125,200 cash surplus at the end of October. Madison's managers will have to consider how these funds can be best utilized. Perhaps the money should be paid out to owners as dividends or bonuses, or be used for fixed asset acquisitions, or be temporarily invested in marketable securities for later use within the business. This decision will be made on the basis of Madison's overall financial plan.

This brief illustration shows the mechanics and managerial value of the cash budget. However, before concluding this discussion of the cash budget, several additional points need to be made. First, if cash inflows and outflows are not uniform during the month, a monthly cash budget can seriously understate a business's peak financing requirements. The data in Table 14.5 show the situation expected on the last day of each month, but on any given day during the month it can be quite different. If all payments had to be made on the fifth of each month, but collections came in uniformly throughout the month, Madison would need to borrow cash to cover within-month shortages. For example, August's \$123,500 of cash payments may occur before the full amount of the \$174,600 in collections has been made. In this situation, some amount of cash would have to be obtained to cover shortfalls in August, even though the end-of-month cash flow after all collections have been made is positive. In this case, Madison would have to prepare a weekly or daily cash budget to indicate such borrowing needs.

Also, because the cash budget represents a forecast, all the values in the table are "expected" values. If actual patient volume, collection times, supplies purchases, wage rates, and so on differ from forecasted levels, the projected cash deficits and surpluses will be incorrect. Thus, there is a reasonable chance that Madison may end up needing to obtain a larger amount of funds than is indicated on Line 18. Because of the uncertainty of the forecasts, spreadsheet programs are particularly well suited for constructing and analyzing cash budgets. For example, Madison's managers can change any assumption—say, projected monthly volume or the time third-party payers take to pay—and the cash budget would automatically and instantly be recalculated. This assumption would show Madison's managers exactly how the firm's cash position would change under alternative operating assumptions. Typically, such an analysis is used to determine how large a credit line to establish to cover



temporary cash shortages.<sup>11</sup> In Madison's case, such an analysis indicated that a \$20,000 line is sufficient.

## Self-Test Questions

1. Considering all the information in projected financial statements, why do organizations need a cash budget?
2. Does the cash budget require an extensive knowledge of accounting principles?
3. In your view, what is the most important line of the cash budget?

## Key Concepts

This chapter described in broad outline how firms forecast their financial statements, estimate their future financing requirements, and plan their cash needs. Here are its key concepts:

- The primary planning documents are *strategic plans*, *operating plans*, and *financial plans*.
- *Financial forecasting* generally begins with a forecast of the firm's revenues, in terms of both volume and reimbursement rates, for some future time period.
- *Pro forma*, or *projected*, *financial statements* are developed to estimate the firm's future financial condition and external financing requirements.
- The *constant growth method* of forecasting financial statements is based on the assumptions (1) that most income statement items and balance sheet accounts vary directly with revenues and (2) that the business's current levels of income statement items and balance sheet accounts are optimal for its current level of revenues.
- A business can determine the amount of the *external financing requirement* by estimating the amount of assets necessary to support the forecasted level of revenues and then subtracting from that amount the forecasted total claims. The business can then plan to raise the necessary funds through bank borrowing, by issuing securities, or both.
- Additional external capital means additional interest and/or dividends, which lowers the amount of forecasted retained earnings. Thus, raising external funds creates a *financing feedback* effect that must be incorporated in the forecasting process.
- Five factors have the greatest impact on the external financing requirement. (1) The higher a firm's *revenue growth rate*, the greater will be its need for external financing. (2) The greater the *capital intensity*, the greater the need for external capital. (3) The higher the *profit margin*, the lower the need. (4) The larger a for-profit business's

*dividend payout*, the greater its need for external funds. (5) Finally, the greater a not-for-profit firm's ability to attract *contribution capital*, the smaller its need for external capital.

- The constant growth method typically is inadequate to deal with real-world situations such as *nonoptimal relationships*, *economies of scale*, *excess capacity*, or *lumpy assets*.
- *Linear regression*, *curvilinear regression*, *multiple regression*, and *specific item forecasting techniques* can be used to forecast asset requirements when the constant growth method is not appropriate.
- Even the smallest businesses now use *computerized financial planning models* to forecast both their financial statements and their external financing needs.
- *Financial controls* should be an integral part of a firm's planning system.
- A *cash budget* is a forecast that shows projected cash inflows and outflows over some period. It is used to forecast cash shortages and surpluses and hence is the primary tool for cash management purposes.

The type of forecasting described in this chapter is important for several reasons. First, if the projected operating results are unsatisfactory, management can “go back to the drawing board,” reformulate its plans, and develop more reasonable targets for the coming year. Second, it is possible that the funds required to meet the forecast simply cannot be obtained; if so, it is obviously better to know this in advance and to scale back the projected level of operations than suddenly to run out of cash and have operations grind to a halt. Third, even if the required funds can be raised, it is desirable to plan for their acquisition well in advance.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in financial forecasting.

In addition, the chapter has three problems in spreadsheet format that focus on financial forecasting issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

- For information on the Institute of Business Forecasting (IBF), see [www.ibforecast.com](http://www.ibforecast.com).
- For a great deal of valuable information on forecasting, see [forecastingprinciples.com](http://forecastingprinciples.com).

## Selected Cases

There are two cases in *Cases in Healthcare Finance* that are applicable to this chapter:

- Case 8: Snowmass Village Clinic, which examines the preparation and use of a cash budget.
- Case 29: Creekside Community Hospital (B), which focuses on the creation of pro forma financial statements in a hospital setting. Note that this case is best used as a follow-on to Case 1.

## Notes

1. Many businesses today have one or two other statements that complement the mission statement. A *vision statement* generally focuses on what the business aspires to be, rather than on what it is today. A *values statement* lists the core priorities that define the organization's culture.
2. In a log-linear regression, the operating revenue amounts are converted to natural logarithms and regressed against time. The slope coefficient of the regression line, which is  $0.0669 = 6.69\%$  in this case, is the *continuous* growth rate over the five-year period. The continuous growth rate is converted to a *compound annual* growth rate as follows:

$$e^{0.0669} - 1 \approx 6.9\%.$$

3. This assumption does not imply that Bayside's 2006 occupancy rate was 100 percent. A hospital is operating at "full" capacity when its average occupancy is somewhere around 80 to 90 percent. A few times during the year, a hospital may operate at 100 percent capacity, but most hospital managers prefer to maintain a reserve capacity to meet emergency situations.
4. We generated the forecast with a spreadsheet model, so some of the amounts shown on the financial statements may be slightly different from those obtained by a calculator.
5. Some assets, such as short-term investments, clearly are not tied directly to operations and hence would not vary directly with revenues. In fact, Bayside can reduce its short-term investments to zero, thereby reducing any external funding requirements. However, the naïve methodology applied here assumes that most balance sheet accounts would automatically increase with revenues.
6. The maximum growth rate that a business can sustain without requiring external financing is called the *sustainable growth rate*. In Bayside's case, the sustainable growth rate is 8.6 percent. We estimated this rate using a spreadsheet forecasting model by finding the revenue growth rate that results in zero external financing.

Although there are formulas that can be used to estimate the sustainable growth rate, it is easier (and potentially more accurate) to use the financial forecasting model for this purpose.

7. Most managers believe that dividend cuts have a severe negative impact on stock price, and this belief is generally supported by empirical testing.
8. Often, a plot of the data will suggest a nonlinear relationship. The data—  
inventories in this case—can then be converted to logarithms if it appears that the regression points slope down, or raised to a power if the slope of the points seems to be increasing. The graphics capabilities of spreadsheets can be used to identify nonlinear relationships.
9. We will discuss the payments pattern approach to receivables management in Chapter 15.
10. This is a good time to mention the basic axiom of computer modeling: GIGO, which means “garbage in, garbage out.” Stated another way, the output of a financial model is no better than the assumptions and other inputs used to construct it. So when you build models, proceed with caution. Note, though, that one advantage of computer modeling is that it does bring the key assumptions out into the open, where their realism can be examined. One strong advocate of models made this statement: “Critics of our models generally attack our assumptions, but they forget that in their own forecasts, they simply assume the answer.”
11. A *credit line* is an agreement between a borrower and a financial institution that obligates the institution to furnish credit over some time period, typically a year, up to the agreed-on amount. The borrower may use some, all, or none of the credit line. Usually, credit lines require borrowers to pay an up-front fee for the credit guarantee called a *commitment fee*.

## Other Topics

Up to this point in the text, the chapters have primarily focused on long-term, or strategic, management decisions. In Part VII, we move to more immediate, short-term decision making.

Chapter 15 focuses on managing short-term assets and liabilities, a very important activity at all health services organizations. Chapter 16 discusses the valuation of entire businesses, as opposed to individual projects, and how business valuation is used in mergers and acquisitions. Chapter 17 focuses on reimbursement topics, including capitation and risk sharing. Finally, Chapter 18 discusses how health services organizations can manage the risks inherent in financial transactions.

Note that Chapter 19, which focuses on how for-profit businesses return capital to owners, is not included in the book. Rather, it can be accessed on this book's companion website at [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).



## WORKING CAPITAL MANAGEMENT

### Learning Objectives

After studying this chapter, readers should be able to:

- Discuss in general terms how businesses manage cash and marketable securities.
- Discuss the key elements of receivables and supply chain management.
- Explain the role of accruals in a business's financing mix.
- Measure the cost-of-trade credit and determine when costly trade credit is preferable to other short-term debt sources.

### Introduction

In the discussion of healthcare financial management leading up to this chapter, the general focus has been on long-term strategic decisions. Another important element of healthcare finance involves the management of short-term (current) assets, which is commonly called *working capital management*. The term “working capital” originated in the early years in the United States when Yankee peddlers were the main source of goods for many farmers in remote areas of the Northeast. These merchants would load up their wagons with goods and then set off on a regular route to peddle their wares. Following the economic definitions of capital (assets) versus labor, the peddler's horse and wagon constituted the business's fixed capital, while the merchandise was called “working capital” because it was what was sold, or turned over, to produce a profit.

How important is working capital management? The average hospital has almost 10 percent of its assets in cash and short-term investments (marketable securities) plus almost 15 percent in accounts receivable. In addition, not-for-profit hospitals have another 20 percent of assets invested in *funded depreciation*, which is depreciation cash flow that is being accumulated on the balance sheet to purchase fixed assets when current plant needs to be replaced. Thus, hospitals, on average, have close to half of their assets invested in accounts that require management techniques discussed in this chapter. In addition to the management of short-term assets, this chapter also covers accruals and trade credit. Although these are sources of short-term financing



as opposed to assets, accruals and trade credit typically are considered to be part of working capital management.

In general, the goal of working capital management is to support the operations of the business at the lowest possible cost. However, the implementation of working capital management principles is very dependent on the size and nature of the healthcare business. For example, working capital management within a large hospital differs significantly from that within a small home health agency. Thus, this chapter focuses on basic concepts only—the implementation details for different healthcare businesses must be learned in a more specialized setting.

## Cash Management<sup>1</sup>

All businesses need *cash*, which includes both actual cash and funds held in commercial checking accounts, to pay for labor, materials, and supplies; to buy fixed assets; to pay taxes; to service debt; and so on. However, cash earns no return and hence is classified as a *nonearning asset*.<sup>2</sup> In spite of the fact that cash itself earns no return, every dollar on the asset side of the balance sheet, including dollars of cash, must be financed; that is, there must be a corresponding dollar on the liabilities and equity side of the balance sheet. Because each dollar of financing has either a direct or an indirect (opportunity) cost, the goal of cash management is to minimize the amount of cash the business must hold to conduct its normal activities, but at the same time, have sufficient cash on hand to support operations.

### Cash Management Techniques

A key element in a business's cash management process is the cash budget, which is discussed in Chapter 14. In essence, the cash budget tells managers how effective they are in applying the cash management techniques discussed in the following sections.

### Cash Flow Synchronization

If an individual received income once a year, he or she would probably put it in the bank, draw down the account during the year as cash is needed, and have an average balance over the year equal to about half the annual income. If the individual received income monthly instead of once a year, he or she would operate similarly, but the average balance would be much smaller. If the individual could arrange to receive income daily and to pay for rent, food, and other charges on a daily basis, and further was quite confident of the forecasted inflows and outflows, he or she could, at least in theory, hold a zero cash balance.

Exactly the same situation applies to businesses. By improving cash flow forecasts and by taking steps to match cash receipts with required cash out-

flows, businesses can reduce their cash balances to a minimum. Recognizing this point, some firms bill customers on a regular billing cycle throughout the month that matches their own outflows. This improves the *synchronization of cash flows*, which in turn enables a business to reduce its cash balances, decrease its bank loans, lower interest expenses, and boost profits.

### Managing Float

A well-run business has more money in its checking account than the balance shown on its checkbook. *Net float*, or just *float*, is defined as the difference between the balance shown on the bank's records and the balance on the business's checkbook. Alternatively, float can be calculated as the sum of the business's two component floats: disbursement and collections.

To illustrate net float and its components, assume that Gainesville Clinic writes, on average, checks in the amount of \$5,000 each day. Furthermore, it takes six days for these checks to be mailed, delivered, deposited, and cleared, and for the amounts to be deducted from the clinic's bank account. This will cause the clinic's own checkbook to show a balance that is  $6 \times \$5,000 = \$30,000$  less than the balance on the bank's records. Because the clinic's actual balance at the bank is \$30,000 greater than the amount shown on its checkbook, the clinic has a positive \$30,000 *disbursement float*.

Now assume that the clinic receives checks in the amount of \$5,000 daily, but it loses four days while they are being deposited and cleared. This difference will result in  $4 \times \$5,000 = \$20,000$  of *collections float*. Because of the delay in depositing and clearing checks, the clinic's balance at the bank is \$20,000 less than that on its checkbook, which represents a negative collections float of \$20,000.

The clinic's net float, which is the sum of the positive \$30,000 disbursement float and negative \$20,000 collections float, is \$10,000. On average, the clinic's balance at the bank is \$10,000 larger than the balance on its checkbook.

If a business's own collection and clearing process is more efficient than that of the recipients of its checks, the business will have a positive float. Some businesses are so good at managing float that they carry a negative checkbook balance but have a positive balance at the bank. For example, one medical equipment manufacturer stated that its bank's records show an average cash balance of about \$200,000, while its own *book* balance is *minus* \$200,000—it has \$400,000 of net float.

A firm's net float is a function of its ability to speed up collections on checks received and to slow down collections on checks written. Efficient businesses go to great lengths to speed up the processing of incoming checks, thus putting the funds to work faster, and they try to stretch their own payments out as long as possible (without engaging in unethical or illegal practices).

Note, however, that recent changes in check-clearing procedures have made it more difficult for businesses to create substantial floats. In 2004, a new law—Check Clearing for the 21st Century—gave banks greater flexibility in using electronic check clearing, which reduces disbursement float. Still, well-run businesses recognize the value inherent in float and, as we explain in the following sections, continue to do whatever is possible to maximize it.

### **Acceleration of Receipts**

Managers have searched for ways to collect receivables faster since the day that credit transactions began. Although cash collection is the responsibility of a firm's managers, the speed with which checks are cleared is dependent on the banking system. Several techniques are now used both to speed collections and to get funds where they are needed, but the three most popular are lockbox services, concentration banking, and electronic claims processing. Here are some points to note about lockbox services and concentration banking. The discussion of electronic claims processing occurs later in this chapter.

*Lockboxes* are one of the oldest cash management tools, and virtually all banks that offer cash management services also offer lockbox services. In a lockbox system, incoming checks are sent to post office boxes rather than to corporate headquarters. For example, Health SouthWest, a regional HMO headquartered in Oklahoma City, has its Texas members send their payments to a box in Dallas, its New Mexico members send their checks to Albuquerque, and so on, rather than have all checks sent to Oklahoma City. Several times a day, a local bank collects the contents of each lockbox and deposits the checks into the firm's local account. The bank then provides the HMO with daily records of the receipts collected, usually by electronic data transmission, in a format that permits online updating of the firm's receivables accounts.

A lockbox system reduces the time required for a business to receive incoming checks, to deposit them, and to get them cleared through the banking system so that the funds are available for use more quickly. This time reduction occurs because mail time and check collection time are both reduced if the lockbox is located in the geographic area where the customer (check writer) is located. Lockbox services can often increase the availability of funds by one to four days over the regular system for businesses with customers over a large geographical area.

Lockbox systems, although efficient in speeding up collections, result in the business's cash being spread around among many banks. The primary purpose of *concentration banking* is to mobilize funds from decentralized receiving locations, whether they are lockboxes or decentralized firm locations, into one or more central cash pools. In a typical concentration system, the firm's collection banks record deposits received each day. Based on disbursement needs, the funds are then transferred from these collection points to a concentration bank. Concentration accounts allow businesses to take maximum advantage of economies of scale in cash management and investment. Health SouthWest uses an Oklahoma City bank as its concentration bank. The

HMO cash manager then uses this pool for short-term investing or reallocation among its other banks.

One of the keys to concentration banking is the ability to quickly transfer funds from collecting banks to concentration banks, and electronic systems make such transfers easy. *Automated clearinghouses* are communications networks that provide a means of sending data from one financial institution to another. Instead of using paper checks, computer files are created, and all entries for a particular bank are placed on a single file that is sent to that bank. Some banks send and receive their data on tapes, while others have direct computer links to the clearinghouse. In addition to automated clearinghouses, the *Federal Reserve wire system* can be used for cash concentration or for other cash transfers. This system is used to move large sums that occur on a sporadic basis, such as would occur if Health SouthWest borrowed \$10 million in the commercial paper market.

Accelerated collections represent one side of using float, and controlling funds outflows is the flip side of the coin. Efficient cash management can only result if both inflows and outflows are effectively managed.

### Disbursement Control

No single action controls disbursements more effectively than *payables centralization*. This permits the firm's managers to evaluate the payments coming due for the entire business and to meet these needs in an organized and controlled manner. Centralized disbursement also permits more efficient monitoring of payables and float balances. However, centralized disbursement does have a downside—centralized offices may have difficulty in making all payments promptly, which can create ill will with suppliers and potentially lose prompt-payment discounts.

*Zero-balance accounts (ZBAs)* are special disbursement accounts that have a zero-dollar balance on which checks are written. Typically, a firm establishes several ZBAs in the concentration bank and funds them from a *master account*. As checks are presented to a ZBA for payment, funds are automatically transferred from the master account. If the master account goes negative, it is replenished by borrowing from the bank against a line of credit or by selling some securities from the firm's marketable securities portfolio. Zero-balance accounts simplify the control of disbursements and cash balances and hence reduce the amount of idle (i.e., non-interest-bearing) cash.

Whereas ZBAs are typically established at concentration banks, *controlled disbursement accounts* can be set up at any bank. In fact, controlled disbursement accounts were initially used only in relatively remote banks, so this technique was originally called *remote disbursement*. The basic technique is simple: controlled disbursement accounts are not funded until the day's checks are presented against the account. The key to controlled disbursement is the ability of the bank that has the account to report the total amount of checks received for clearance each day by 11 a.m., Eastern Standard Time. This early notification gives a firm's managers sufficient time to wire funds to the

controlled disbursement account to cover the checks presented for payment and to invest excess cash at midday, when money market trading is at a peak.

### **Matching the Costs and Benefits of Cash Management**

Although a number of techniques have been discussed to reduce cash balance requirements, implementing these procedures is not a costless operation. How far should a business go in making its cash operations more efficient? As a general rule, a business should incur these expenses only so long as the marginal returns exceed the marginal costs.

The value of careful cash management depends on the opportunity costs of funds invested in cash, which in turn depends on the current rate of interest. For example, in the early 1980s, with interest rates at relatively high levels, businesses were devoting a great deal of care to cash management. Today, with interest rates much lower, but rising, the value of cash management is reduced. Clearly, larger businesses, with larger cash balances, can better afford to hire the personnel necessary to maintain tight control over their cash positions. Cash management is one element of business operations in which economies of scale are present. Banks also have placed considerable emphasis on developing and marketing cash management services. Because of scale economies in cash management operations, smaller businesses generally find bank-supplied services to be less costly than operating in-house cash management systems.

### **Self-Test Questions**

1. What is float?
2. How do businesses use float to increase cash management efficiency?
3. What are some methods that businesses can use to accelerate receipts?
4. What are some methods that businesses can use to control disbursements?
5. How should cash management actions be evaluated?

### **Marketable Securities Management**

Many businesses hold portfolios of temporary financial investments historically called *marketable securities*. On the balance sheet, such securities often are labeled *short-term investments*. Typically, such investments are held as a substitute for cash balances. Thus, although discussed in separate sections, cash and marketable securities management cannot be separated in practice because management of one implies management of the other. In addition to marketable securities, which are held to meet short-term needs, many providers also hold portfolios of securities that will be used for long-term as opposed to short-term purposes. These portfolios will be discussed in the next major section.

### **Rationale for Holding Marketable Securities**

Most businesses hold marketable securities in lieu of larger cash balances. Then, some of the securities are liquidated periodically as needed to increase the cash account (when outflows exceed inflows). In addition, most businesses also rely on bank credit lines to meet unforeseen needs, but they may still hold marketable securities to guard against a possible shortage of bank credit. Of course, the motivation to hold marketable securities instead of cash is the ability to convert a nonearning asset into an earning asset. Even if the yield on marketable securities is low, it is clearly more than the yield on cash.

In addition to holding marketable securities as a substitute for cash, they are also used to accumulate funds to meet large payments that are anticipated to occur in the near term. Thus, funds might be accumulated in marketable securities to pay for an expected liability settlement or to make a tax payment that is coming due. The key here is that marketable securities are carried to either account for uncertainty in cash flows or fund a known short-term need.

### **Criteria for Selecting Marketable Securities**

In general, the key characteristics sought in marketable securities investments are safety and liquidity. Thus, most healthcare managers are willing to give up some return to ensure that funds are available, in the amounts expected, when needed.

Large businesses, with large amounts of surplus cash, often directly own Treasury bills, commercial paper, negotiable certificates of deposit, and even Euromarket securities (i.e., dollar denominated loans held outside the United States). Such securities, which are highly liquid and free of interest rate and default risk, are known as *cash equivalents*. In addition, large taxable firms often hold floating-rate preferred stock because of its 70 percent dividend exclusion from federal income taxes. Conversely, smaller businesses are more likely to invest with a bank or with a money market or preferred stock mutual fund because a small business's volume of investment simply does not warrant hiring specialists to manage the marketable securities portfolio. Small businesses often use a mutual fund and then literally write checks on the fund to bolster the cash account as the need arises.<sup>3</sup> Interest rates on mutual funds are somewhat lower than rates on direct investments of equivalent risk because of management fees. However, for smaller firms, net returns may well be higher on mutual funds because no in-house management expense is required.

To illustrate a typical investment mix of marketable securities, the average hospital marketable securities portfolio consists of roughly 10 percent domestic stocks and bonds and about 90 percent cash equivalents. Clearly, hospital managers are willing to sacrifice return for safety when securities are chosen for **short-term** purposes.

## Self-Test Questions

1. Why do businesses hold marketable securities?
2. What are some securities that are commonly held as marketable securities?
3. Why are these the securities of choice?

## Long-Term Securities Management

Not-for-profit providers, and hospitals in particular, often have large portfolios of long-term security holdings, which is something that is not common in for-profit businesses. These holdings are listed on the balance sheet as *long-term investments*. The reasons that not-for-profit hospitals typically carry large amounts of long-term securities are as follows:

- Not-for-profit hospitals often set aside funds for future fixed asset replacement rather than acquire the funds at time of replacement. Because the funds for this purpose generally stem from depreciation-generated cash flow, as opposed to net income, they are called *funded depreciation*.
- Many hospitals self-insure at least part of their professional liability exposure and hence establish an investment pool to meet actuarial needs.
- Many hospitals have defined benefit pension plans, which require a firm-sponsored pension fund.
- Not-for-profit hospitals receive endowment gifts that must be managed over time. If not administered by a separately incorporated foundation, such endowment funds will appear on the hospital's balance sheet.

The selection of securities for long-term investment obviously is quite different from those selected for marketable securities. With time now on their side, managers are more willing to take risks to gain a return edge. For example, the typical hospital's funded depreciation account (portfolio) consists of roughly 30 percent domestic stocks, 45 percent domestic bonds, 20 percent cash equivalents, and 5 percent international stocks and bonds. Furthermore, the typical endowment fund consists of roughly 50 percent domestic stock, 30 percent domestic bonds, 10 percent cash equivalents, 5 percent international investments, and 5 percent alternative investments. *Alternative investments* include nontraditional investments such as hedge funds, commodities, real estate, venture capital, and private equity.

It is clear that hospital managers, especially those at big hospital systems with large amounts of money to invest for the **long term**, are willing to create riskier portfolios in the search for higher returns. The most recent trend in long-term investment portfolio management at not-for-profit hospitals has been the willingness to include more and more alternative investments. The



trend may continue, but it brings significant risk, especially to smaller systems and stand-alone hospitals. Because such investments are less liquid than traditional investments, they make most sense for large, financially stable systems that can afford to invest for long periods of time.

1. Why do businesses, mostly not-for-profit hospitals, hold long-term investment portfolios?
2. Why do the securities held differ from those held in marketable securities portfolios?

## Self-Test Questions

## Receivables Management

Generally, businesses would rather sell for cash than on credit, but competitive pressures force most firms to offer credit. The problem is most acute in the health services industry where the third-party-payment system forces providers to extend credit to most patients. In a credit sale, goods are shipped or services are provided, revenues are booked, and an account receivable is created. Eventually, the customer or third-party payer will pay the account, at which time the business will receive cash and its receivables will decline.

### *The Accumulation of Receivables*

The total amount of accounts receivable outstanding at any given time is determined by two factors: (1) the volume of credit sales and (2) the average length of time between sales and collections. For example, suppose Home Infusion, Inc., a home health care business, begins operations on January 1, and on the first day starts to provide services to patients billed at \$1,000 each day. For simplicity, assume that all patients have the same insurance, that it takes Home Infusion two days to submit patients' bills, and that it takes the insurer another 18 days to make the payments. Thus, it takes 20 days from delivery of service to receipt of payment.

At the end of the first day, Home Infusion's accounts receivable will be \$1,000; they will rise to \$2,000 by the end of the second day, and by January 20, they will have risen to \$20,000. On January 21, another \$1,000 will be added to receivables, but, assuming that the insurer pays the full amount for services provided 20 days earlier, payments for services provided on January 1 will reduce receivables by \$1,000, so total accounts receivable will remain constant at \$20,000. If either the volume of credit sales or the collection period changes, the amount in accounts receivable will change.

What is the cost implication of carrying \$20,000 in receivables? The \$20,000 on the left side of the balance sheet must be financed by a like amount on the right side. Home Infusion uses a bank loan to finance its receivables, which has an interest rate of 8 percent. Thus, over a year, the firm must pay



the bank  $0.08 \times \$20,000 = \$1,600$  in interest to carry its receivables balance. The cost associated with carrying other current assets can be thought of in a similar way.<sup>4</sup>

### Monitoring the Receivables Position

If a sale is made for cash, the profit is definitely earned, but if the sale is on credit, the profit is not actually earned until the account is collected. If the account is never collected, the profit is never earned. Thus, healthcare managers must closely monitor receivables to ensure that they are being collected in a timely manner and to uncover any deterioration in the “quality” of receivables. Early detection can help managers take corrective action before the situation has a significant negative impact on the organization’s financial condition.

#### Average Collection Period

Suppose Adolph Weiss & Sons, a manufacturer of surgical instruments, manufactures and sells 200,000 instruments a year at an average sales price of \$198 each. Furthermore, assume that all sales are on credit, with terms of 2/10, net 30, which means that customers must pay within 30 days, but they receive a 2 percent discount if they pay within ten days. Finally, assume that 70 percent of the firm’s customers take discounts and pay on Day 10, while the other 30 percent pay on Day 30.

Weiss’s *average collection period (ACP)*, generally called *days in patient accounts receivable* in provider organizations, is 16 days:

$$\text{ACP} = (0.7 \times 10 \text{ days}) + (0.3 \times 30 \text{ days}) = 16 \text{ days.}$$

The ACP is a measure of the **average** length of time it takes Weiss’s customers to pay off their credit purchases, and the ACP is often compared to the industry-average ACP. For example, if all surgical instrument manufacturers sell on the same credit terms, and if the industry-average ACP is 25 days versus Weiss’s 16-day ACP, then Weiss either has a higher percentage of discount customers or else its credit department is exceptionally good at ensuring prompt payment.

The ACP can also be compared with the firm’s own credit terms. For example, suppose Weiss’s ACP had been running at a level of 35 days versus its 2/10, net 30 credit terms. With a 35-day ACP, some customers would obviously be taking more than 30 days to pay their bills. In fact, if some customers were paying within ten days to take advantage of the discount, the others would, on average, have to be taking much longer than 35 days. One way to check this possibility is to use an aging schedule, which we describe in the next section.

If you know both the accounts receivable balance and average daily credit sales, the ACP can be calculated in an alternative way. To illustrate, Weiss’s *average daily sales (ADS)*, assuming a 360-day year, is \$110,000:

$$\begin{aligned} \text{ADS} &= \frac{\text{Annual sales}}{360} = \frac{\text{Units sold} \times \text{Sales price}}{360} = \frac{200,000 \times \$198}{360} \\ &= \frac{\$39,600,000}{360} = \$110,000. \end{aligned}$$

If the firm had made cash as well as credit sales, the analysis would focus on credit sales only, and the calculated amount would have been average daily *credit* sales.

Weiss has an accounts receivable balance of \$1,760,000, so its ACP calculated in the alternative way is also 16 days:

$$\text{ACP} = \frac{\text{Receivables}}{\text{ADS}} = \frac{\$1,760,000}{\$110,000} = 16 \text{ days.}$$

An *aging schedule* breaks down a firm's receivables by age of account. Table 15.1 contains the December 31, 2006, aging schedules of two surgical instrument manufacturers—Weiss and Cutright. Both firms offer the same credit terms, 2/10, net 30, and both show the same total receivables balance. However, Weiss's aging schedule indicates that all of its customers pay on time: 70 percent pay on Day 10, while 30 percent pay on Day 30. Cutright's schedule, which is more typical, shows that many of its customers are not abiding by its credit terms: 27 percent of its receivables are more than 30 days past due, even though Cutright's credit terms call for full payment by Day 30.

Aging schedules cannot be constructed from the type of summary data that are reported in a business's financial statements; they must be developed from the accounts receivable ledger. However, well-run businesses have computerized accounts receivable records. Thus, it is easy to determine the age of each invoice, sort electronically by age categories, and thus generate an aging schedule.

### Aging Schedules

Age of Account (Days)	Weiss		Cutright	
	Value of Account	Percentage of Total Value	Value of Account	Percentage of Total Value
0–10	\$1,232,000	70%	\$ 825,000	47%
11–30	528,000	30	460,000	26
31–45	0	0	265,000	15
46–60	0	0	179,000	10
Over 60	0	0	31,000	2
Total	<u>\$1,760,000</u>	<u>100%</u>	<u>\$1,760,000</u>	<u>100%</u>

**TABLE 15.1**  
Aging Schedules  
for Two Firms

### Unique Problems Faced by Healthcare Providers

Although the general principles of receivables management discussed up to this point are applicable to all businesses, healthcare providers face some unique problems. The most obvious problem is the complexities in billing created by the third-party-payer system. For example, rather than having to deal with a single billing system that applies to all customers, providers have to deal with the rules and regulations of many different governmental and private insurers using different payment methodologies. Thus, providers have to maintain large staffs of specialists that operate under the firm's *patient accounts manager*.

To illustrate the problem, consider Table 15.2, which contains the receivables mix for the hospital industry. There are multiple payers within many of the categories listed in the table, so the actual number of different payers can easily run into the hundreds or thousands.

Table 15.3 provides information on how long it takes hospitals to collect receivables. Because of the large number of payers, and the complexities involved with billing and follow-up actions, which lead to high error rates, hospitals clearly have a great deal of difficulty in collecting bills in a timely manner. On average, collecting a receivable takes about 60 days. However, this number has decreased in recent years as hospital managers have become increasingly aware of the costs associated with carrying receivables and as automated systems have made the collections process more efficient. In spite of the positive trend, about 25 percent of receivables still were over 90 days old. In addition, about 5 percent of patient bills were never paid at all, with about 3 percent being charged off as bad debt losses and 2 percent going to charity care.

To help providers collect in a timely fashion from managed care plans, many states have enacted laws that mandate “prompt” payment. For example, New York State requires that all undisputed claims by providers be paid by plans within 45 days of receipt. If prompt payment is not made, fines are assessed.

**TABLE 15.2**

Hospital  
Industry's  
Receivables Mix

<i>Payer</i>	<i>Percentage of Total Accounts Receivable</i>
Medicare	27.2%
Managed care	23.0
Commercial insurers	15.3
Self-pay	13.8
Medicaid	13.3
Other	7.4
	<u>100.0%</u>

Source: Aspen Publishers, *Hospital Accounts Receivable Analysis (HARA)*, updated quarterly.

TABLE 15.3

Hospital  
Industry's  
Collection  
Performance**Aggregate Aging Schedule**

Age of Account (Days)	Percentage of Total Accounts Receivable
0–30	42.5%
31–60	21.4
61–90	11.2
91–120	7.8
Over 120	17.1
	<u>100.0%</u>

**Days in Patient Accounts Receivable**

Percentile Values	Average Collection Period (Days)
10th	43.9 days
25th	52.7
Median	62.8
75th	73.6
90th	87.9

Sources: Aspen Publishers, *Hospital Accounts Receivable Analysis (HARA)*, updated quarterly.  
Ingenix, *Comprehensive Performance Report*, published annually.

**The Revenue Cycle**

One of the current “hot” topics in healthcare finance, especially among hospitals, is the *revenue cycle*. The concept is not new, but it is gaining increased emphasis as it becomes harder and harder to maintain profitability in today’s healthcare environment. Generically, the revenue cycle is defined as the set of recurring business activities and related information processing associated with providing and collecting for goods or services provided to customers. More pragmatically, the revenue cycle at provider organizations should ensure that patients are **properly** categorized regarding payment obligation, that **correct** billing takes place, and that the **correct** payment is received, all in a timely fashion.

For analysis at individual businesses, revenue cycle activities typically are broken down into three parts: (1) those that occur before the service is provided, (2) those that are simultaneous with the service, and (3) those that occur afterward. Here are some examples of revenue cycle activities:

*Before-Service Activities*

- **Preinsurance verification.** Here, the payer status of the patient is identified immediately after the appointment (stay) is scheduled.
- **Precertification of managed care patients.** If the verification indicates that the payer requires precertification, it should be done immediately.
- **Preservice patient financial counseling.** The patient should be counseled before the service regarding both the payer’s and patient’s responsibilities regarding payment for services.

### *Service Activities*

- **Time of service verification.** The patient's insurance status should be checked at time of service to ensure that there have been no changes. The verification should be done both with the patient and with the payer.
- **Claims production.** The services provided should be documented in a way that facilitates correct claims submission. The documentation process should ensure that (1) the services provided are coded in accordance with the payer's claim system and (2) the code reflects the highest legitimate reimbursement amount.

### *After-Service Activities*

- **Claims submission.** The claim should be submitted to the payer as quickly as possible after the service is rendered. However, speed should not take precedence over accuracy because incomplete and inaccurate billing accounts for a large proportion of late payments.
- **Third-party follow-up.** If payment is not received within 30 days, a follow-up should be sent.
- **Denials management.** Claim denials by third-party payers are one of the major impediments to prompt reimbursement. Typically, most claim denials are caused by improper precertification and incomplete or erroneous claims data. Prompt claims resubmission is essential to good revenue-cycle management.
- **Payment receipt and posting.** This activity ends the revenue cycle, but not revenue cycle management.
- **Monitoring and reporting.** Once the revenue cycle activities are identified and timing goals are set for each activity, the patient accounts manager then should implement a system of key performance indicators to ensure that these goals are being met.

The revenue cycle requires constant attention because the external factors that influence the cycle are constantly changing. Also, problems that occur at any point in the cycle tend to have “ripple” effects; that is, a problem that occurs early in the cycle can create additional problems at later points in the cycle. For example, failure to obtain required precertification can lead to a denial and, at best, payment delay or, at worst, no payment at all.

### **Electronic Claims Processing**

One development of note in provider billing and collections is the move to *electronic claims processing*. In this system, claims and reimbursement information is electronically transmitted in a standard format that can be processed without human intervention. Although the *electronic data interchange (EDI)* of payer information has been in use for many years, its implementation has tended to be fragmented and payer unique. However, one portion of the Health Insurance Portability and Accountability Act (HIPAA) of 1996 requires that all providers and insurers adhere to specific electronic data trans-

action standards This initiative has provided the impetus to fully automate the exchange of all billing and collections data between providers and payers, which helps ensure the shortest possible revenue cycle.

1. Explain how a business's receivables balance is built up over time and why there are costs associated with carrying receivables.
2. Briefly, discuss three means by which a firm can monitor its receivables position.
3. What are some of the unique problems faced by healthcare providers in managing receivables?
4. What is the revenue cycle and how does electronic data interchange (EDI) fit in?

## Self-Test Questions

### Credit Policy

The success or failure of a business depends primarily on the demand for its products or services—as a rule, the higher its sales, the larger its profits and the better its financial condition. Sales, in turn, depend on a number of factors, some of which are exogenous but others are under the control of the firm. The major controllable variables that affect demand are sales prices, product or service quality, marketing, and the firm's *credit policy*. Credit policy, in turn, consists of four variables:

1. The *credit period*, which is the length of time buyers (payers) are given to pay for their purchases
2. The *credit standards*, which refer to the minimum financial strength of acceptable credit customers and the amount of credit available to different customers
3. The firm's *collection policy*, which is measured by its toughness or laxity in following up on slow-paying accounts
4. Any *discounts* given either for bulk purchases, such as contracts with managed care plans, or for early payment, including the discount amount and period

In general, healthcare businesses have only limited control over credit policy because much of it is more or less dictated to them. For example, providers are prohibited from setting credit standards because they must treat all patients who need care (at least sufficiently to stabilize the condition). In addition, credit period is more dependent on the payment system and payer policies than it is on policies established by the provider. Still, healthcare businesses do have discretion regarding some aspects of credit policy. Collection policy is probably the most important credit policy variable for healthcare providers.

At large health services organizations, credit policy usually is administered by a person with the title of patient accounts manager. However, the credit policy itself normally is established by the organization's executive committee, which usually consists of the business's president and vice presidents in charge of finance, marketing, and operations.

*Collection policy* refers to the procedures that a business follows to collect past-due accounts. For example, a letter may be sent to a patient (or third-party payer) when a bill is ten days past due; a more severe letter, followed by a telephone call, may be used if payment is not received within 30 days; and the account may be turned over to a collection agency after 90 days. One of the keys to an effective collection policy is to collect as quickly as possible. To illustrate the concept, consider Table 15.4, which lists the probability of collecting a self-pay account as time passes by. After two years, the probability of collecting is only about 12 percent, which confirms that timeliness is one of the most important factors in collections.

The collection process can be expensive in terms of both out-of-pocket expenditures and lost goodwill, but at least some firmness is needed to prevent an undue lengthening of the collection period and to minimize outright losses. As in similar situations, a balance must be struck between the costs and benefits of different collection policies.

The key to a good collection program is to first identify which patients can be collected from immediately, and how much can be collected. Then, the patients must be segregated into categories on the basis of probability of payment—say, (1) most likely to pay full amount, (2) likely to pay partial amount, and (3) unlikely to pay. This classification allows the patient accounts manager to best use the provider's collection resources. Most effort should be directed toward the “most likely to pay” patients, while the least effort should be applied to the “unlikely to pay” patients. A rational approach to collection policy should result in the greatest amount of collections for the lowest cost.

Many providers are now accepting credit card payments from patients to collect copays and deductibles, and even full charges from self-pay patients. Although credit card payments are somewhat reduced by fees paid to spon-

**TABLE 15.4**  
Relationship  
Between Age of  
Receivable and  
Collectibility

<i>Probability of Collecting</i>	<i>Age of Receivable</i>
96%	Less than 30 days
92	1 month
85	2 months
72	3 months
56	6 months
42	9 months
25	12 months
12	24 months

Source: Aspen Publishers, *Hospital Accounts Receivable Analysis (HARA)*, updated quarterly.

soring banks, credit card payments represent almost instant cash in hand. Additionally, money collected at the time services are provided reduces the need for later billing and collections, which is a very costly process.

The key factor in determining whether or not a receivable will be collected is *credit quality*, which is defined in terms of the probability of default. The probability estimate for a given patient is, for the most part, a subjective judgment, but credit evaluation is a well-established practice and a good patient accounts manager can make reasonably accurate judgments regarding the probability of default by different classes of patients.

Although most credit decisions are subjective, many businesses use *credit-scoring systems* based on *multiple discriminant analysis (MDA)* to assess credit quality. MDA is similar to multiple regression analysis. The dependent variable is, in essence, the probability of default, and the independent variables are factors associated with financial strength and the ability to pay off the debt if credit is granted. For example, if a firm such as Walgreen Drug Stores evaluated consumers' credit quality, then the independent variables in the credit-scoring system might be the following: (1) Does the credit applicant own his or her own home? (2) How long has the applicant worked at his or her current job? (3) What is the applicant's outstanding debt in relation to his or her annual income? (4) Does the potential customer have a history of paying his or her debts on time?

The major advantage of a credit-scoring system is that a customer's credit quality is expressed in a single numerical value, rather than as a subjective assessment of various factors. This automated procedure is a tremendous advantage for large firms, which must evaluate many customers in many different locations using many different credit analysts, because without it, the firm would have a hard time applying equal standards to all credit applicants. To illustrate credit scoring, suppose Hanover Pharmaceuticals has historical information on 500 of its customers, all of whom are retail drug stores. Of these 500, assume that 400 have always paid on time, but the other 100 either paid late or, in some cases, went bankrupt and did not pay at all. Furthermore, the firm has historical data on each customer's quick ratio, times-interest-earned ratio, debt ratio, years in existence, and so on. MDA relates the experienced record, or historical probability, of late payment or nonpayment with various measures of a firm's financial condition, and MDA assigns weights for the critical factors. In effect, MDA produces an equation that looks much like a regression equation, and when data on a customer are plugged into the equation, then a credit score for that customer is produced.

In closing, note that in recent years, healthcare providers, especially hospitals, have been highly criticized for the way they handle self-payers. The first problem revolves around charges. To illustrate, consider the case of Jane Adams, age 22 and uninsured, who recently spent two days in Front Street Hospital having an appendectomy. Her hospital bill was \$14,000, while doctor's fees added another \$5,000. It turns out that if a local HMO had



insured Jane, the hospital bill would have been about \$2,500. Medicaid would have paid about \$5,000, and Medicare would have paid about \$7,800 for the same procedure.

Unfortunately, Jane stumbled onto a troubling fact of hospital billing: most hospitals set standard “charges” for their services but then agree to discount or even ignore those rates for third-party payers. As a result, almost no one but the uninsured ever pays these rates. In some ways, hospital charges are like hotel “rack rates,” which are posted prices that everybody knows nobody pays. But the hospital industry is different because uninsured patients historically have been billed the equivalent of rack rates.

The second problem revolves around collection tactics. Although hospitals typically collect only a small percentage of billings to uninsured patients, many hospitals have been very aggressive in their collection tactics. If and when uninsured patients cannot pay, according to critics, hospitals often intimidate and harass them until they either pay or declare personal bankruptcy.

Recognizing the problem, the American Hospital Association recently issued guidelines for billing and collecting from uninsured patients that have been adopted by more than 4,000 hospitals. In essence, these guidelines require hospitals to (1) treat all patients with respect and compassion, (2) serve the emergency healthcare needs of everyone regardless of ability to pay, (3) assist patients who cannot pay for part or all of their care, and (4) balance the need to provide financial assistance for some patients with overall fiscal responsibilities. In addition to agreeing to these guidelines, many hospitals have adopted policies that create hospital bills for the uninsured that more closely match the amounts paid by third-party payers. In fact, many hospitals now charge uninsured patients according to a sliding scale that varies with the patients’ income expressed as a percentage of the poverty level.

## Self-Test Questions

1. What are the four credit policy variables?
2. Which one is most important to healthcare providers? Explain your answer.
3. What is a credit-scoring system?
4. How have hospitals reacted to criticism about their billing and collection practices for the insured?

## Supply Chain Management

Inventories are an essential part of virtually all business operations. As is the case with accounts receivable, inventory levels depend heavily on patient volume and hence revenues. However, whereas receivables build up after services have been provided, inventories must be acquired beforehand. This is a critical difference, and the necessity of forecasting volume before establishing target inventory levels makes inventory management a difficult task. Also,

because errors in inventory levels can lead either to catastrophic consequences for patients or to excessive carrying costs, inventory management in health services organizations is as important as it is difficult.

The overall management of inventory, including purchasing, transportation, storage, and use or disposal, is called *supply chain management* or *materials management*. Proper supply chain management requires close coordination among the marketing, purchasing, patient services, and finance departments. The patient services departments are generally the first to spot changes in volume. These changes must be worked into the business's purchasing and operating schedules, and the financial manager must arrange any financing that will be needed to support the inventory buildup. Improper communication among departments, poor volume forecasts, or both can lead to disaster.

The key to cost-effective supply chain management is information technology. Without information systems that support supply chain management, the control system will become bogged down with slow-moving hardcopy data. To illustrate, most healthcare businesses now employ *computerized inventory control systems*. The computer starts with an inventory count in memory. As withdrawals are made, they are recorded in the computer and the inventory balance is revised. When the order point is reached, the computer automatically places an order, and when the order is received, the recorded balance is increased.

A good supply chain management system must be dynamic. A large provider may stock thousands of different items of inventory. The usage of these items can rise or fall quite separately from rising or falling aggregate utilization of services. As the usage rate for an individual item begins to rise or fall, the supply chain manager must adjust its balance to avoid running short or ending up with obsolete items. If the change in the usage rate appears to be permanent, then the *base inventory* level should be recomputed, the *safety stock* should be reconsidered, and the computer model used in the control process should be reprogrammed.

A relatively new approach to inventory control called *just-in-time (JIT)* is gaining popularity in all industries, including health services. To illustrate the use of just-in-time systems among providers, consider the following example. One large hospital used to maintain a 25,000 square foot warehouse to hold its medical supplies. However, as cost pressures mounted, the hospital closed its warehouse and sold the inventory to a major hospital supplier. Now, the supplier is a full-time partner of the hospital in the ordering and delivering of supplies of both the supplier itself and of some 400 other firms.

The supply chain streamlining process began with daily deliveries to the hospital's loading dock but soon expanded to a JIT system called *stockless inventory*. Now, the supplier fills orders in exact, sometimes small, quantities and delivers them directly to the hospital's departments, including the operating rooms and nursing floors. The hospital's managers estimate that the

stockless system has saved about \$1.5 million a year since it was instituted, including \$350,000 from staff reductions and \$650,000 from inventory reductions. Additionally, the hospital has converted space that was previously used as storerooms to patient care and other cash-generating uses. The suppliers that offer stockless inventory systems typically add 3 to 5 percent service fees, but many hospitals still can realize savings on total inventory costs.

The stockless inventory concept has its own set of problems. The major concern is that a *stock-out*, which occurs when an inventory item is not in stock, will cause a serious problem. “We walk very carefully and slowly because we can’t afford a glitch,” said a spokesperson for the supplier. “The first morning that an operating room doesn’t open, we’ve got a problem.” Some hospital managers are concerned that such systems create too much dependence on a single supplier, and eventually the cost savings will disappear as prices are increased.

As stockless inventory systems become more prevalent in hospitals, more and more hospitals are relying on outside contractors who assume both inventory management and supplier roles. In effect, hospitals are beginning to outsource supply chain management. For example, some hospitals are experimenting with an inventory management program known as *point-of-service distribution*, which is one generation ahead of stockless systems. Under point-of-service programs, the supplier delivers supplies, intravenous solutions, medical forms, and so on to the supply rooms. The supplier owns the products in the supply rooms until used by the hospital, at which time the hospital pays for the items.

In addition to reducing inventories, outside supply chain managers often are better at ferreting out waste than are their in-house counterparts. For example, an inventory management firm recently found that one hospital was spending \$600 for products used in a single open-heart surgery, while another was spending only \$420. Because there was no meaningful difference in the procedure or outcomes, the higher-cost hospital was able to change the type of medical supplies used in the surgery and to pocket the difference.

In an even more advanced form of inventory management, some hospitals are just beginning to negotiate with suppliers to furnish materials on the basis of how much medical care is delivered, rather than the type and number of products used. In such agreements, providers pay suppliers a set fee for each unit of patient service provided—for example, \$125 for each case-mix-adjusted patient day. Under this type of system, a hospital ties its supplies expenditures to its revenues, which, at least for now, are for the most part tied to the number of units of patient service. The end of the evolution of inventory management techniques for healthcare providers is expected to be some form of capitated payment, whereby providers will pay suppliers a previously agreed-on fee regardless of actual future patient volume and hence regardless of the amount of materials actually consumed.

## Self-Test Questions

1. Why is good supply chain management important to a business's success?
2. Describe some recent trends in supply chain management by healthcare providers.

## The Economic Ordering Quantity Model

Inventories are obviously necessary, but it is equally obvious that a business's profitability will suffer if it has too much or too little inventory. How can we determine the optimal inventory level? In general, inventory levels are set on the basis of experience, which, after all, is the best teacher. However, managers can gain a feel for those factors that affect inventory levels by examining the *economic ordering quantity (EOQ) model*. The EOQ model examines the costs associated with inventory, and then identifies the level that minimizes these costs. Inventory costs typically are broken down into three categories: (1) carrying costs, (2) ordering costs, and (3) stockout costs. *Stockout costs*, which are the costs associated with running out of an item of inventory, tend to be difficult to measure and hence will not be included in our discussion of the EOQ model.

### Carrying Costs

*Carrying costs* generally rise in direct proportion to the average amount of inventory carried. Inventories carried, in turn, depend on the frequency with which orders are placed. To illustrate the concept, consider the following example. If a hospital uses  $S$  units per year, and if it places equal-sized orders  $N$  times per year, then  $S / N$  units will be purchased with each order. If the inventory is used evenly over the year, and if no safety stocks are carried, then the average inventory,  $A$ , will be:

$$A = \frac{\text{Units per order}}{2} = \frac{S/N}{2}.$$

For example, if  $S = 120,000$  units per year, and  $N = 4$ , then the hospital will order 30,000 units at a time and its average inventory will be 15,000 units.

$$A = \frac{S/N}{2} = \frac{120,000/4}{2} = \frac{30,000}{2} = 15,000 \text{ units.}$$

Just after a shipment arrives, the inventory will be 30,000 units; just before the next shipment arrives, it will be zero; and on average, 15,000 units will be carried.

Now, assume the hospital purchases its inventory at a price  $P = \$2$  per unit. The average inventory value is, thus,  $P \times A = \$2 \times 15,000 = \$30,000$ . If the hospital uses short-term debt with a cost of 10 percent to finance its

inventory, it will incur \$3,000 in interest expense to carry the inventory for one year. Furthermore, assume that each year the hospital incurs \$2,000 of storage costs (space, utilities, security, taxes, and so forth), that its inventory insurance costs are \$500, and that it must mark down inventories by \$1,000 because of depreciation and obsolescence. Then, the hospital's total costs of carrying the \$30,000 average inventory is  $\$3,000 + \$2,000 + \$500 + \$1,000 = \$6,500$ , so the annual percentage cost of carrying the inventory is  $\$6,500 / \$30,000 = 0.217 = 21.7\%$ .

Defining the annual percentage carrying cost as  $C$ , we can, in general, find the annual total carrying cost (TCC) as the percentage carrying cost,  $C$ , times the price per unit,  $P$ , times the average number of units,  $A$ :

$$\text{TCC} = \text{Total carrying cost} = C \times P \times A.$$

In our example,

$$\text{TCC} = 0.217 \times \$2 \times 15,000 = \$6,500.$$

### Ordering Costs

Although we assume that carrying costs are entirely variable and rise in direct proportion to the average size of inventories, we assume that all *ordering costs* are fixed. For example, the costs of placing and receiving an order—interoffice memos, long-distance telephone calls, costs to the supplier of setting up a production run (if necessary), and taking delivery—are essentially fixed, regardless of the size of an order, so this part of inventory costs is simply the fixed cost of placing and receiving orders times the number of orders placed per year.<sup>5</sup> If the fixed costs associated with ordering inventories are designated  $F$ , and if we place  $N$  orders per year, the total ordering cost is given by this equation:

$$\text{Total ordering cost} = \text{TOC} = F \times N.$$

Substituting  $N = S / 2A$  into the equation produces this result:

$$\text{TOC} = F \times \left( \frac{S}{2A} \right).$$

To illustrate the use of the total ordering cost equation, assume that  $F = \$100$ ,  $S = 120,000$  units, and  $A = 15,000$  units. With these data, the total annual ordering cost is \$400:

$$\text{TOC} = \$100 \times \left( \frac{120,000}{30,000} \right) = \$100 \times 4 = \$400.$$

### Total Inventory Costs

The expressions for total carrying cost and total ordering cost can be combined to find total inventory costs (TIC) as follows:

$$\begin{aligned} \text{TIC} &= \text{TCC} + \text{TOC} \\ &= [C \times P \times A] + \left[ F \times \left( \frac{S}{2A} \right) \right]. \end{aligned}$$

Recognizing that the average inventory carried is  $A = Q / 2$ , or one-half the size of each order quantity,  $Q$ , we can rewrite the TIC equation as follows:

$$\text{TIC} = \left[ C \times P \times \left( \frac{Q}{2} \right) \right] + \left[ F \times \left( \frac{S}{Q} \right) \right].$$

Here, we see that TCC equals average inventory in units,  $Q / 2$ , multiplied by unit price,  $P$ , times the percentage annual carrying cost,  $C$ . TOC equals the number of orders placed per year,  $S / Q$ , multiplied by the fixed cost of placing and receiving an order,  $F$ .

### The EOQ Model



Figure 15.1 illustrates the basic premise on which the EOQ model is built—namely, that some costs rise with larger inventories while other costs decline, and there is an optimal order size (and associated average inventory) that minimizes the total costs associated with inventories. In essence, carrying costs rise with larger orders because larger order size leads to larger average inventories. On the other hand, ordering costs decline with larger orders because larger orders lead to fewer orders being placed.

The sum of the carrying and ordering cost curves in Figure 15.1 represents total inventory costs. The point where TIC is minimized defines the EOQ, which, in turn, determines the optimal average inventory level. The EOQ is found by differentiating the TIC equation with respect to ordering quantity,  $Q$ , and then setting the derivative equal to zero. The end result is this equation, called the *EOQ model*:

$$\text{EOQ} = \sqrt{\frac{2 \times F \times S}{C \times P}}.$$

Here,

EOQ = economic ordering quantity, or the optimum quantity to be ordered each time an order is placed.

F = fixed costs of placing and receiving an order.

S = annual usage in units.

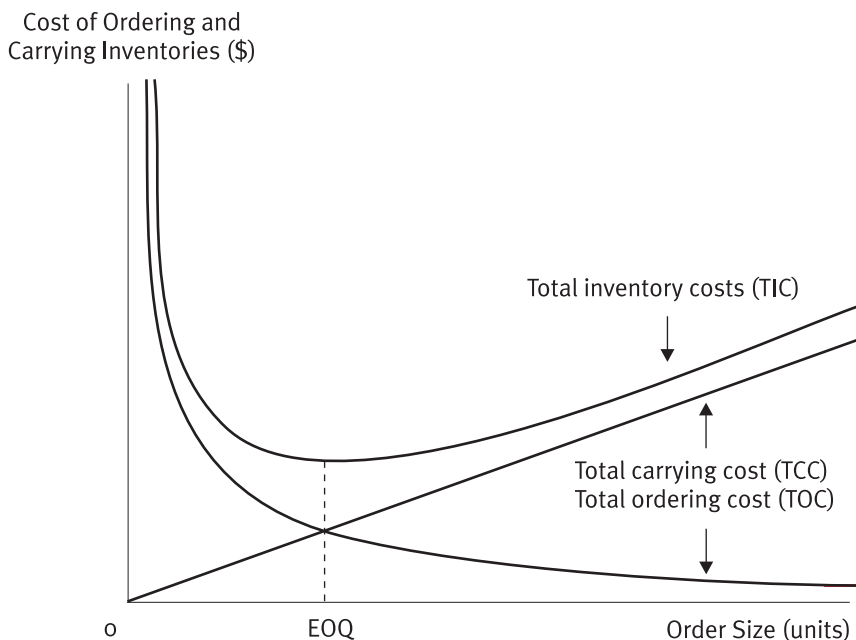
C = annual carrying costs expressed as percentage of average inventory value.

P = purchase price the firm must pay per unit of inventory.

To illustrate the EOQ model, consider the following data supplied by Bayside Memorial Hospital. One of the items used by several of Bayside's laboratories is a biological hazard bag used to dispose of biological wastes. For this item:

**FIGURE 15.1**

The EOQ  
Concept



F = fixed cost per order = \$100.

S = annual usage = 11,250 bags per year.

C = percentage carrying cost = 25 percent of inventory value.

P = purchase price per bag = \$1.00 per bag.

Substituting these data into the model results in an EOQ of 3,000 bags:

$$\text{EOQ} = \sqrt{\frac{2 \times F \times S}{C \times P}} = \sqrt{\frac{2 \times \$100 \times 11,250}{0.25 \times \$1.00}} = \sqrt{9,000,000} = 3,000.$$

With an EOQ of 3,000 bags and annual usage of 11,250 bags, Bay-side will place  $11,250 / 3,000 = 3.75$  orders per year. Notice that average inventory holdings depend directly on the EOQ. Immediately after an order is received, 3,000 bags are in stock. Because the weekly usage rate is 216 bags ( $11,250 / 52$  weeks), inventories are drawn down by this amount each week. Thus, the actual number of units held in inventory will vary from 3,000 bags just after an order is received to zero just before a new order arrives. With a 3,000 beginning balance, a zero ending balance, and an assumed uniform usage rate, inventories will average one-half the EOQ, or 1,500 bags, during the year. At a cost of \$1.00 per bag, the average investment in inventories will be  $1,500 \times \$1.00 = \$1,500$ . If inventories are financed by bank loans, the

loan balance will vary from a high of \$3,000 to a low of \$0, but the average amount outstanding over the course of a year will be \$1,500.

Notice that the EOQ, and hence average inventory holdings, rises with the square root of usage. Therefore, a given increase in volume, and hence usage, will result in a less-than-proportional increase in inventories, so the revenues/sales ratio will tend to decline as a business grows. For example, Bayside's EOQ is 3,000 bags at an annual usage of 11,250, and the average inventory is 1,500 bags, or \$1,500. However, if usage of biological hazard bags were to increase by 100 percent to 22,500 bags per year, the EOQ would rise only to 4,243 units, or by about 41 percent, and the average inventory would rise by this same percentage. This suggests that there are economies of scale in holding inventories.<sup>6</sup>

Finally, what is Bayside's TIC for the year, assuming that the EOQ is ordered each time. Using the equation developed earlier, TIC is calculated to be \$750:

$$\begin{aligned} \text{TIC} &= \left[ C \times P \times \left( \frac{Q}{2} \right) \right] + \left[ F \times \left( \frac{S}{Q} \right) \right] \\ &= \left[ 0.25 \times \$1.00 \times \left( \frac{3,000}{2} \right) \right] + \left[ \$100 \times \left( \frac{11,250}{3,000} \right) \right] \\ &= \$375 + \$375 = \$750. \end{aligned}$$

Note two points. First, the \$750 total inventory cost represents the total of carrying costs and ordering costs, but this amount does not include the  $11,250 \times \$1.00 = \$11,250$  annual purchasing price of the inventory itself. Second, as we see both in Figure 15.1 and in the numbers just preceding, at the EOQ, TCC equals TOC. This property is not unique to the Bayside illustration; it always holds.

The EOQ model can be used to examine such issues as reorder points, safety stocks, and the impact of quantity discounts on inventory decisions. However, as stated at the beginning, the model is more useful for understanding inventory decisions than for making them. Thus, we will leave further discussion to other books.

1. What are some of the costs associated with inventories?
2. Briefly, describe the economic ordering quantity (EOQ) model and its implications for inventory management.

## Self-Test Questions

## Accruals

At this point in the chapter, we have concluded our discussion of current asset management. Now, we turn our attention to two current liability accounts: (1) accruals and (2) accounts payable. Although these accounts are liabilities,



and hence a source of financing to businesses, they are considered to be part of working capital management. Thus, accounts payable and accruals management are discussed in this chapter rather than in Chapter 5 (Debt Financing).

Businesses generally pay employees on a weekly, biweekly, or monthly basis, even though wages actually are earned on a daily basis. Similarly, the business's estimated income taxes (if applicable), Social Security and income taxes withheld from employee payrolls, and sales taxes collected are generally paid on a weekly, monthly, or quarterly basis, even though the obligations are created on a daily basis. The wages and taxes that a business owes because of these timing differentials are listed on the balance sheet as *accruals*.

Accruals increase automatically, or *spontaneously*, as a business's operations expand. Furthermore, this type of short-term debt is free in the sense that no explicit interest is paid on accruals. For these two reasons, accruals are an important source of short-term financing for businesses, especially those that are growing rapidly. However, a business cannot ordinarily control the amount of accruals on its balance sheet because the timing of wage payments is set by economic forces and industry custom, and tax payment dates are established by law. Because accruals represent "free" financing, businesses should use all the accrual financing they can obtain, but managers have little control over the levels of such accounts.

## Self-Test Questions

1. What is meant by the term "spontaneous financing"?
2. What are accruals, and what should a business's policy be regarding the use of accrual financing?

## Accounts Payable (Trade Credit)

Healthcare businesses often make purchases from other firms on credit. Such debt is recorded on the balance sheet as an *accounts payable*. Accounts payable, or *trade credit*, is the largest single category of short-term debt for many businesses. Because small businesses typically do not qualify for financing from other sources, they rely especially heavily on trade credit.

### The Cost of Trade Credit



Like accruals, trade credit is a spontaneous source of financing in the sense that it arises from ordinary business transactions. For example, suppose that a hospital purchases an average of \$2,000 a day of medical supplies on terms of net 30, which means that the hospital must pay for goods 30 days after the invoice date. On average, the hospital will owe 30 times \$2,000, or \$60,000, to its suppliers, assuming that the hospital's managers act rationally and do not pay before the credit is due. If the hospital's volume, and consequently its purchases, were to double, its accounts payable would also double to

\$120,000. Simply by growing, the hospital would have spontaneously generated an additional \$60,000 of financing. Similarly, if the terms under which it bought supplies were extended from 30 to 40 days, the hospital's accounts payable would increase from \$60,000 to \$80,000. Thus, both expanding volume and a lengthening credit period generate additional financing for a business.

Firms that sell on credit have a *credit policy* that includes certain *terms of credit*. For example, Midwestern Medical Supply Company sells on terms of 2/10, net 30, which means that a 2 percent discount is given if payment is made within ten days of the invoice date, with the full invoice amount being due and payable within 30 days if the discount is not taken. Suppose that Chicago Health System, Inc., buys an average of \$12 million of medical and surgical supplies from Midwestern each year, less a 2 percent discount, for net purchases of  $\$11,760,000 / 360 = \$32,666.67$  per day. For the sake of simplicity, suppose that Midwestern is Chicago Health System's only supplier. If Chicago Health System takes the discount, paying at the end of the tenth day, its payables will average  $10 \times \$32,666.67 = \$326,667$ , so Chicago Health System will, on average, be receiving \$326,667 of credit from its only supplier, Midwestern Medical Supply Company.

Suppose now that the health system's managers decide not to take the discount. What effect will this decision have on the system's financial condition? First, Chicago Health System will begin paying invoices in 30 days, so its accounts payable will increase to  $30 \times \$32,666.67 = \$980,000$ . Midwestern will now be supplying Chicago Health System with  $\$980,000 - \$326,667 = \$653,333$  of **additional** trade credit. The health system can use this additional credit to pay off bank loans, to expand inventories, to increase fixed assets, to build up its cash account, or even to increase its own accounts receivable.

Note that we used \$32,666.67 for average daily sales, which is based on the discounted price of the surgical supplies, regardless of **whether or not** Chicago Health System takes the discount. In general, businesses treat the discounted price of supplies as the "true" cost when reporting expenses on the income statement. If the business does not take the discount, the cost difference is reported separately on the income statement as an expense called "discounts lost." Thus, we used the discounted price to reflect the cost of the supplies in both instances.

Chicago Health System's additional credit from Midwestern has a cost—it is forgoing a 2 percent discount on its \$12 million of purchases, so its costs will rise by \$240,000 per year. Dividing this \$240,000 dollar cost by the amount of additional credit provides the implicit approximate percentage cost of the added trade credit:

$$\text{Approximate percentage cost} = \frac{\$240,000}{\$653,333} = 36.7\%.$$

Assuming that Chicago Health System can borrow from its bank or from other sources at an interest rate less than 36.7 percent, it should not expand its payables by forgoing discounts.

The following equation can be used to calculate the approximate percentage cost, on an annual basis, of not taking discounts:

$$\text{Approximate \% cost} = \frac{\text{Discount percent}}{100 - \text{Discount percent}} \times \frac{360}{\text{Days credit received} - \text{Discount period}}$$

The numerator of the first term, Discount percent, is the cost per dollar of credit, while the denominator in this term,  $100 - \text{Discount percent}$ , represents the funds made available by not taking the discount. Thus, the first term is the periodic cost rate of the trade credit. In this example, Chicago Health System must spend \$2 to gain \$98 of credit, for a cost rate of  $2 / 98 = 0.0204 = 2.04\%$ . The second term shows how many times each year this cost is incurred; in this example,  $360 / (30 - 10) = 360 / 20 = 18$  times. Putting the two terms together, the approximate cost of not taking the discount when the terms are 2/10, net 30, is computed as follows:

$$\begin{aligned} \text{Approximate \% cost} &= \frac{2}{98} \times \frac{360}{20} = 0.0204 \times 18 \\ &= 0.367 = 36.7\%. \end{aligned}$$

The cost of trade credit can be reduced by paying late—that is, by paying beyond the date that the credit terms allow. Such a strategy is called *stretching*. If Chicago Health System can get away with paying Midwestern in 60 days rather than in the specified 30, the effective credit period would become  $60 - 10 = 50$  days, and the approximate cost would drop from 36.7 percent to  $(2 / 98) \times (360 / 50) = 14.7\%$ . In recessionary periods, businesses may be able to get away with late payments to suppliers, but they will also suffer a variety of problems associated with stretching accounts payable and being branded a slow payer.

On the basis of the preceding discussion, it is clear that trade credit consists of two distinct components:

1. *Free trade credit* involves credit received during the discount period.
2. *Costly trade credit* involves credit in excess of the free credit, and whose cost is an implicit one based on the forgone discount.

From a finance perspective, managers should view trade credit in this way. First, the actual price of supplies is the discounted price—that is, the price that would be paid on a cash purchase. Any credit that can be taken without an increase in price is free credit that should be taken. Second, if the discounted price is the actual price, then the added amount that must be paid

if the discount is not taken is, in reality, a *finance charge* for granting additional credit. A business should take the additional credit only if the finance charge is less than the cost of alternative credit sources.

In the example, Chicago Health System should take the \$326,667 of free credit offered by Midwestern Medical Supply Company. Free credit is good credit. However, the cost rate of the additional \$653,333 of costly trade credit is approximately 37 percent. The health system has access to bank loans at a 9.5 percent rate, so it does not take the additional credit. Under the terms of trade found in most industries, the costly component will involve a relatively high percentage cost, so stronger firms will avoid using it.

1. What is trade credit?
2. What is the difference between free and costly trade credit?
3. How should businesses make the decision as to how much trade credit to use?

## Self-Test Questions

### Key Concepts

This chapter examined working capital management, including accruals and trade credit. Here are its key concepts:

- The essence of working capital management is to support the business's operations at the lowest possible cost.
- The *primary goal of cash management* is to reduce the amount of cash held to the minimum necessary to conduct business.
- *Cash management techniques* generally fall into four categories: (1) *synchronizing cash flows*, (2) *using float*, (3) *accelerating collections*, and (4) *controlling disbursements*.
- *Lockboxes* are used to accelerate collections. A *concentration banking system* consolidates the collections into a centralized pool that can be managed more efficiently than a large number of individual accounts.
- Three techniques for controlling disbursements are (1) *payables centralization*, (2) *zero-balance accounts*, and (3) *controlled disbursement accounts*.
- The implementation of a sophisticated cash management system is costly, and all cash management actions must be evaluated to ensure that the benefits exceed the costs.
- Firms can reduce their cash balances by holding *marketable securities*, which serve both as a *substitute for cash* and as a *temporary investment* for funds that will be needed in the near future. Safety is the primary consideration when selecting marketable securities.
- When a firm sells goods to a customer on credit, an *account receivable* is created.

- Businesses can use *aging schedules* and the *average collection period (ACP)* measure to help keep track of their receivables position and to help avoid the buildup of possible bad debts.
- The four credit policy variables are (1) *credit period*, (2) *credit standards*, (3) *collection policy*, and (4) *discounts*.
- Because of unique circumstances, the credit policy variable most controllable by healthcare providers is collection policy.
- Proper *supply chain (inventory) management* requires close coordination among the marketing, purchasing, patient services, and finance departments as well as a sophisticated information technology system. Because the cost of holding inventory can be high and the consequences of stockouts severe, supply chain management is very important to health services organizations.
- *Just-in-time (JIT)* systems are used to minimize inventory costs and, simultaneously, to improve operations.
- *Inventory costs* can be divided into two types for purposes of the *economic ordering quantity (EOQ) model* (1) carrying costs and (2) ordering costs. In general, *carrying costs* increase as the level of inventory rises, but ordering costs decline with larger inventory holdings.
- The EOQ is a formula for determining the order quantity that will minimize total inventory costs. It provides many insights into inventory management, but its real-world use is limited.
- *Accruals* are a source of short-term financing that result from the buildup of wages and taxes due. Because they are a costless source of financing, businesses should take all the accruals that they can get.
- *Accounts payable*, or *trade credit*, is a source of short-term financing that stems from buying supplies on credit.
- Businesses should take all of the *free trade credit* available but should take *costly trade credit* only if the implied cost is less than that on other sources of short-term credit.

Our discussion of working capital management has been brief. However, the concepts covered enable readers to at least have some appreciation for the issues involved. For additional information, see any of the large number of references given next.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in working capital management.

In addition, the chapter has seven problems in spreadsheet format that focus on working capital management issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

- To learn more about the cash management services offered by large banks, see [www.wachovia.com](http://www.wachovia.com). Then, click on Corporate & Institutional and, finally, Cash Management and Deposit Services.
- For more information on the revenue cycle, see the Healthcare Financial Management Association website at [www.hfma.org](http://www.hfma.org). Then, click on Resource Center and, finally, Revenue Cycle.
- To learn more about supply chain management, see <http://filebox.vt.edu/c/chbrow12>.

## Selected Cases

There are two cases in *Cases in Healthcare Finance* that are applicable to this chapter:

- Case 27: Beltline Pharmaceuticals, which focuses on the basic concepts of receivables management.
- Case 28: Red River Hospital, which covers inventory management, with emphasis on the EOQ model.

## Notes

1. This discussion of cash management is necessarily brief. For a much more detailed discussion of cash management within the health services industry, see Alan G. Seidner and William O. Cleverley, *Cash and Investment Management for the Health Care Industry* (Gaithersburg, MD: Aspen, 1990).
2. Banks are prohibited by law from paying interest on commercial checking accounts except for proprietorships that meet certain qualifications.
3. Money market mutual funds cannot be used as a replacement for commercial checking accounts because the number of checks that can be written against such funds normally is limited to just a few per month.
4. To be precise, the full amount of the receivables account does **not** require financing. The cash costs associated with providing the services that produce the \$20,000 in revenues do need to be financed, but the profit component does not. For example, assume that Home Infusion has cash costs of \$800 associated with each day's revenues of \$1,000. Then, 20 days of receivables would actually require only  $20 \times \$800 = \$16,000$  in financing. The remaining \$4,000 of receivables, which represent profits, would be offset on the balance sheet by increasing the retained earnings (equity) account by a like amount.
5. Note that in reality both carrying and ordering costs can have variable and fixed cost elements, at least over certain ranges of inventory. For example, security and utilities charges are probably fixed in the short run over a wide range of

inventory levels. Similarly, labor costs in receiving inventory can be tied to the quantity received and hence can be variable. To simplify matters, the EOQ model treats all carrying costs as variable and all ordering costs as fixed.

6. Note, however, that these scale economies relate to each particular item and not to the entire business. For example, a large distributor of hospital supplies might have a higher inventory/sales ratio than a much smaller distributor if the small firm has only a few high-sales-volume items while the large firm distributes a great many low-volume items.



# BUSINESS VALUATION, MERGERS, AND ACQUISITIONS

## Learning Objectives

After studying this chapter, readers should be able to:

- Discuss the history of merger activity in the United States.
- Describe the most popular motives for mergers and make judgments regarding their validity.
- Value businesses using both the discounted cash flow and market multiple approaches.
- Discuss the unique problems that arise when small businesses are being valued and when not-for-profit businesses are acquired by investor-owned businesses.

## Introduction

Most of the growth in health services organizations occurs through internal expansion, which takes place when a business's existing operations grow through normal capital budgeting activities. However, the most dramatic examples of growth result from mergers and acquisitions. For some purposes, it is necessary to distinguish between mergers and acquisitions, but those distinctions are more legal in nature and do not affect the fundamental business and financial considerations involved. Thus, we generally will refer to all combinations in which a single business unit is formed from two or more existing units as a *merger*. We will begin our discussion of mergers with some general background information. Later, we will focus on mergers in the health services industry, including a discussion of the factors that must be considered when investor-owned and not-for-profit firms merge. In addition, we will discuss business valuation, which is a key element in any merger analysis.

## Level of Merger Activity

To better understand mergers, it is useful to review the level of merger activity in the United States, including activity in the health services industry.

## **Merger Waves**

Five major *merger waves* have occurred in the United States. The first was in the late 1800s, when consolidations took place within the oil, steel, tobacco, and other basic industries. The second occurred in the 1920s, when the buoyant stock market helped promoters consolidate businesses in a number of industries, including utilities, communications, and automobiles. The third was in the 1960s, when conglomerate mergers (mergers among unrelated firms) were the rage.

The fourth wave of mergers was the “merger mania” of the 1980s. This wave was fueled by many factors, including (1) the relatively depressed condition of the stock market at the beginning of the decade (in early 1982, the Dow Jones Industrial Index was below its 1968 level); (2) the unprecedented level of inflation that existed during the 1970s and early 1980s, which increased the replacement value of firms’ assets; (3) a political climate that fostered a more tolerant attitude toward mergers; (4) the general belief among major natural resource firms that it was cheaper to “buy reserves on Wall Street” than to explore and find them in the field; (5) the development of an active junk bond market, which helped acquirers obtain the capital needed to do the deals; and (6) the decline of the dollar, which made U.S. firms relatively cheap for foreign businesses to acquire, combined with huge U.S. trade deficits, which gave these businesses large pools of funds to invest in the United States.

The final merger wave began in 1992 and ended in 2000. In general, the 1980s mergers were financial transactions in which acquirers were seeking to buy firms that were selling at less than their true long-run values as a result of poor temporary economic trends or management. If a firm could be better managed, if redundant assets could be sold, or if administrative or operating costs could be cut, then cash flows and stock price would rise. In the 1990s merger wave, however, most mergers were strategic in nature—firms were merging to enable the consolidated enterprise to better position itself to compete in the future. Indeed, many of the 1990s mergers involved businesses in the banking, computer, health services, media, pharmaceutical, and telecommunications industries, all of which were undergoing structural changes and intense competition.

## **Merger Activity in the Health Services Industry**

Prior to the 1990s, mergers in the health services industry were neither as frequent nor as large as mergers in some other industries. First, the health services industry, at least in its current form, is relatively new—not having really developed until after World War II. Second, the motivations that fueled the wave of the 1980s only partially applied to health services, so the industry was not one of the major participants in that wave, although there were some spectacular mergers between for-profit hospital chains. However, the 1990s

wave of mergers in the health services industry has been very strong, with 1999 setting the record for the greatest number of deals. Table 16.1 provides some feel for the current level of merger activity in the hospital industry. Note that hospital deals peaked in 1996, which was somewhat earlier than the health services industry in total.

Several factors have been suggested to account for the decrease in merger activity in the health services industry since 1997. First, the Balanced Budget Act of 1997 (BBA), which placed significant restrictions on the growth of Medicare reimbursement rates, has lessened the values of many healthcare providers—primarily nursing home, rehabilitation, and home health care businesses. Second, the results of merger activity that occurred earlier in the decade are now in, and the verdict on many types of mergers is not good. Specifically, physician management firms have not delivered the cost savings and profits as promised. Additionally, the backlash against managed care has slowed the merger activity in that industry. Finally, many mergers designed to create large, integrated delivery systems have not lived up to their promise of managerial and operational efficiencies, and some of these mergers are now being undone. Although only time will tell if merger activity returns to previous levels as never-ending changes in the healthcare environment materialize, merger activity in the health services industry will always be a fact of life.

To illustrate healthcare mergers, here are two completed deals:

1. In late 2004, Anthem, Inc., of Indianapolis, Indiana, acquired WellPoint Health Networks, of Thousand Oaks, California, creating the nation's largest health insurer. Both companies were former not-for-profit Blue Cross/Blue Shield companies that had converted to for-profit businesses. Under the merger agreement, WellPoint stockholders received \$23.80 in cash and one share of Anthem common stock for each share held,

<i>Year</i>	<i>Number of Facilities Involved</i>	<i>Number of Deals</i>
1995	735	230
1996	768	235
1997	627	217
1998	687	198
1999	530	142
2000	318	129
2001	267	95
2002	163	60
2003	100	68
2004	164	81
2005	175	87

**TABLE 16.1**  
Merger Activity  
in the Hospital  
Industry:  
1995–2005

resulting in a total value for the transaction of \$16.5 billion. The combined company, which was renamed WellPoint, Inc., serves 34 million members in 14 states with its Blue Cross/Blue Shield–branded products. According to the company’s press release, “This merger provides the opportunity to offer more value to our members, employers, physicians, and hospitals.” Size is important to health insurers for two reasons. First, there are economies of scale in the industry. For example, the merger was expected to produce about \$200 million in annual cost savings (synergies). Second, the larger the product network geographically, the more appealing the health insurer becomes to large, nationwide employers, which can obtain coverage for a large proportion of their employees through a single company.

2. In 2005, Health Management Associates (HMA), Inc., of Naples, Florida, paid \$251 million to acquire three hospitals from the Bon Secours Health System: a 312-bed hospital in Venice, Florida; a 212-bed hospital in Port Charlotte, Florida; and a 133-bed hospital in Norton, Virginia. Interestingly, HMA is a for-profit company whereas Bon Secours is not for profit. As we explain in a later section, this type of acquisition is permitted by law because the value of the assets (the \$251 million paid to Bon Secours) will continue to be used for charitable purposes. For HMA, the acquisition helps the company establish a hospital network in Southwest Florida, one of the fastest growing areas in the country. With the acquisition, HMA operates 56 nonurban hospitals in 15 states with about 8,000 beds. For Bon Secours, headquartered in Marriottsville, Maryland, the sale provides geographic consolidation of hospital assets as well as funds for redeployment in the system.

### Self-Test Questions

1. What are the five major merger waves that have occurred in the United States?
2. What are the differences between the waves of the 1980s and the 1990s?
3. Are mergers in the health services industry rising or falling? Explain your answer.
4. Describe one recent merger in the healthcare sector.

### Motives for Mergers: The Good, the Bad, and the Ugly

In the previous section, we presented some factors that fueled merger waves in the past. In this section, we take a more detailed look at some of the motives behind business mergers, along with some views regarding the validity of these motives.

## Synergy

From an economic perspective, the best motivation for mergers is to increase the value of the combined enterprise. If Firms A and B merge to form Firm C, and if C's value exceeds that of A and B taken separately, then *synergy* is said to exist. When synergy drives a merger, value is created and hence society benefits. Furthermore, such a merger can be beneficial to both A's and B's stockholders if the firms are investor owned.

Synergistic effects can arise from four sources:

1. **Operating economies.** Operating economies result from economies of scale in management, marketing, contracting, operations, or distribution, including mergers that better position a business strategically.
2. **Financial economies.** Financial economies can result in lower transactions costs, better access to capital markets, and better coverage by security analysts.
3. **Differential efficiency.** When differential efficiency is involved, inefficient management is replaced by a better one, which results in the business's assets being used more productively.
4. **Increased market power.** Increased market power (reduced competition) can create synergistic effects by increasing the contracting clout of the enterprise.

Operating and financial economies are socially desirable for both investor-owned and not-for-profit businesses, as are mergers that increase managerial efficiency. To some extent, increased market power can also be beneficial to society, such as the contracting savings that result when major purchasers buy healthcare services. However, too much market power can result in monopoly or monopsony power, which can be harmful to society and hence is both undesirable and illegal.<sup>1</sup>

## Availability of Excess Cash

Mergers are an easy, perhaps too easy, way for managers to get rid of excess cash. If a business has a shortage of internal investment opportunities compared with its cash flow, it can (1) increase its dividend or repurchase stock if investor owned, (2) invest in marketable securities, or (3) purchase another business. Marketable securities often provide a good temporary parking place for money, but, generally, the rate of return on such securities is less than the return on real-asset investments.

Although there is nothing inherently wrong with using excess cash to buy other firms, the acquisition must create value to be economically worthwhile. Just making a firm larger may benefit managers, but it does not necessarily benefit stockholders or society at large. If the return on a potential



acquisition is not as high as the opportunity cost of the capital used, then the capital should be used for other purposes. If the business is investor owned, the capital should be returned to the firm's investors, while if the firm is not for profit, the capital should be used to retire debt or should be invested temporarily in securities until better uses can be found.

### **Purchase of Assets at Below Replacement Cost**

Sometimes a business will be touted as a possible acquisition candidate because the cost of replacing its assets is considerably higher than its market value. For example, suppose that a small, rural hospital can be acquired for \$5 million, while the cost to construct a similar hospital from the ground up is \$10 million. There might be a strong temptation to say that the hospital is a "good buy" because it can be bought for less than its replacement value.

However, the true economic value of any business should be based on its earning power, which sets the value of its assets. The real question, then, is not whether the hospital can be acquired for less than its replacement cost but whether it can be acquired for less than its *economic value*, which is a function of the cash flows that the hospital is expected to produce in the future. If the rural hospital's earning power gives it a value of \$7 million, then it is a good buy at \$5 million, but this conclusion is based on economic, not replacement, value. (Note that not-for-profit hospitals often have social [noneconomic] value that might increase their overall value, especially to acquiring not-for-profit organizations.)

### **Diversification**

Managers often claim that diversification into other lines of business is a reason for mergers. They contend that diversification helps to stabilize the business's earnings stream and thus benefits its owners. Stabilization of earnings is certainly beneficial to managers, employees, suppliers, customers, and other stakeholders, but its value is less certain from the standpoint of stockholders. If a stockholder is worried about the variability of a firm's earnings, he or she can diversify more easily than can the firm. Why should Firms A and B merge to stabilize earnings when a stockholder in Firm A can sell half of his or her stock in A and use the proceeds to purchase stock in Firm B? Stockholders can create diversification more easily than the firm can.

Also, if a stockholder is concerned about the relative performance of different industry segments, he or she can solve the problem more easily through portfolio diversification than can managers through mergers. For example, assume that a stockholder who holds primarily hospital stocks is concerned that the increased purchasing power of managed care plans will erode hospital profits, and hence value, over time. It is easier for the stockholder to purchase a managed care company's stock than it is for hospitals to diversify into managed care.

Of course, there are some situations where mergers for diversification do make sense from a stockholder's perspective. For example, if you were the owner/manager of a closely held business, it might be nearly impossible for you to sell part of your ownership interest to diversify because this would dilute your ownership and perhaps also generate a large capital gains tax liability. In this case, a diversification merger might well be the best way to achieve personal diversification. Also, as mentioned earlier, diversification mergers that better position businesses to deal with future events are worthwhile because such mergers can create operating synergies.

Even though diversification, without synergy, does not benefit shareholders directly, it clearly benefits a firm's other stakeholders. Thus, diversification-motivated mergers can be beneficial to not-for-profit businesses. Furthermore, stockholders can obtain indirect benefits from diversification because making the firm less risky to managers, creditors, suppliers, customers, and the like can have positive implications for the owners of the business.

### **Personal Incentives**

Economists like to think that business decisions are based solely on economic considerations. However, there can be no question that some business decisions are based more on managers' personal motivations than on economic analyses. Many people, business leaders included, like power, and more power is attached to running a larger business than a smaller one. Obviously, no executive would ever admit that his or her ego was the primary reason behind a merger, but knowledgeable observers are convinced that egos do play a prominent role in many mergers. It has also been observed that executive salaries, prestige, and perquisites are highly correlated with the firm's size—the bigger the firm, the higher the executive benefits. This factor may also play a role in the aggressive acquisition programs of some corporations.

Managers' personal incentives as a basis for mergers illustrate the *agency problem*, which arises because managers have motives other than what is best for the business. Of course, there is nothing wrong with executives feeling good about increasing the size of their firms, or with their getting a better compensation package as a result of growth through mergers, provided that the mergers make economic sense.

### **Breakup Value**

In general, firms are valued assuming they will continue to operate. However, if the value of a business is greater when it is broken into pieces and sold than when it remains intact, then the relevant value is its *breakup value*. There are takeover specialists that identify such businesses, buy them, sell off the pieces, and make a profit. Although this rationale is not common in health services acquisitions, mergers do occur occasionally because of breakup value.

## Self-Test Questions

1. Define synergy. Is synergy a valid rationale for mergers?
2. Describe several situations that might produce synergistic gains within the health services industry.
3. Suppose your firm can purchase another firm for only half of its replacement value. Would this be sufficient justification for the acquisition?
4. Discuss the merits of diversification as a rationale for mergers.
5. Can managers' personal incentives motivate mergers? Explain your answer.
6. How can breakup value motivate mergers?

## Types of Mergers

Economists have traditionally classified mergers into three primary categories:

1. **Horizontal.** A *horizontal merger* occurs when one firm combines with another in its line of business; for example, when one hospital acquires another or one home health care business merges with a second. The 2005 acquisition of Downriver Centers, Inc., in Allen Park, Michigan, by DaVita, Inc., illustrates a horizontal merger. DaVita, Inc., headquartered in El Segundo, California, operates about 1,300 outpatient dialysis centers in 41 states serving almost 100,000 patients. Downriver operated one dialysis center serving about 150 patients. The merger was a horizontal merger because both firms were in the outpatient dialysis industry.
2. **Vertical.** A *vertical merger* occurs when a firm merges with a supplier or when one type of provider acquires another. An example of a vertical merger is a drug manufacturer's acquisition of a pharmaceutical distribution firm, such as Eli Lilly's acquisition of PCS Health Systems. Another example is the acquisition of medical practices and home health care businesses by hospitals.
3. **Conglomerate.** A *conglomerate merger* occurs when unrelated enterprises combine. Because most health services organizations are in related business lines, mergers between such firms are rarely classified as conglomerate.

Operating economies, and anticompetitive effects, are, at least partially, dependent on the type of merger involved. Vertical and horizontal mergers generally provide the greatest synergistic operating benefits, but they are also the ones most likely to be attacked by federal or state authorities as anticompetitive. In any event, it is useful to think of these economic classifications when analyzing the feasibility of a prospective merger.

1. What are the three primary economic classifications of mergers?
2. Briefly, describe the characteristics of each classification.

## Self-Test Questions

### Hostile Versus Friendly Takeovers

In the vast majority of merger situations, a firm (the *acquirer*) simply decides to buy another firm (the *target*), negotiates a price with the target firm's management, and then acquires the firm. Occasionally, the acquired firm will initiate the action, but it is much more common for a firm to seek acquisitions than to seek to be acquired.

Once an acquiring firm has identified a possible target it must (1) establish a suitable price, or range of prices, and (2) tentatively set the terms of payment: will it offer cash, its own common stock, bonds, or a mix of securities? Next, the acquiring firm's managers must decide how to approach the target firm's managers. If the acquirer has reason to believe that the target's management will support the merger, then it will simply propose a merger and try to work out suitable terms. If an agreement is reached, then the two management groups will issue statements indicating that they approve the merger and, if the firms are investor owned, recommend that stockholders agree to the merger. Generally, the stockholders of acquiring firms must merely vote to approve the merger, but the stockholders of target firms are asked to *tender*, or send in, their shares to a designated financial institution along with a signed power of attorney that transfers ownership of the shares to the acquiring firm. The target firm's stockholders then receive the specified payment, be it common stock of the acquiring firm (in which case, the target firm's stockholders become stockholders of the acquiring firm), cash, bonds, or some mix of cash and securities. This type of merger is called a *friendly merger*, or a *friendly tender offer*.

The 2004 acquisition of WellPoint Health Networks by Anthem described above typifies a friendly merger. First, the boards of directors of the two firms announced that the merger had been agreed on. Then, the merger was approved by shareholders of both firms, by the Justice Department, and by the states in which the businesses operated. Note, however, that a great deal of negotiation between state regulators and the two companies was required before the acquisition was finally completed.

Often, however, the target firm's management resists the merger. Perhaps the managers feel that the price offered for the stock is too low or perhaps they simply want to retain their autonomy. In either case, the acquiring firm's offer is said to be *hostile* rather than friendly, and the acquiring firm must make a direct appeal to the target firm's stockholders. In a *hostile merger*, the acquiring firm will again make a tender offer, and again it will ask the stockholders of the target firm to tender their shares in exchange for the offered price. This

time, though, the target firm's managers will urge stockholders not to tender their shares, generally stating that the price offered (cash, bonds, or stocks in the acquiring firm) is too low.

Although many hostile takeover bids fail, most eventually succeed. It is very difficult to defend against a hostile takeover attempt if the bidder has a large amount of resources that it is willing to spend on the battle. In such situations, the acquiring firm can offer enough cash to shareholders to overcome even the most-adamant managerial resistance.

### Self-Test Questions

1. What is the difference between a hostile and a friendly merger?
2. Describe the mechanics of a typical friendly takeover and of a typical hostile takeover.

## Merger Regulation

Merger regulation falls into two broad categories: (1) regulation of the procedures that acquiring firms must follow in making hostile bids and (2) antitrust regulation to ensure that mergers do not lead to monopoly power.

### *Bid Procedure Regulation*

Prior to the mid-1960s, friendly acquisitions generally took place through simple exchange-of-stock mergers, and the *proxy fight* was the primary weapon used in a hostile control battle. (In a proxy fight, a dissident group attempts to gain control of the board of directors by placing alternative candidates on the proxy statement, who, if elected, would bring in other managers.) However, in the mid-1960s, corporate raiders began to operate differently. First, they noted that it took a long time to mount a proxy fight—they had to first request a list of the target firm's stockholders, then be refused, and finally get a court order forcing management to turn over the list. During that time, management could think through and then implement a strategy to fend off the raider. As a result, the instigator lost most proxy fights.

That lengthy process led raiders to turn from proxy fights to tender offers, which have a much shorter response time. For example, the stockholders of a firm whose stock was selling for \$20 might be offered \$25 per share and be given two weeks to accept. The raider, meanwhile, would have accumulated a substantial block of the shares in open market purchases, and additional shares might have been purchased by institutional friends of the raider who promised to tender their shares in exchange for the tip that a raid was to occur, even though such actions are illegal.

Faced with a well-planned raid, managers generally would be overwhelmed and unable to plan a timely counteraction. Although the stock might still be undervalued at the offered price in the opinion of management of the target firm, they simply would not have time to get this message across to

stockholders, or to find a friendly competing bidder (called a *white knight*), or to take any other action. This situation was thought to be unfair, and as a result, Congress passed the Williams Act in 1968. This law had two main objectives: (1) to regulate the way in which acquiring firms can structure takeover offers and (2) to force acquiring firms to disclose more information about their offers. Basically, Congress wanted to put target managers in a better position to defend against hostile offers. Additionally, Congress believed that shareholders needed easy access to information about tender offers, including information on any securities that might be offered in lieu of cash, to make a rational decision.

The Williams Act placed the following three major restrictions on the activities of acquiring firms:

1. Acquirers must disclose their current holdings and future intentions within ten days of amassing at least 5 percent of a firm's stock, and they must disclose the source of the funds to be used in the acquisition.
2. The target firm's shareholders must be allowed at least 20 days to tender their shares—that is, the offer must be “open” for at least 20 days.
3. If the acquiring firm increases the offer price during the 20-day open period, all shareholders who tendered prior to the improved offer must receive the higher price.

In total, these restrictions were intended to reduce the ability of the acquiring firm to surprise management and to stampede target shareholders into accepting the offer. Prior to the Williams Act, offers were generally made on a first-come, first-served basis, and they were often accompanied by an implicit threat to lower the bid price after 50 percent of the shares were in hand. The legislation also gave target managers more time to mount a defense, and it gave rival bidders and white knights a chance to enter the fray and thus help a target's stockholders obtain a better price.

Many states have also passed laws designed to protect firms in their states from hostile takeovers. At first, these laws focused on disclosure requirements, but by the late 1970s, several states had enacted takeover statutes so restrictive that they virtually precluded hostile takeovers. The constitutionality of state laws regulating takeover bids was challenged, and, at first, the state laws were struck down. But in 1987, the U.S. Supreme Court upheld an Indiana law that radically changed the rules of the takeover game. Specifically, the Indiana law first defined “control shares” as enough shares to give an investor 20 percent of the vote, and it went on to state that when an investor buys control shares, those shares can be voted only after approval by a majority of “disinterested shareholders,” which are defined as those who are neither officers nor inside directors of the firm nor associates of the raider. Thus, a hostile acquirer that owned 20 percent of a target firm's shares could not force a takeover by gaining only 31 percent more but rather would have to get 51

percent of the remaining 80 percent, or 41 percent more. The law also gives the buyer of control shares the right to insist that a shareholders' meeting be called within 50 days to decide whether the shares may be voted. The Indiana law dealt a major blow to raiders mainly because it slowed down the action. Delaware (the state in which most large firms are incorporated) later passed a similar bill, and so did many other states.

The new state laws also have some features that protect target stockholders from their own managers. Included are limits on the use of *golden parachutes*, which are lucrative compensation plans given to managers who lose their jobs as a result of takeovers, and the elimination of some types of *poison pills*, which are actions that managers of beleaguered firms can take to “kill off their own companies” to make them less attractive as targets. Because these types of state laws do not regulate tender offers per se but govern the practices of firms in the state, they have thus far withstood all legal challenges.

### Antitrust Regulation

Antitrust laws are intended to ensure that no organization attains enough market power to act as a monopoly. Such laws are based on the assumption that vigorous competition is the most effective way to ensure that consumers receive the best possible goods and services at the lowest cost. Although both federal and state laws are involved, two primary federal laws govern antitrust litigation: (1) the Sherman Act and (2) the Clayton Act. The *Sherman Act*, which dates back to 1890, prohibits contracts, conspiracies, and combinations that restrain trade. The *Clayton Act*, which was passed in 1914, prohibits all mergers, acquisitions, and joint ventures that may substantially lessen competition or allow creation of a monopoly. Merger laws contain notification clauses, which require firms involved in mergers to file certain information with federal and state agencies. These agencies then have 30 days to request additional information, approve the deal, or file suit to prevent the merger.

The two agencies that are charged with enforcing antitrust laws are (1) the *Federal Trade Commission (FTC)* and (2) the *Justice Department (JD)*. The FTC and JD classify potential antitrust violations into two categories: per se or rule of reason. *Per se* violations are those so unlikely to produce redeeming consumer benefits that they are immediately presumed to be illegal. Examples would be two hospitals agreeing to fix prices for certain procedures or agreeing to allocate specific markets. Actions that are not considered per se violations are evaluated using *rule of reason* analysis. Under rule of reason analysis, the FTC or JD must first determine whether a merger, or other combination, will enable a business to exercise market power in an anticompetitive manner. If so, the agency must then analyze whether the activity produces economic efficiencies that outweigh the anticompetitive effects. If the benefits outweigh the anticompetitive consequences, then the merger is allowed to take place. Mergers within the health services industry generally fall into the



rule of reason category, so a great deal of leeway exists in implementing the antitrust laws.

Clearly, the manner in which antitrust laws are enforced has a significant impact on merger activity and hence on the future structure of the healthcare system. Before the 1990s, when fee-for-service insurance prevailed, physicians competed with one another for patients and hospitals competed for inpatient business. Today, however, the health services industry is being transformed by the growth of managed care, selective contracting, and vertical integration, which can create single organizations that are capable of providing both insurance and medical services. This transformation means that the FTC and JD have a difficult task in deciding how and when to apply antitrust laws. For example, two hospitals may merge to increase their bargaining power with insurers. If insurers now have fewer hospitals with which to negotiate, they cannot drive nearly as hard a bargain as before, so the merger may be anticompetitive. But by merging, the hospitals may be able to reduce duplicative services and achieve other operating efficiencies that can lead to lower prices, which would be good for the insurers and ultimately for consumers. The question then becomes which merger policy—vigorous or lax enforcement—should the FTC and JD follow to ensure good health policy?

With encouragement from the Clinton administration, in late 1994 the FTC and JD issued a joint policy statement containing “safety zone” guidelines. The statement describes circumstances under which mergers between hospitals, physician/network joint ventures, and other healthcare combinations will not be challenged. For example, a hospital merger will not be challenged if one or both of the hospitals has fewer than 100 beds, has less than 40 patients per day, and is more than five years old. Also, a physician network will not be contested if the network has no more than 20 percent of the physicians in a specialty in a particular geographical market. Although the guidelines have no effect on court decisions, and hence are no guarantee of legality, most industry representatives agree that the guidelines are helpful in establishing ground rules for future merger activity.

States are also involved in the antitrust field, as both supporters and challengers of proposed mergers. For example, four states requested information concerning the impact of the Columbia/HCA–Healthtrust merger on individual markets, and state actions have caused hospital chains involved in large mergers to agree to sell off hospitals in particular markets to avoid antitrust actions. However, for the most part, states have been supportive of mergers in the health services industry. Many states have passed certificate of public advantage (COPA) laws, which grant immunity from federal antitrust laws. However, COPA laws generally require merging hospitals to return to the community any savings that result from the merger. Furthermore, hospitals must file annual reports with the state that prove that the specific COPA requirements set down for the merger are being met. Finally, there is always



the possibility that the FTC or JD might challenge activities permitted by state immunity doctrine legislation because of lax supervision.

### Self-Test Questions

1. Is there a need to regulate mergers? Explain your answer.
2. Do the states play a role in merger regulation, or is it all done at the federal level?
3. What is the difference between bidding regulation and antitrust regulation?
4. What two federal agencies enforce antitrust laws?
5. Do you think that enforcement of antitrust laws should be aggressive or lenient for health services industry mergers? Support your position.

### Mergers Involving Not-for-Profit Businesses

One of the unique aspects of the health services industry is the large proportion of not-for-profit firms. In general, the concepts presented thus far in the chapter are applicable to both for-profit and not-for-profit businesses. Furthermore, the merger of two not-for-profit firms generally does not require special consideration. However, the acquisition of a not-for-profit firm by an investor-owned business can present two significant problems.

The first major problem arises because of the *charitable trust doctrine*. This doctrine, which was established in English common law and has been adopted by most states, holds that assets used for charitable purposes must be held in trust. The charitable trust doctrine shaped the state incorporation laws for not-for-profit firms, which require that assets being used for charitable purposes be used for such purposes in perpetuity (forever). The implication of this doctrine is that the proceeds from the sale of a not-for-profit corporation to an investor-owned business must continue to be used for charitable purposes.

Charitable trust laws place two requirements on the board of trustees of a target not-for-profit business. First, the trustees must ensure that the acquisition price reflects the full fair market value of the assets being acquired. This assurance is normally obtained by obtaining the opinion of an investment banker specializing in mergers and acquisitions or of a professional appraiser.

Second, the trustees must ensure that the acquisition proceeds continue to be used for charitable purposes. When a not-for-profit firm sells only a portion of its assets, such as the Health Management Associates/Bon Secours deal described earlier, no problem arises. The acquisition price is paid to a not-for-profit organization that continues in existence, and hence the funds continue to be used for charitable purposes. However, when a stand-alone entity is acquired, that not-for-profit organization ceases to exist. Thus, a new charitable entity must be created to administer the proceeds from the sale.

The usual vehicle for continuing the charitable purpose of the not-for-profit corporation is the tax-exempt *foundation*.

Many foundations have been spawned by the sales of not-for-profit businesses to investor-owned firms, primarily in the hospital industry and primarily as a result of acquisitions by large investor-owned chains. Note, however, that foundations have also been created by sales of HMOs and other not-for-profit healthcare businesses. To illustrate the foundation concept, consider the Presbyterian Health Foundation, which was created some time ago when Presbyterian Hospital in Oklahoma City was acquired by Hospital Corporation of America (HCA). The foundation, which began with \$60 million in assets (the acquisition price), now has assets totaling over \$110 million. By law, at least 5 percent of assets of charitable foundations must be distributed each year, and Presbyterian Health Foundation has already distributed more than \$90 million for rural outreach and other programs, primarily at the University of Oklahoma Health Science Center.

Although merger-related foundations are clearly doing a lot of good work with their vast amounts of assets, they have their critics. Most of the criticism stems from the close relationships that many foundations have with the for-profit providers that created them. Indeed, some foundations, instead of being funded entirely with cash, have ownership interests in the for-profit acquirer, which make it easy for conflicts of interest to occur. One not-for-profit foundation even lost its tax-exempt status because it squandered millions of dollars on overpriced clinics, excessive compensation, and extravagant spending on personal items for managers and employees. Not-for-profit hospitals usually are constrained by competitive forces, whereas the burden of oversight at charitable foundations falls completely on the board of trustees.

Many states have passed laws in recent years to ensure that hospital conversions are subject to full public scrutiny and oversight. In general, these laws, more than anything else, require full disclosure. For example, Georgia's law requires not-for-profit hospitals that are being sold or merged to file with the state attorney general's office, regardless of whether the merger is with a for-profit or a not-for-profit business. Such filings, which become public information, must include the merger plan plus any financial gain that would accrue to board members, physicians, or managers. Furthermore, the state has the power to hold public hearings to determine whether or not the buyer is paying fair market value for the target hospital.

The second major problem, in addition to charitable trust requirements, involves the tax-exempt, or municipal, debt that not-for-profit targets typically carry. Such debt is issued for the sole purpose of funding plant and equipment owned by not-for-profit corporations. Furthermore, such debt usually has restrictive covenants that constrain the provider from merger activity that would lower the creditworthiness of the bonds or negatively affect the bonds' tax-exempt status.

To somewhat ease the conversion problems associated with municipal debt, many not-for-profit providers now include the so-called “Columbia clause” in their municipal bond indentures. In most indentures, the issuing hospital lists the circumstances under which the bonds may be redeemed prior to maturity. The Columbia clause allows bonds to be redeemed in the instance of a sale, lease, or joint venture with a for-profit firm involving a facility that had been financed with tax-exempt debt. Prior to placing such clauses in municipal bond indentures, hospitals selling to for-profit entities had to obtain private-letter rulings from the IRS to retire the bonds or make a tender offer to bondholders, and both of these mechanisms are relatively expensive compared to a call triggered by the clause.

Clearly, the restrictions on mergers involving not-for-profit firms and for-profit firms make such activities more complicated than mergers involving only for profits or only not for profits. Nevertheless, as evidenced by the amount of such merger activity, these kinds of mergers do occur.

## Self-Test Questions

1. What is the charitable trust doctrine, and what impact does it have on for-profit acquisitions of not-for-profit firms?
2. What unique problems arise in the acquisition of a not-for-profit business by an investor-owned business as a result of outstanding municipal debt?

## Business Valuation

Businesses are valued for many purposes, including acquisitions, divestitures, and estate tax assessments. Our discussion here focuses on valuation for acquisition purposes, but the basic principles of valuation are applicable for all purposes. A very key point to remember throughout this discussion is that **business valuation is a very imprecise process**. The best that can be done, even by professional *appraisers* who conduct these valuations on a regular basis, is to attain a reasonable valuation, as opposed to a precise one.

Many different approaches can be used to value businesses, but we will confine our discussion to the two most commonly used in the health services industry: (1) discounted cash flow and (2) market multiple. However, regardless of the valuation approach, it is crucial to recognize two factors that affect acquisition valuations. First, the business being valued typically will not continue to operate as a separate entity but will become part of the acquiring business’s portfolio of assets. Thus, any changes in ownership form or operations that occur as a result of the proposed acquisition that would affect the value of the target business must be considered in the analysis. Second, the goal of merger valuation is to set the value of the target business’s equity, or ownership position, because a business is acquired from its owners,

not from its creditors. Thus, although we use the phrase “business valuation,” the ultimate goal is to value the equity stake in the business rather than its total value.

**Discounted Cash Flow Approach**



The *discounted cash flow (DCF)* approach to valuing a business involves the application of classic capital budgeting procedures to an entire business rather than to a single project. To apply this approach, two key items are needed: (1) a set of pro forma statements that contain the incremental cash flows expected to result from the merger and (2) a discount rate, or cost of capital, to apply to these cash flows. There are two primary methods of DCF analysis: (1) the free operating cash flow method and (2) the free cash flow to equityholders method. The methods differ in how the cash flows and discount rate are formulated.

The development of accurate postmerger cash flow forecasts is, by far, the most important step in the DCF approach. In a pure *financial merger*, in which no synergies are expected, the incremental postmerger cash flows are simply the expected cash flows of the target firm if it were to continue to operate independently. However, even in this situation, the cash flows for a healthcare provider may be quite difficult to forecast because the nature of the industry is changing so rapidly. In an *operational merger*, in which the operations are to be integrated, the acquiring firm usually intends to change the target’s operations to get better results, so forecasting future cash flows is even more complex.

Table 16.2 contains projected cash flow statements for Doctors’ Hospital, an investor-owned hospital that is being evaluated as a possible acquisition by United Health Services Corporation (UHSC), a large integrated healthcare business. These statements are formatted like income statements, but they (1)

	2007	2008	2009	2010	2011
1. Net revenues	\$ 105.0	\$ 126.0	\$ 151.0	\$ 174.0	\$ 191.0
2. Patient services expenses	80.0	94.0	111.0	127.0	137.0
3. Other expenses	9.0	12.0	13.0	16.0	16.0
4. Depreciation	8.0	8.0	9.0	9.0	10.0
5. Earnings before interest and taxes (EBIT)	\$ 8.0	\$ 12.0	\$ 18.0	\$ 22.0	\$ 28.0
6. Interest	4.0	4.0	5.0	5.0	6.0
7. Earnings before taxes (EBT)	\$ 4.0	\$ 8.0	\$ 13.0	\$ 17.0	\$ 22.0
8. Taxes (40 percent)	1.6	3.2	5.2	6.8	8.8
9. Net profit	\$ 2.4	\$ 4.8	\$ 7.8	\$ 10.2	\$ 13.2
10. Estimated retentions	\$ 4.0	\$ 4.0	\$ 7.0	\$ 9.0	\$ 12.0

**TABLE 16.2**  
Doctors’ Hospital: Projected Cash Flow Statements and Retention Estimates (millions of dollars)

focus on cash flows rather than on accounting income and (2) do not have to conform to generally accepted accounting principles (GAAP). The projected data are for the postmerger period, so all synergistic effects have been included in the estimates. Doctors' currently uses 50 percent debt, and if it were acquired, UHSC would maintain Doctors' debt ratio at 50 percent.<sup>2</sup> Doctors' has a 30 percent marginal tax rate, but UHSC faces a 40 percent marginal federal-plus-state tax rate.

Line 1 of Table 16.2 contains the forecast for Doctors's net revenues, including both patient services revenue and other revenue. Note that all contractual allowances and other adjustments to charges, including collection delays, have been considered, so Line 1 represents actual cash revenues. Note also that any change in Doctors' stand-alone forecasted revenues resulting from synergies have been incorporated into the Line 1 amounts. Lines 2 and 3 contain the cash expense forecasts, while Line 4 lists depreciation, a noncash expense. Again, the expense amounts pertain to Doctors' operations assuming that the merger takes place, so savings due to efficiencies are included. Line 5, which is merely Line 1 minus Lines 2, 3, and 4, contains the earnings before interest and taxes (EBIT) projection for each year.

In the cash flow forecasts, interest expense is shown on Line 6. Note that Line 6 includes both the interest on Doctors' existing debt and the interest on any new debt expected to be issued to help fund future growth. Line 7 contains the earnings before taxes (EBT), and Line 8 lists the taxes based on a 40 percent marginal rate, which is the rate that would be applied to the combined enterprise. Line 9 lists each year's profit or loss. Finally, because some of Doctors' assets are expected to wear out or become obsolete, and because UHSC plans to expand Doctors' subsidiary should the acquisition occur, some equity funds must be retained and reinvested in the subsidiary to pay for asset replacement and growth. These retentions, which are not available for transfer from the hospital to the UHSC parent, are shown on Line 10.

Of course, the postmerger cash flows attributable to the target firm are extremely difficult to estimate. But in a friendly merger, the acquiring firm would send a team consisting of literally dozens of accountants, financial analysts, engineers, and so forth to the target firm to go over its books, to estimate required maintenance expenditures, to set values on assets such as real estate, and the like. This work would be done as part of a "due diligence" analysis, which we discuss in a later section.

Table 16.3 provides relevant cost of capital data for Doctors'. These data will be used to set the discount rates used in the DCF valuations.

### Free Operating Cash Flow Method



As its name implies, the *free operating cash flow* method focuses on operating cash flows and hence values the entire business. Because our aim is to value the equity position in a business, the value of the debt financing must be stripped out from the overall valuation.

Cost of equity	18.2%
Cost of debt	12.0%
Proportion of debt financing	0.50
Proportion of equity financing	0.50
Tax rate	40.0%

$$\begin{aligned}
 \text{CCC} &= [w_d \times R(R_d) \times (1 - T)] + [w_e \times R(R_e)] \\
 &= [0.50 \times 12.0\% \times (1 - 0.40)] + [0.50 \times 18.2\%] \\
 &= 3.6\% + 9.1\% = 12.7\%.
 \end{aligned}$$

**TABLE 16.3**

Doctors'  
Hospital:  
Selected Cost of  
Capital  
Data and  
Calculations

*Note:* If necessary, see Chapter 9 for a discussion of the corporate cost of capital (CCC).

Free operating cash flow is defined as net operating profit after taxes, which is often called *NOPAT* and is calculated as  $(\text{EBIT} \times [1 - T])$ , plus non-cash expenses (depreciation) less operating cash flow needed for reinvestment in the business. Table 16.4 uses the data contained in Table 16.2 to forecast the free operating cash flows for Doctors'. In merger valuations, the term "free" means cash flows that are available to the enterprise, or to shareholders, after all expenses, including asset replacement costs and costs to support growth, have been taken into account.

Now, because the cash flows in Table 16.4 are operating cash flows, as are the cash flows in a conventional capital budgeting analysis, the appropriate discount rate is the corporate cost of capital. Should it be UHSC's corporate cost of capital? No. The cost of capital must reflect the riskiness of the cash flows being discounted, and hence the appropriate rate is that for Doctors', which was estimated in Table 16.3 to be 12.7 percent.<sup>3</sup> At this discount rate, the present value of the free operating cash flows shown in Table 16.4, discounted back to the end of 2006 (the beginning of 2007), is \$41.9 million.

Note that we have projected only five years of cash flows, but UHSC would likely operate Doctors' for many years, perhaps 20 or 30 or more. If the free operating cash flows given in Table 16.4 are assumed to grow at a constant rate after 2011, the constant growth model can be used to estimate Doctors' *terminal value*. Assuming a constant 5 percent growth rate in free operating cash flow forever, the terminal value is estimated to be \$201.8 million:

$$\begin{aligned}
 \text{Terminal value} &= \frac{2011 \text{ Cash flow} \times (1 + \text{Growth rate})}{\text{Required rate of return} - \text{Growth rate}} \\
 &= \frac{\$14.8 \times 1.05}{0.127 - 0.05} = \frac{\$15.54}{0.077} \\
 &= \$201.8 \text{ million.}
 \end{aligned}$$

The terminal value of Doctors', which represents the value at the end of 2011 of all cash flows beyond 2011, has a value of \$111.0 million when discounted back to 2006 at 12.7 percent.<sup>4</sup>

TABLE 16.4

		2007	2008	2009	2010	2011
Doctors' Hospital:						
Projected Free Operating Cash Flow (millions of dollars)	1. NOPAT	\$4.8	\$ 7.2	\$10.8	\$13.2	\$16.8
	2. Plus depreciation	8.0	8.0	9.0	9.0	10.0
	3. Less total retentions	4.0	4.0	7.0	9.0	12.0
	4. Free operating cash flow	<u>\$8.8</u>	<u>\$ 11.2</u>	<u>\$12.8</u>	<u>\$13.2</u>	<u>\$14.8</u>

The final estimate of the total value of Doctors' to UHSC is  $\$41.9 + \$111.0 = \$152.9$  million. However, Doctors' has debt outstanding that has a current market value of \$55.7 million, so the ownership (equity) value of the hospital is  $\$152.9 - \$55.7 = \$97.2$  million.

### Free Cash Flow to Equityholders Method



The *free cash flow to equityholders* method, also called the *equity residual* method, focuses solely on the cash flows that would be available to UHSC's stockholders, which are developed in Table 16.5. Note that the starting cash flow in Table 16.5 is net profit as opposed to NOPAT, which was used in the net operating cash flow method. Also, because asset replacement and additions are assumed to be financed at the optimal capital structure, 50 percent of the retentions represent debt financing, so the Table 16.5 values are only half the amounts used in the net operating cash flow method.

Because the cash flows shown on Line 4 of Table 16.5 are equity flows (as opposed to operating flows), they should be discounted at the cost of equity rather than at the corporate cost of capital. Furthermore, the cost of equity used must reflect the riskiness of the free cash flows in the table, and hence the discount rate is more closely aligned with the cost of equity of Doctors' than with the cost of equity of either UHSC or the consolidated enterprise.

As before, the current value of Doctors' to UHSC is the present value of the free cash flows given in Table 16.5 plus the terminal value, all discounted at the 18.2 percent cost of equity. The present value of the Table 16.5 cash flows is \$37.9 million. The terminal value, calculated in a similar manner as in the previous free operating cash flow method, is \$136.8 million, and its present value is \$59.3 million. Thus, the equity value of Doctors' is  $\$37.9 + \$59.3 = \$97.2$  million.

Of course, we "cooked the books" to ensure that the value came out to be the same under both of the DCF methods. Still, in real-world valuations, the two methods would be relatively consistent, so either one can be used.

Note that the final value estimate of Doctors' Hospital probably would be higher than the DCF value. The reason is that the DCF method only values the **operations** of the business. Thus, \$97.2 million represents the value of all of the business's assets that support operations. Many businesses hold some nonoperating assets such as marketable securities holdings in excess of that required for operations or real estate that will not be needed in the



	2007	2008	2009	2010	2011
1. Net profit	\$2.4	\$4.8	\$7.8	\$10.2	\$13.2
2. Plus depreciation	8.0	8.0	9.0	9.0	10.0
3. Less equity retentions	2.0	2.0	3.5	4.5	6.0
4. Free cash flow to equityholders	<u>\$8.4</u>	<u>\$10.8</u>	<u>\$13.3</u>	<u>\$14.7</u>	<u>\$17.2</u>

**TABLE 16.5**  
Doctors' Hospital:  
Projected Free Cash Flow to Equityholders  
(millions of dollars)

future to support operations. The overall value of a business is the sum of its *operational value*, as estimated by the DCF method, plus the market values of any nonoperating assets. In this example, we assume that Doctors' Hospital does not have material nonoperating assets, so a reasonable estimate of its value is \$100 million.

Obviously, UHSC would try to buy Doctors' at as low a price as possible, while Doctors's managers would hold out for the highest possible price. The final price is determined by negotiation, with the stronger negotiator capturing most of the incremental value. The larger the synergistic benefits, the more room for bargaining and the higher the probability that the merger will actually be consummated. We will have more to say about setting the bid price in a later section.

Although we will not illustrate it here, UHSC would perform a risk analysis on both the Table 16.4 and Table 16.5 cash flows just as it does on any set of capital budgeting flows. Generally, scenario analysis and Monte Carlo simulation would be used to give UHSC's management some feel for the risks involved with the acquisition and resulting range of valuations. In the illustration, as with many healthcare mergers, the target firm is investor owned but not publicly traded, so it is not possible to obtain a market beta on Doctors's stock. However, we can obtain market betas of the stocks of the major investor-owned hospital chains, and this value can be used to help estimate the capital costs given in Table 16.3.

### Market Multiple Analysis



Another method of valuing a business is *market multiple analysis*, which applies a market-determined multiple to some proxy for value—typically some measure of revenues or earnings. Like the DCF valuation approach, the basic premise here is that the value of any business depends on the cash flows that the business produces. The DCF approach applies this premise in a precise manner, while market multiple analysis is more ad hoc.

To illustrate the concept, suppose that in recent hospital mergers, acquirers have been willing to pay six times the EBITDA of the target. EBITDA is one of the more common proxies for value used in market multiple analysis. It means *earnings before interest, taxes, depreciation, and amortization (EBITDA)*. Thus, we would say that the EBITDA market multiple is 6. To estimate the value of Doctors' using this method, note that Doctors' 2007



EBITDA estimate is \$8 million in EBIT plus \$8 million in depreciation, or \$16 million. Multiplying EBITDA by the 6 market multiple gives a value of Doctors' of \$96 million. Because equity multiples are typically used in these analyses, the resulting value is the equity, or ownership, value of the business.

To illustrate another, less direct proxy, consider the nursing home industry. In recent years, prices paid for nursing home acquisitions have been in the range of \$80,000 to \$120,000 per bed, with an average of roughly \$100,000. Thus, using number of beds as the proxy for value, a nursing home with 50 beds would be valued at  $50 \times \$100,000 = \$5$  million.

### Comparison of the Two Methods

Clearly, the valuation of a business can only be considered a rough estimate. Although the DCF approach has strong theoretical support, one has to be very concerned over the validity of the estimated cash flows, growth rates, and discount rates applied to those flows. It doesn't take much variation in any of these estimates to create large differences in estimated value.

The market multiple method is more ad hoc, but its proponents argue that a proxy estimate for a single year, such as measured by EBITDA, is more likely to be accurate than a multiple-year cash flow forecast. Furthermore, the market multiple approach avoids the problem of having to estimate a terminal value. Of course, the market multiple approach has problems of its own. One concern is the comparability between the business being analyzed and the firm (or firms) that set the market multiple. Another concern is how well one year, or even an average of several years, of EBITDA captures the value of a business that will be operated for many years into the future, and whose EBITDA can soar as a result of merger-related synergies.

The bottom line is that both methods have problems. In general, business valuations should use both the DCF and market multiple methods as well as other available methods. Then, a great deal of judgment must be applied to reconcile any valuation differences that occur.

### Self-Test Questions

1. Briefly, describe two approaches commonly used to value acquisition candidates.
2. What are some problems that occur when valuing target firms?
3. Which approach do you believe to be best? Explain your answer.

### Unique Problems in Valuing Small Businesses

It should be obvious that the valuation of potential takeover candidates is a very difficult task, even when the target is a large, publicly traded firm. One of the primary difficulties in the process is estimating the right market *capitalization rate*, either the discount rate in the DCF approach or the market multiple in the market multiple approach. When the target is a small, privately

owned firm—say, a medical practice—several additional factors, such as the ones listed below, arise that might require modification of a rate based on the analysis of publicly traded firms.

- **Geographic and business line diversification.** Capitalization rates based on large business transactions typically involve businesses that have geographic and business line diversification. If the transaction behind the valuation does not have the same diversification benefits, then the capitalization rates may need to be adjusted. For example, the acquisition of one hospital by a large national chain places the target in a large diversified portfolio of hospitals. The same acquisition by a neighboring stand-alone hospital lacks such a diversification benefit. This fact makes the acquisition riskier for the neighbor than for the national chain and hence argues for a higher discount rate, or a lower market multiple. Of course, there may be more synergies inherent in merging with the neighbor, which would show up in the valuation as higher cash flow projections. Still, the added risk needs to be considered in the valuation process.
- **Owners' diversification.** When a large, publicly traded firm makes an acquisition, the target business is being added to the well-diversified personal investment portfolios of the acquiring firm's stockholders. Thus, the owners see only market risk in the transaction as opposed to corporate risk. When merger transactions take place between smaller businesses, or when the acquirer is a not-for-profit business, market risk is not relevant. Thus, the portfolio benefit associated with owners' personal diversification is not applicable, which may raise the riskiness inherent in the transaction.
- **Liquidity (marketability).** The ownership of a small business lacks liquidity (marketability), which lowers its value relative to the stock of a large firm that is publicly traded on a major exchange or in the over-the-counter market. In effect, a liquidity premium should be assessed when valuing small businesses, which will raise the discount rate used in the DCF approach and lower the multiple used in the market multiple approach. Of course, the effect of all three of these adjustments is to lower the value of the target firm. It is very difficult to judge how much lower the value should be because of lack of diversification or liquidity, but it has been suggested that the value loss is quite large—as high as 50 percent or more.<sup>5</sup>
- **Control.** The final factor that often arises in valuing closely held businesses is that of control. The ability to control a business is very important, and, as such, it has value. For example, assume that a business that is valued at \$100,000 has three owners—one with 50.2 percent of the stock and two each with 24.9 percent. The value of the stock owned by the controlling stockholder is worth more than the proportionate amount—that is, it is worth more than \$50,200, perhaps a great deal more. Similarly, the stock of each of the minority stockholders is worth

less than \$24,900, which is their proportionate share. The value of *control interests*, as opposed to *minority interests*, must be taken into account when assessing value, especially when the acquisition will not be for 100 percent of the stock of the target firm. Furthermore, control issues need to be considered when setting the terms of the acquisition offer.

- **Cash flows of medical practices.** Smaller medical practices typically use a modified cash-basis accounting methodology. Furthermore, at the end of each year, any net income generated in excess of that required for retentions is paid out to the owner/physicians as bonuses. To determine the true cash flows that would accrue to an acquirer, the statements must be recast with the bonuses “backed out.” The assumption, of course, is that physicians would be willing to work as hard in the future in the absence of bonuses as they do today. This assumption has spelled disaster for many medical practice acquisitions.

The above factors make it clear that the valuation of small businesses is more difficult than that for large businesses, primarily because of the difficulties in estimating the correct capitalization rate. In general, the rates estimated from the data of large businesses must be adjusted to reflect the risk and liquidity factors unique to small businesses. (See Chapter 9 for a discussion of the cost of capital to small businesses.)

### Self-Test Question

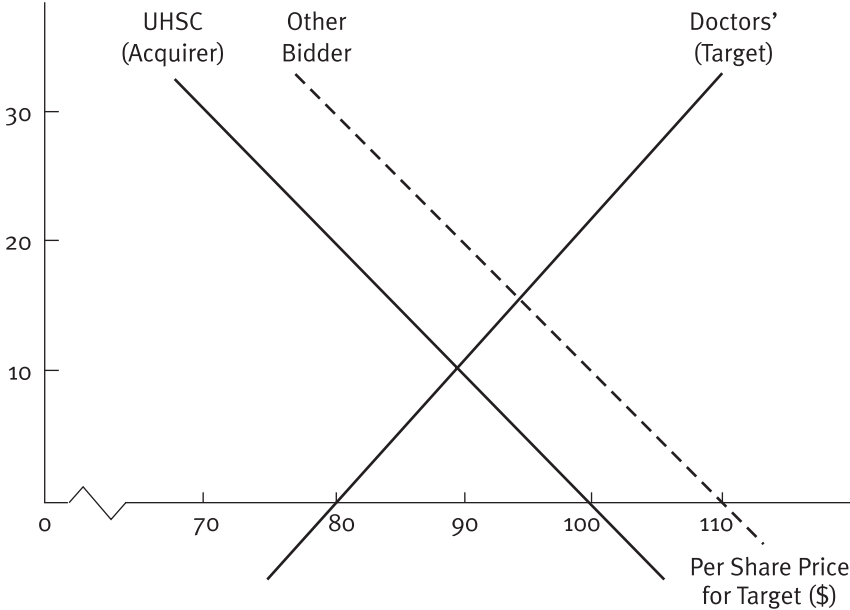
1. What unique considerations arise when valuing small, privately held businesses?

### Setting the Bid Price

Assume that after a thorough valuation, UHSC concludes that Doctors’ is worth \$100 million. Furthermore, assume that Doctors’ has 1 million shares of stock outstanding and that some shares sold recently in a private sale at \$80 a share, so Doctors’ total market value is assumed to be \$80 million. With an estimated value of \$100 million to UHSC, it can offer as much as \$100 per share for Doctors’ without diluting the value of its own stock.

Figure 16.1 illustrates the situation facing UHSC’s managers as they set the bid price. The \$100 per share maximum offer price is shown as a point on the horizontal axis, which plots bid price. If UHSC pays less—say, \$95 a share—its stockholders will gain \$5 per share, or \$5 million in total, from the merger. On the other hand, if UHSC pays more than \$100 per share, its stockholders will lose value. The line that shows the impact of the per share bid price on UHSC’s stockholders is a 45-degree downward-sloping line that cuts the X-axis at \$100. The distance between this diagonal line and the X-axis is the amount that UHSC’s stockholders will gain, or lose, for each share of

Change in Wealth  
per Share of Target  
(\$)



**FIGURE 16.1**  
Evaluating the  
Takeover Bid

Doctors' acquired. The situation facing Doctors's shareholders is depicted by a 45-degree upward-sloping line that crosses the X-axis at \$80. If the hospital is acquired for more than \$80 per share, its shareholders will gain value, while they would lose value if the price were less than \$80.

Note that there is a bid price range between \$80 and \$100 where the shareholders of both UHSC and Doctors' benefit from the merger. The range exists because the merger has synergistic benefits that can be divided between the two groups of stockholders. The greater the synergistic benefits, the greater the range of feasible bid prices and the greater the chance that the merger will be consummated.

The issue of how to divide the synergistic benefit is critically important in any merger transaction. Obviously, both parties will want to gain as much as possible. If Doctors's shareholders knew the maximum price that UHSC is willing to pay, \$100, it would hold out for that price. UHSC, on the other hand, will try to acquire the hospital at a price as close to \$80 a share as possible. Where within the \$80 to \$100 range should UHSC set its initial bid? The answer depends on a number of factors, including whether UHSC will pay with cash or securities, whether the managers of UHSC or Doctors' have the better negotiating skills, and whether another bidder is likely to enter the picture.

The likelihood of a bidding war for Doctors' plays an important role in setting the initial bid. Suppose first that no other bidder is likely. In this situation, UHSC might make a relatively low take-it-or-leave-it offer, and Doctors's shareholders might take it because some gain is better than no gain. On the other hand, assume that Doctors' has a unique situation that makes it attractive to several competing health systems. Now, when UHSC announces its bid, other bidders may enter the fray, and the final price will likely be close to \$100 per share. Perhaps another potential acquirer can achieve even greater synergies with Doctors' Hospital than can UHSC, as shown in Figure 16.1 by the "Other Bidder" dashed line. If so, the bid price can rise above \$100, in which case UHSC should drop out of the bidding.

UHSC would, of course, want to keep its maximum bid secret, and it would plan its bidding strategy carefully and consistent with the situation. If UHSC thought that other bidders would emerge, or that Doctors' management would resist a bid to protect their jobs, UHSC might decide to make a high *preemptive*, or *knockout*, bid in hopes of scaring off competing bids, eliminating management resistance, or both. On the other hand, if no other bidders were expected, UHSC might make a low-ball bid in hopes of "stealing" the hospital.

Another factor that influences the initial bid is the employment/control situation. First, consider the situation in which a small, owner-managed firm sells out to a larger concern. The owner/manager may be anxious to retain a high-status position, and he or she may also have developed a close relationship with the employees and thus be concerned about keeping operating control of the organization after the merger. These points are often stressed during the merger negotiations. When a publicly owned firm not controlled by its managers is merged into another firm, the acquired firm's management is also worried about its postmerger position. If the acquiring firm agrees to retain the old management, then management may be willing to support the merger and to recommend its acceptance to the stockholders. If the old management is to be removed, then it will probably resist the merger.

### Self-Test Questions

1. What impact does the amount of synergistic benefit have on the likelihood of a merger being consummated?
2. What are some factors that influence the starting and final bid price?

### Structuring the Takeover Bid

If the acquiring firm is investor owned, its offer to the target shareholders can be in the form of cash, stock of the acquiring firm, debt of the acquiring firm, or a combination of the three. The structure of the bid is extremely important because it affects (1) the capital structure of the postmerger firm, (2) the tax

treatment of both the acquiring firm and the target's stockholders, (3) the ability of the target firm's stockholders to reap the rewards of future merger-related gains, and (4) the types of federal and state regulations to which the acquiring firm will be subjected. In this section, we focus on how taxes and regulation influence the way in which acquiring firms structure their offers.

The form of payment offered to the target shareholders determines the personal tax treatment of the target's stockholders. Target shareholders do not have to pay taxes on the transaction if they maintain a substantial equity position in the combined firm, defined by the IRS to mean that at least 50 percent of the payment to target shareholders must be in shares (either common or preferred) of the acquiring firm. In such nontaxable offers, target shareholders do not realize any capital gains or losses until the equity securities they receive in the takeover are sold. However, capital gains must be taken and treated as income in the transaction year if an offer consists of over 50 percent of either cash or debt securities, or some combination of the two.

All other things being equal, target stockholders prefer nontaxable offers, especially when they believe that the combined firm will perform well, because they can (1) benefit from the continuing good performance of the combined firm and (2) postpone the realization of capital gains and the payment of taxes. Most target shareholders are thus willing to sell their stock for a lower price in a nontaxable offer than in a taxable offer. As a result, one might expect nontaxable bids to dominate; however, other factors are at work. If a firm pays more than book value for a target firm's assets in a taxable merger, it can write up those assets, depreciate the marked-up value for tax purposes, and thus lower the postmerger firm's taxes vis-à-vis the taxes of the two firms operating separately. However, if the acquiring firm writes up the target firm's assets for tax purposes, then the target firm must pay capital gains taxes in the year the merger occurs. (These taxes can be avoided if the acquiring firm elects not to write up acquired assets and depreciates them on their old basis.)

Securities laws also have an effect on the construction of the offer. As we discussed in Chapter 6, the Securities and Exchange Commission (SEC) has oversight over the issuance of new securities, including stock or debt issued in connection with a merger. Therefore, whenever a corporation bids for control of another firm through the exchange of equity or debt, the entire process must take place under the scrutiny of the SEC. The time required for such reviews allows target management to implement defensive tactics and other firms to make competing offers, and, as a result, most hostile tender offers are for cash rather than securities.

1. What are some alternative ways of structuring takeover bids?
2. How do taxes influence the payment structure?
3. How do securities laws affect the payment structure?

## Due Diligence Analysis

One of the most important aspects of a merger is *due diligence analysis*.<sup>6</sup> Generically, due diligence is the level of judgment, care, and prudence that a person would be reasonably expected to achieve before taking some action. The primary purposes of a merger due diligence analysis are (1) to uncover issues that would prevent the acquirer from pursuing the acquisition and (2) to provide the acquirer with insights into the day-to-day operations of the target firm so that an appropriate transaction can take place. Due diligence requires a uniform, disciplined approach to the merger analysis, which presumably will minimize the risk of overlooking issues that are key to the acquisition.<sup>7</sup>

Due diligence analysis normally takes place after a letter of intent has been signed between the acquiring and target firms but before the terms of the transaction have been completed. It is normally carried out by a team that has been specially assembled for the task. Typically, the team will include one or two top executives, plus specialists from applicable staffs such as finance, legal, medical, nursing, personnel, risk management, and engineering. The team may consist entirely of personnel from the acquiring firm or it may contain consultants in addition to the in-house members.

The due diligence team will gather and analyze information about the acquisition. The end result is a report that summarizes the team's findings and makes recommendations as to whether or not to proceed with the acquisition and how the deal, if recommended, should be structured. The time required to conduct a due diligence analysis varies depending on the number of individuals on the team, the nature of the acquisition, and the accessibility of information. Generally, however, due diligence analyses take about 60 to 90 days, so acquirers must allow sufficient time for due diligence analysis when developing merger time tables.

Conducting a thorough due diligence analysis is a necessary component of the acquisition process. In addition to protecting the acquirer against a poor acquisition, it can establish a relationship between acquiring and target firms' management that not only facilitates successful negotiations but, more importantly, can help lead to a successful merger.

### Self-Test Questions

1. What is due diligence analysis?
2. Why is due diligence analysis so important to the merger process?

## The Role of Investment Bankers

The investment banking community is involved with mergers in a number of ways: (1) helping to arrange mergers; (2) helping target firms develop and implement defensive tactics; (3) helping in due diligence analysis, especially valuing target firms; (4) helping to finance mergers; and (5) speculating in the stocks of potential merger candidates.



## Arranging Mergers

The major investment banking firms have merger and acquisition groups that operate within their corporate finance departments. (Corporate finance departments offer advice, as opposed to underwriting or brokerage services, to firms.) Members of these groups strive to identify businesses with excess cash that might want to buy other firms; firms that might be willing to be bought; and firms that might, for a number of reasons, be attractive to others. Similarly, dissident stockholders of firms with poor track records might work with investment bankers to oust management by helping to arrange a merger.

## Developing Defensive Tactics

Target firms that do not want to be acquired generally enlist the help of an investment banking firm, along with a law firm that specializes in helping to block mergers. Defenses include such tactics as (1) changing the bylaws so that only one-third of the directors are elected each year or that a 75 percent approval (a super majority) versus a simple majority is required to approve a merger, or both; (2) trying to convince the target firm's stockholders that the price being offered is too low; (3) raising antitrust issues in the hope that the FTC or the JD will intervene; (4) repurchasing stock in the open market in an effort to push the price above that being offered by the potential acquirer; (5) getting a *white knight* who is more acceptable to the target firm's management to compete with the potential acquirer; (6) getting a *white squire* who is friendly to current management to buy some of the target firm's shares; and (7) taking a poison pill, as described next.

*Poison pills*, which occasionally really do amount to committing economic suicide to avoid a takeover, are such tactics as: (1) borrowing on terms that require immediate repayment of all loans if the firm is acquired, (2) selling off at bargain prices the assets that originally made the firm a desirable target, (3) granting such lucrative golden parachutes to target executives that the cash drain from these payments would render the merger infeasible, and (4) planning defensive mergers that would leave the firm with new assets that have questionable value and a huge debt load to service. Currently, the most popular poison pill is for a firm to give its stockholders *stock purchase rights* that allow them to buy at half price the stock of an acquiring firm should the firm be acquired. The blatant use of poison pills is constrained by directors' awareness that excessive use can trigger personal suits by stockholders against directors who voted for them and, perhaps in the near future, by laws that would further limit management's use of such poison pills. Still, investment bankers and acquisition lawyers are busy thinking up new poison pill formulas, and others are just as actively trying to come up with antidotes.

## Establishing a Fair Value

If a friendly merger is being worked out between two firms' managers, it is important to be able to document that the agreed-on price is a fair one; other-



wise, the stockholders of either firm may sue to block the merger. Therefore, in many large mergers, each side will hire an investment banking firm to evaluate the target firm and to help establish the fair price. Even if the merger is not friendly, investment bankers may still be asked to help establish a price. If a surprise tender offer is to be made, the acquiring firm will want to know the lowest price at which it might be able to acquire the stock, while the target firm may seek help in “proving” that the price being offered is too low.

### Arranging Financing

Many mergers are financed with the acquiring firm’s excess cash. At other times, however, the acquiring firm has no excess cash; hence, it requires a source of funds to pay for the target firm. Perhaps the single most important factor behind the 1980s merger wave was the widespread use of junk bonds, and the system that was developed to market these bonds. To be a successful investment banker in the mergers and acquisitions business, a banker must be able to offer a financing package to clients, whether they are acquirers that need capital for acquisitions or target firms that need capital to finance stock repurchase plans or other defenses against takeovers.

### Risk Arbitrage

*Arbitrage* generally means simultaneously buying and selling the same commodity or security in two different markets at different prices and pocketing a risk-free return. However, the major brokerage houses, as well as some wealthy private investors, are engaged in a different type of arbitrage called *risk arbitrage*. The *arbitrageurs*, or “arbs” as they are called, speculate in the stocks of firms that are likely takeover targets. Vast amounts of capital are required to speculate in a large number of securities, and thus reduce risk, and also to make money on narrow spreads; however, many institutional investors have the wherewithal to play the game. To be successful, arbs need to be able to sniff out likely targets, assess the probability of offers reaching fruition, and move in and out of the market quickly and with low transaction costs.

### Self-Test Questions

1. What are some roles that investment bankers play in mergers?
2. What are some defensive tactics that firms can use to resist hostile takeover attempts?
3. What is the difference between pure arbitrage and risk arbitrage?

### Who Wins? The Empirical Evidence

The most recent merger waves have been notable for both the large number of businesses that have combined and the size of the mergers. With all of this activity and wealth transfer, the following questions have emerged: Do

corporate acquisitions create value? If so, how is the value shared between the parties involved?

Financial researchers have classified corporate acquisitions as part of “the market for corporate control.” Under this concept, management teams are viewed as facing constant competition from other management teams. If the team that currently controls a firm is not maximizing the value of the firm’s assets, then an acquisition will likely occur and increase the value of the firm by replacing its poor managers with better ones. Furthermore, under this model, intense competition will cause managers to combine or divest assets whenever such steps would increase the value of the firm.

The validity of the competing views on who gains from corporate mergers can be tested by examining the stock price changes that occur around a merger announcement. Such changes in the stock prices of the acquiring and target firms represent market participants’ beliefs about the value created by the merger and about how this value will be divided between the target and acquiring firms’ shareholders. As long as market participants are neither systematically wrong nor biased in their perceptions of the effects of mergers, examining a large sample of stock price movements will shed light on the issue of who gains from mergers.

One cannot simply examine stock prices around merger announcements dates because other factors influence stock prices. For example, if a merger were announced on a day when the entire market advanced, the fact that the stock price of a firm involved in a merger rose would not necessarily signify that the merger created value. Hence, studies examine the *abnormal returns* associated with merger announcements, where abnormal returns are defined as that part of a stock price change caused by factors other than changes in the general stock market.

Many studies have examined both acquiring and target firms’ stock price responses to mergers and tender offers. Jointly, these studies have covered nearly every acquisition involving publicly traded firms from the early 1960s to the present, and they are remarkably consistent in their results: On average, the stock price of target firms increases by about 30 percent in hostile tender offers, while in friendly mergers the average increase is about 20 percent. However, for both hostile and friendly deals, the stock prices of acquiring firms, on average, remain constant. Thus, the evidence strongly indicates that (1) acquisitions do create value but (2) shareholders of target firms reap virtually all of the benefits.

In hindsight, these results are not too surprising. First, target firms’ shareholders can always say no, so they are in the driver’s seat. Second, takeovers are a competitive game, so if one potential acquirer does not offer full value for a target firm, then another potential acquirer will generally jump in with a higher bid. Finally, managers of acquiring firms might well be willing to give up all the value created by the merger because the merger

would enhance the acquiring managers' personal positions with no explicit cost to their shareholders.

### Self-Test Questions

1. Explain how researchers can study the effects of mergers on shareholder wealth.
2. Do mergers create value? If so, where does this value go?
3. Do the research results discussed in this section seem logical? Explain your answer.

## Corporate Alliances

Mergers are one way for two firms to join forces, but many firms are striking cooperative deals, called *corporate alliances*, that fall short of merging. Whereas mergers combine all of the assets of the firms involved, as well as managerial and technical expertise, alliances allow firms to create combinations that focus on specific business lines that have the most potential for synergies. These alliances take many forms—from straightforward marketing agreements to joint ownership of world-scale operations.

A common form of corporate alliance is the *joint venture*, in which parts of firms are joined together to achieve specific, limited objectives. A joint venture is controlled by a management team consisting of representatives of the two, or more, parent firms. Joint ventures are becoming more prevalent in the health services industry as it strives to consolidate both insurance and provider functions. For example, both state officials and the Justice Department blocked the merger of two not-for-profit hospitals—Morton Plant and Mease—because the combined entity would dominate acute care delivery in an area near St. Petersburg, Florida. However, the hospitals were allowed to form a joint venture to consolidate billing and record keeping and to offer expensive high-tech services such as open-heart surgery, MRIs, and neonatal care. By forming a joint venture, the hospitals were able to gain at least some benefits of merging yet satisfy antitrust laws.

A joint venture analysis is similar to a merger analysis, except that there are multiple classes of equity investors (partners), each having its own set of cash flows and risk. To assess the financial attractiveness of the venture to each partner, the overall cash flows to the venture must be broken down into individual partner distributions. Then, each partner's cash flows are discounted at a cost of equity that reflects the unique risk faced by that partner. In effect, each partner conducts its own capital budgeting analysis to determine if the venture is in its best interest.

### Self-Test Questions

1. What is the difference between a merger and a corporate alliance?
2. What is a joint venture? Give some reasons why joint ventures may be advantageous to the parties involved.

## Goodwill

We close this chapter by briefly discussing the concept of *goodwill*. Goodwill is an accounting concept that is used to account for the fact that businesses often are acquired for a price that exceeds the value of the assets purchased. When a business is acquired, its balance sheet (real) assets often are increased, or written up, to account for the fact that their true value is greater than their book value. Under *purchase accounting* rules, the dollar amount of the write-up is added to the book value of equity to obtain a new equity value, called the *net asset value*.<sup>8</sup> Then, if the purchase price exceeds the net asset value, this excess is placed on the balance sheet of the combined enterprise in an asset account called goodwill. The theory is that the business being acquired has some intangible asset, such as a trademark or consumer (patient) loyalty, that creates value above the value of the business's tangible assets.

To illustrate the concept, assume that Big Hospital is acquiring Small Hospital (SH) for \$20 million. SH's premerger balance sheet has \$10 million in liabilities and \$10 million in equity. Furthermore, SH's total assets will be written up from \$20 million to \$25 million. The result is a net asset value for SH of  $\$10 + \$5 = \$15$  million. Now, with a purchase price of \$20 million versus a net asset value of \$15 million, the merger will create \$5 million in goodwill that will appear on the asset side of the combined balance sheet.

What happens to goodwill? Under old accounting guidelines, it was written off over 40 years, so  $\$5,000,000 / 40 = \$125,000$  in goodwill amortization expense would have appeared on the combined income statement for the next 40 years. Under current guidelines, goodwill "sits" on the balance sheet until some event occurs that reduces (impairs) its value. Then the entire amount, or some portion thereof, is written off. Because it is not a cash expense, the expensing of goodwill does not affect a business's cash flow, but it does lower reported income and earnings per share.

Note that goodwill represents a residual of the merger valuation rather than a component—that is, often you will hear someone ask, "Where is the premium for goodwill?" Any amount paid for goodwill must stem from the valuation process described previously. If this process does not identify a value that exceeds the balance sheet net asset value, the business has no goodwill, or at least none that raises its value above that stated on the balance sheet.

1. Describe the concept of goodwill.

## Self-Test Question

### Key Concepts

This chapter examined mergers and acquisitions, including business valuation. Here are its key concepts:

- A *merger* occurs when two firms combine to form a single firm.
- In most mergers, one firm (the *acquirer*) initiates action to take over another (the *target*).
- There have been five prominent *merger waves* in the United States. The most recent wave included a great deal of activity in the health services industry, which, for the most part, involved mergers that aimed to better position firms to respond to the changing healthcare marketplace.
- The primary *motives* for mergers are (1) synergy, (2) excess cash, (3) purchase of assets below replacement cost, (4) diversification, and (5) personal incentives.
- A *horizontal* merger occurs when two firms in the same line of business combine. A *vertical* merger is the combination of a firm with one of its customers or suppliers. A *conglomerate* merger occurs when firms in totally different industries combine.
- In a *friendly merger*, the managers of both firms approve the merger, whereas in a *hostile merger*, the target firm's management opposes the merger.
- Merger regulation falls into two broad categories: (1) *bid procedure regulation* and (2) *antitrust regulation*.
- *Merger analysis* consists of three tasks: (1) valuing the target firm, (2) setting the bid price, and (3) structuring the bid.
- Two approaches are most commonly used to *value businesses*: (1) the discounted cash flow (DCF) approach and (2) the market multiple approach.
- The DCF approach has two variations: (1) the *free operating cash flow method* focuses on operating cash flows, which are available to both service debt and equity investors, and (2) the *free cash flow to equityholders method* focuses on cash flows available solely to equityholders.
- The *market multiple approach* uses some proxy for value, such as earnings before interest, taxes, depreciation, and amortization (EBITDA), and then multiplies it by a multiple derived from recent merger transactions.
- The DCF approach has the strongest theoretical basis, but its inputs—the projected cash flows and discount rate—are very difficult to estimate. The market multiple approach is somewhat ad hoc, but it requires a much simpler set of inputs.
- The valuation of *small businesses* is complicated by several factors, including (1) lack of geographic and business line diversification, (2) lack of owners' diversification, (3) and lack of liquidity.
- Potential acquirers undertake *due diligence analysis* (1) to uncover issues that would prevent the acquirer from pursuing the acquisition and (2) to provide the acquirer with insights into the day-to-day

operations of the target firm so that an appropriate transaction can take place.

- *Investment bankers* are involved in mergers in a number of ways: (1) they help arrange mergers, (2) they help target firms develop and implement defensive tactics, (3) they help value target firms, (4) they help finance mergers, and (5) they speculate in the stocks of potential merger candidates.
- Many studies have been conducted to determine who wins in mergers. These studies indicate that mergers do create value, but most of this value goes to the shareholders of target firms.
- Mergers are one way for two firms to join forces, but many firms are striking cooperative deals, called *corporate alliances*, that fall short of merging. A *joint venture* is a corporate alliance in which two or more firms combine some of their resources to achieve a specific, limited objective.
- Some unique problems arise when not-for-profit firms are involved in mergers with for-profit firms. The two largest are (1) a *charitable foundation* must be created from the merger proceeds and (2) all *tax-exempt debt* must be refunded.
- *Goodwill*, a balance sheet asset account, is created when a business is acquired for more than its *net asset value*.

This concludes our discussion of business valuation, mergers, and acquisitions. In the next chapter, we discuss capitation and risk sharing.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that helps students understand how spreadsheets can be used in merger analysis.

In addition, the chapter has three problems in spreadsheet format that focus on merger analysis issues.

Both the model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

- To learn more about merger activity in the health services industry, see the Irving Levin Associates site at [www.levinassociates.com](http://www.levinassociates.com).
- Ohio State University maintains a website with video clips by various finance professionals briefly discussing topics of relevance to this course. Unfortunately, the clips do not include healthcare executives. To access the clips, go to [www.cob.ohio-state.edu/fn/clips.htm](http://www.cob.ohio-state.edu/fn/clips.htm). Then, click on the clip of interest.

## Selected Cases

There are three cases in *Cases in Healthcare Finance* that are applicable to this chapter:

- Case 22: Mount Olive Teaching Hospital, which focuses on the valuation and acquisition of one hospital by another.
- Case 23: Lowcountry Health Partners, which examines the feasibility of a proposed joint venture.
- Case 24: Madison Clinics, which focuses on the valuation of a medical practice.



## Notes

1. *Monopsony* power arises when there is a single buyer, so healthcare insurers can, at least in theory, become monopsonies.
2. For simplicity, we are holding the target's debt ratio at its current level. If the target has excess debt capacity, then the amount of new debt initially supported by the target increases the value of the target. Look at this in another way: Any new debt that can be issued up front on the basis of the target's assets reduces the amount of funds that the acquirer must put up to make the acquisition.
3. If the merger will affect the riskiness of the cash flows being discounted, then an adjustment must be made to the target's corporate cost of capital.
4. The use of the constant growth model to estimate a target's terminal value can create an upward bias in the valuation estimate because it assumes that the target will be operated forever. However, the contribution of cash flows after 40 to 50 years to the terminal value of the business is inconsequential, so the constant growth model does not really require constant growth into perpetuity. Still, if there is some doubt as to the life of the target, it might be best to either subjectively reduce the resulting constant growth terminal value estimate or to use some other methodology to estimate the terminal value.
5. See Ernest W. Walker and J. William Petty II, *Financial Management of the Small Firm* (Englewood Cliffs, NJ: Prentice-Hall, 1986), Chapter 13.
6. For more information on due diligence analysis, see Paul Louiselle, "Conducting Financial Due Diligence Analysis of Medical Practices," *Healthcare Financial Management*, December 1995, 29–33.
7. For an example of a due diligence checklist, see HFMA Principles and Practices Board, "Practice Acquisition: A Due Diligence Checklist," *Healthcare Financial Management*, December 1995, 36–39.
8. There are two methods of accounting for mergers: (1) *pooling of interests* and (2) *purchase accounting*. Under a pooling of interests, the balance sheet of the combined enterprise is merely the sum of the balance sheets of the two businesses. Under purchase accounting, goodwill is created as described in the text. The Financial Accounting Standards Board (FASB) recently issued a ruling that requires all mergers to use purchase accounting.

## CAPITATION, RATE SETTING, AND RISK SHARING

### Learning Objectives

After studying this chapter, readers should be able to:

- Discuss, both in qualitative and quantitative terms, the incentives and risks inherent in capitation reimbursement.
- Describe how premium rates are developed.
- Explain the risk-sharing process, including its goals and implementation problems.

### Introduction

Thus far, we have focused on making financial management decisions in what might be termed a *conventional reimbursement* environment. In such an environment, providers are reimbursed on the basis of each patient encounter, and hence the term *fee-for-service* often is used to describe conventional reimbursement. Here, each hospital stay in an inpatient setting and each patient visit in an outpatient setting will generate additional revenue. The basis for payment may be charges, discounted charges, prospective payment, per diem, or some other methodology, but the key feature of conventional reimbursement is that higher patient volume leads to increased revenues. Also, in many conventional payment methodologies, the greater the intensity of service provided, and hence the higher the costs, the greater the reimbursement amount.

Under *capitation*, providers receive a fixed fee for each member (patient) enrolled, regardless of the amount or intensity of services provided. Clearly, capitation represents a reimbursement methodology that requires a different approach to financial management decision making than that used under conventional reimbursement. The basic cornerstones of finance, such as discounted cash flow analysis, risk and return, and opportunity costs, remain unchanged, but the manner in which these concepts are applied must recognize the unique features of capitation.

In this chapter, we first present some background information about capitation and discuss the mechanics of capitation and its implications for

healthcare financial management. Then we present some techniques for setting rates on capitation contracts. Finally, we present some information on risk sharing among provider components within integrated delivery systems.

## An Overview of Capitation

Formally defined, capitation is a flat periodic payment per enrollee to a health-care provider; it is the sole reimbursement for providing services to a defined population. The word “capitation” is derived from the term “per capita,” which means per person. Generally, capitation payments are expressed as some dollar amount *per member per month (PMPM)*, where the word “member” typically means enrollee in some managed care plan, which is usually an HMO. For example, a primary care physician may receive a capitated payment of \$20 PMPM for attending to the healthcare needs of 250 members of BetterCare, a regional HMO. Under this contract, the physician would receive  $\$20 \times 250 \times 12 = \$60,000$  in total capitation payments over the year, and this amount must cover all of the primary care services offered to the patient population specified in the contract. (Do not jump to the conclusion that the primary care physician is \$60,000 richer because of this contract. In addition to physician compensation, the \$60,000 must cover all of the practice costs involved with treating these patients, which are substantial.) Usually, capitated payments are adjusted for age and gender, but no other adjustments typically are made.

In a fee-for-service system, the financial risk of providing healthcare services is shared between purchasers, typically employers, and insurers. Hospitals, physicians, and other providers bear negligible risk (assuming “fair” reimbursement amounts) because they are paid on the basis of the volume of services provided. Insurers bear short-term risk in that in any year, payments to providers can exceed the amount of premiums collected. However, poor profitability by insurers in one year usually can be offset by price increases to purchasers the next year, so the long-term risk of financing the healthcare system is borne by purchasers.

Under capitation, fixed payments are made to providers regardless of the volume of services rendered, so risk sharing occurs among all three parties. Providers bear the short-term risk that the costs of providing service, including opportunity costs (profits), might exceed the capitation payment. Insurers/networks bear a longer-term risk in that provider costs can increase when contracts are renewed, but purchasers still bear the ultimate risk of having to support the cost of the healthcare system.

### Self-Test Questions

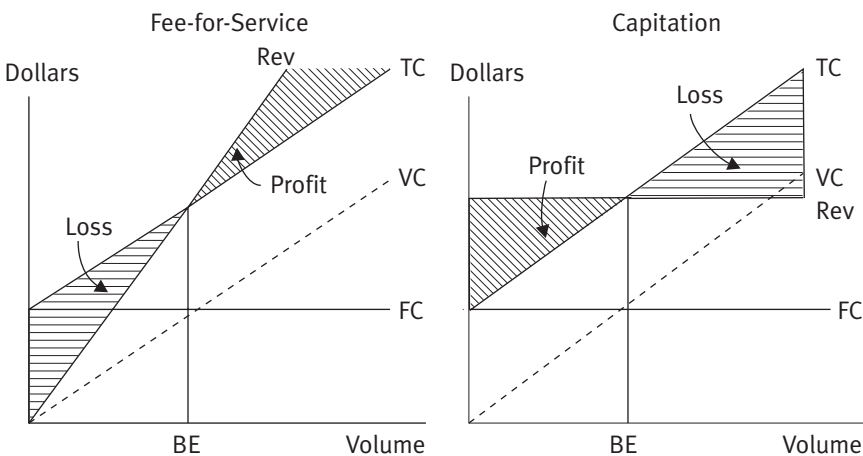
1. What is capitation?
2. What are the primary differences between a conventional payment system and capitation?

### Provider Incentives Under Capitation

Capitation has a dramatic impact on provider incentives and hence on provider behavior. Consider Figure 17.1, which depicts revenues and costs to a provider under both fee-for-service and capitation. Regardless of the payment system, total costs (TC), which are merely the sum of fixed costs (FC) and variable costs (VC), are tied directly to volume, so the greater the volume of services delivered, the greater the amount of total costs. The difference between the two graphs is the revenue line and how profits and losses are realized. Under fee-for-service, the revenue line (Rev) is upward sloping, and it starts at the origin. At zero volume, the provider receives zero revenue, but at any positive volume, the greater the volume the higher the revenue. Under capitation, assuming a fixed number of enrollees, revenues are fixed independently of volume, and hence the revenue line is horizontal. On each graph, breakeven (BE) occurs when revenues equal total costs.

Although the graphs are somewhat similar in general appearance, there is a profound difference in how profits and losses occur. First, consider the fee-for-service graph in Figure 17.1. All volumes to the left of breakeven produce a loss for the provider, while all volumes to the right of breakeven produce a profit. Thus, the incentive for providers is to increase utilization because increased volume leads to increased profits. Now, look at the capitation graph. Here, all volumes to the left of breakeven produce a profit, whereas all volumes to the right of breakeven result in a loss. Under capitation, providers have the incentive to decrease utilization because decreased volume leads to increased profits. The only way to increase revenues is to increase the number of covered lives (enrollees).

Capitation completely reverses the actions that providers must take to ensure financial success, and many providers find it difficult to adjust to the new, perverse (by conventional reimbursement standards) incentive system.



**FIGURE 17.1**  
Revenue and Cost Structures Under Fee-for-Service and Capitation

Under fee-for-service, the keys to success are to work harder, increase volume, and hence increase profits; under capitation, the keys to profitability are to work smarter and decrease volume. Because the primary means to profitability with fee-for-service is increased volume, increased reimbursement rates, or both, the primary task of managers is to maximize utilization and reimbursement rates. Furthermore, any deficiencies in cost control often can be overcome by higher volume. Under capitation, the primary path to profitability is through cost control, so the key to success is lower volume and cost-effective treatment plans.

In general, capitation motivates providers to provide only needed services, and to provide those services in the lowest-cost setting. Has capitation influenced provider behavior? It is difficult to fully assess the impact of capitation because few providers are fully capitated. Indeed, capitation is used most widely for primary care physicians, less so for specialists, and even less for hospitals. In fact, there is some evidence that managed care plans are cutting back on their use of capitation. Still, even relatively limited use of capitation, coupled with aggressive utilization management, can influence an entire market because it will set the standard for low-cost services. Evidence indicates that capitation accompanied by aggressive utilization management can reduce inpatient days from the national average of about 700 per 100,000 population to less than 250. If 85 percent occupancy is considered to be full capacity, then only about 0.8 beds are required per 1,000 population versus the current need, based on national average usage rates, of about 2.3 beds per 1,000 population. In spite of recent downsizing in the hospital industry, these data indicate that the industry still has too much capacity and that continued shrinkage is likely to occur.

Regarding physicians' behavior, the key feature is that managed care and capitation, with its emphasis on wellness and prevention as opposed to treatment, requires a different mix and fewer physicians than currently exists. Although studies in this area are far from consistent, most indicate that the managed care system, as compared to a fee-for-service system, will require about the same number of primary care physicians but 25 to 50 percent fewer specialists. Furthermore, managed care plans use more physician extenders, such as nurse practitioners and physician assistants, than are currently utilized. Of course, not all predictions come true, and the structure of the health services industry may not change as drastically as these data indicate. However, the handwriting on the wall suggests two powerful trends: (1) fewer hospital beds and (2) a physician mix that contains a greater proportion of primary care physicians. Most importantly, the data tell us that historical utilization rates based on conventional reimbursement methodologies are not good predictors of future utilization when the payment system is capitation or some other system that encourages aggressive utilization control.

Although much has been written about the negative aspects of capitation, particularly the incentive to withhold needed services, it must also be

recognized that there are positive aspects to capitation. Here are some potential benefits associated with capitation:

- Providers receive a fixed payment regardless of whether services are actually rendered. Capitation revenues are predictable and timely and thus are less risky than revenues from conventional payment methodologies that are tied to volume.
- Capitation payments are received before services are rendered, so, in effect, payers are extending credit to providers rather than vice versa, as under conventional reimbursement.
- Capitation supports national healthcare goals—primarily increased emphasis on cost control as well as wellness and prevention.
- Capitation may ease the reimbursement paperwork burden and hence reduce expenditures on administrative costs.
- Capitation aligns the economic interests of physicians and hospitals because risk-sharing systems are typically established that allow all providers in a capitated system to benefit from reducing costs.
- Similarly, capitation encourages utilization of lower-cost treatments, such as outpatient surgery and home health care, as opposed to higher-cost inpatient alternatives. Thus, capitation creates incentives to use those services that are typically preferred by patients when such alternatives are clinically appropriate.

1. What are the differences in provider incentives under conventional reimbursement and capitation?
2. What are the advantages of a capitated payment system?
3. What does current experience under managed care tell us about the look of the future healthcare delivery system?

## Self-Test Questions

## Financial Risk Under Capitation

One of the key issues facing providers under capitation is its impact on financial risk. To examine this issue, we will first present a descriptive picture of financial risk, then examine the nature of financial risk, and finally present the results of an analysis that examines the financial risk inherent in capitation contracts.

### *Descriptive Risk*

One way to assess the risk inherent in capitation versus other reimbursement contracts is to describe the nature of the risks incurred. Table 17.1 lists the most common provider-reimbursement methodologies and describes the financial risks inherent in each system.

Fee-for-service is the least risky because the only risk facing providers is the risk that volume will be too low to cover fixed costs, assuming that

**TABLE 17.1**

Descriptive Risk  
Under Various  
Reimbursement  
Methodologies

<i>Contract Type</i>	<i>Provider Risks</i>
Fee-for-service (charges)	Volume too low to cover fixed costs
Discounted fee-for-service (Discounted charges)	Volume too low to cover fixed costs
Prospective payment	Volume too low to cover fixed costs Case intensity Length of stay (for inpatients)
Per diem	Volume too low to cover fixed costs Case intensity Case mix Payer-limited length of stay
Global pricing	Volume too low to cover fixed costs Case intensity Pre- and postoperative care Physician services
Capitation	Utilization Case intensity Case mix Actuarial accuracy

the charge is set high enough to cover variable costs. **Note that regardless of the specific fee-for-service methodology, providers bear the cost-of-service risk in that costs can exceed revenues.** However, a primary difference among the reimbursement types is the ability of the provider to influence the revenue/cost ratio.

If the fee-for-service payment is based on *charges* established by the provider, it can most easily ensure that revenues exceed costs. Furthermore, if providers have the power to set rates above those that would exist in a truly competitive market, charge-based fee-for-service reimbursement becomes even less risky. Finally, providers can increase usage by *churning*—that is, creating more visits, ordering more tests, extending inpatient stays, and so on—which, in turn, increases revenues and reduces risks.

Most hospitals set standard charges for their services but then agree to discount those charges for most third-party payers whose payments are tied to charges. *Discounted fee-for-service* may lower the profit potential of providers, but it does not alter the risks borne by providers.

*Prospective payment*, in which a fixed payment is made on the basis of each patient's diagnosis or procedure, adds a second dimension of risk to reimbursement contracts because the bundle of services needed to treat a particular diagnosis or the services provided for a particular procedure may

be more costly than that assumed in the payment. If, on average, patients require more intensive services and, for hospitals, a longer length of stay than assumed in the prospective payment amount, the provider must bear the added costs.

*Per diem* reimbursement, whereby providers are paid a preset amount per patient day, is often used for hospitals and long-term care facilities. In addition to a single, all-inclusive per diem rate, *stratified per diems* are sometimes used whereby different rates are paid for dissimilar categories of care, such as general acute inpatient, obstetrical, and intensive care. Even under stratified per diems, where one rate usually covers a large number of diagnoses, providers bear case-mix risk along with intensity risk. In addition, providers bear the risk that the payer, through utilization reviews, will constrain lengths of stay and hence increase intensity during the days that a patient is hospitalized. Thus, under per diem, the “time compression” of services, coupled with shortened lengths of stay, can put significant pressure on providers’ profitability.

Under *global pricing*, payers pay a single prospective payment that covers all services delivered in a single episode, whether the services are rendered by a single or by multiple providers. For example, a global fee may be set for all obstetric services associated with a pregnancy that are provided by a single physician, including all prenatal and postnatal visits, as well as the delivery itself. Or, a global price may be paid for all physician and hospital services associated with cardiac bypass surgery.

From a payer’s perspective, global pricing eliminates the potential for problems associated with unbundling and upcoding. *Unbundling* involves pricing the individual components of a service separately rather than as a package. For example, a physician’s treatment of a fracture can be bundled, and hence billed as one episode, or it can be unbundled, with separate bills submitted for diagnosis, x-rays, setting the fracture, removing the cast, and so on. The rationale for unbundling usually is to provide more detailed records of treatments rendered, but often the result is higher total charges for the parts than would be charged for the entire package. *Upcoding* is the practice of billing for a procedure that yields a higher prospective payment than the one actually performed. Clearly, the more services that must be rendered for a single payment, the more providers are at risk for intensity of services.

Finally, under *capitation*, providers receive a fixed payment PMPM to provide all covered services to some defined population. Now, providers assume utilization and actuarial risks along with the risks assumed under the other reimbursement methods.

When the risks under different reimbursement systems are outlined in this descriptive fashion, it is easy to jump to the conclusion that capitation is by far the riskiest to providers, while fee-for-service based on charges is the least risky. However, before finalizing our conclusions regarding the risk



to providers under capitation, we need to examine the issue a little closer. We begin our more detailed examination with a discussion of the nature of financial risk.

### ***The Nature of Financial Risk***

As we discussed in Chapters 4 and 12, financial risk stems from uncertainties inherent in expected cash flows. If all forecasted cash flows were known with certainty, there would be no financial risk. However, because of uncertainties, there is some probability that a reimbursement contract will be less profitable than expected, and the greater the probability of a realized profitability far below that expected, the greater the financial risk.

Financial risk can be classified along several dimensions, but two dimensions are of particular relevance to our discussion of financial risk under capitation: (1) objective risk and (2) subjective risk. *Objective risk* occurs when the risk inherent in an uncertain outcome is known. For example, the flip of a coin has only objective risk. It is uncertain whether the flip will result in a head or a tail, so the flip is risky, but the probability of flipping a head or tail, 50 percent, is known with certainty. *Subjective risk* occurs when the probability distribution itself is uncertain. For example, a particular weather forecaster may predict that the chance of rain is 20 percent, but different forecasters may attach different probabilities to the event. Here, there are two dimensions to risk: (1) the risk inherent in the probability distribution (20 percent rain/80 percent no rain) and (2) the risk that the probability distribution itself (the weather forecast) is wrong.<sup>1</sup>

We will see that the objective financial risk inherent in capitation contracts is not as high as many people suspect. However, their subjective financial risk is often very high, so the overall impact of capitation on the financial risk of most providers is much higher than indicated by an objective risk analysis because, by definition, subjective risk cannot be measured.

It is important to make one other point concerning financial risk. Under most types of reimbursement, rates can be set too low to cover costs. In such contracts, providers will lose money, but they do not necessarily bear a great deal of financial risk as defined here because such risk is a function of uncertainty, not profitability. If you loan \$1,000 to your brother-in-law with every expectation that the loan will never be repaid, the loan is not very risky at all, even though its expected rate of return is -100 percent. Similarly, a hospital's reimbursement contract with a certain loss of, say, \$100,000, has no financial risk because there is no uncertainty regarding the contract's profitability. The point here is that many payers that offer capitated contracts have a great deal of bargaining power that can be used to negotiate very tough terms with providers. These tough terms, and the resulting potential for losses on the contract, are not a result of the financial risk inherent in capitation contracts, but rather a result of the negotiating power of the payer.

That same payer can negotiate a low-profitability contract regardless of the reimbursement methodology used.

### **A Quantitative Analysis**

The financial risk associated with provider contracts stems from uncertainty in profitability, so both revenues and costs must be considered. We will use hospitals to analyze the financial risk inherent in prospective payment and capitation contracts, but the results apply to physicians and other healthcare providers.<sup>2</sup>

Under prospective payment based on diagnosis, there is significant revenue risk because the amount of reimbursement depends on the number of admissions, with lower volume yielding reduced revenues. However, under capitation, and **assuming a fixed number of enrollees**, there is virtually no revenue risk. The hospital will receive the contractually fixed amount per member per month regardless of patient volume.

On the cost side, the financial risks are identical under the two contracts. There are fixed costs inherent in providing the service that must be met regardless of volume, and variable costs that are incurred for each patient admission. Thus, total costs, the sum of fixed and variable components, are dependent on volume. If we assume, at least initially, that the number and nature of admissions are unaffected by the reimbursement contract, then realized total costs are the same for a given population whether the payment method is prospective payment or capitation.

The financial risk facing hospitals is tied to uncertainty in profitability and hence stems from both uncertainties in the revenue stream and uncertainties in total costs. To examine the impact of these uncertainties, we will consider two hospitals: (1) Hospital F, whose costs are all fixed, and (2) Hospital V, whose costs are all variable. Clearly, no real-world hospital has all fixed or all variable costs, but by looking at these extremes we can gain a better appreciation of the factors that influence financial risk under prospective payment and capitation.

To keep the analysis manageable, assume a hypothetical situation in which the contract involves 1,000 members; the annual capitation payment is \$300 per member per year (PMPY); the expected number of inpatient stays is 0.1 PMPY, or 100 admissions per year; and the prospective payment per admission is \$3,000. On the cost side, assume Hospital F has fixed costs of \$300,000 and no variable costs to treat the population served, while Hospital V has variable costs of \$3,000 per inpatient stay and no fixed costs.

Table 17.2 contains the annual cash flows to each hospital associated with the two contracts. Note that the initial values were chosen so that the revenues are the same under each contract type and that total costs are the same at both hospitals. Also, for ease, the values were chosen so that net income under both contracts is zero.

Now, let's introduce risk into the analysis. Again, to keep the example manageable, assume that the only uncertainty in the contracts is patient volume; that is, the capitation payment, prospective payment per admission, fixed costs, and variable costs per inpatient stay are known with certainty at the beginning of the year (beginning of the contract period). What would happen to profitability if realized volume differed from expected volume? Table 17.3 answers this question.

Uncertain volume has no effect on Hospital F under capitation or on Hospital V under prospective payment. In each instance, revenues and costs move in step with one another. Hospital F has all fixed costs, and under capitation its revenues are fixed, so changes in volume have no impact on profitability. Under prospective payment, revenues vary with volume, while costs are fixed, so higher volume leads to higher profitability. Thus, with prospective payment contracts, Hospital F has a financial incentive to increase volume because increased volume leads to higher profits.

The situation is reversed at Hospital V. When all costs are variable, profits are constant under prospective payment but variable under capitation. Increased volume leads to increased revenue under prospective payment, but the revenue increase is offset exactly by higher costs. Hospital V receives \$3,000

**TABLE 17.2**Annual Cash  
Flows

	<i>Hospital F</i>		<i>Hospital V</i>	
	<i>Prospective Payment</i>	<i>Capitation</i>	<i>Prospective Payment</i>	<i>Capitation</i>
Total revenues	\$300,000	\$300,000	\$300,000	\$300,000
Fixed costs	300,000	300,000	0	0
Variable costs	0	0	300,000	300,000
Net income	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$ 0</u>	<u>\$ 0</u>

**TABLE 17.3**Net Income at  
Different Volume  
Levels

<i>Number of Inpatient Stays</i>	<i>Hospital F</i>		<i>Hospital V</i>	
	<i>Prospective Payment</i>	<i>Capitation</i>	<i>Prospective Payment</i>	<i>Capitation</i>
80	(\$60,000)	\$0	\$0	\$ 60,000
85	(45,000)	0	0	45,000
90	(30,000)	0	0	30,000
95	(15,000)	0	0	15,000
100	0	0	0	0
105	15,000	0	0	(15,000)
110	30,000	0	0	(30,000)
115	45,000	0	0	(45,000)
120	60,000	0	0	(60,000)

for each admission, but its variable costs also equal \$3,000 per admission, so additional admissions add nothing to the bottom line. Lower volume means lower costs regardless of the reimbursement method, but under capitation the revenue stream is fixed, so Hospital V has a financial incentive under capitation to decrease volume because lower volume leads to higher profits.

The analysis can be extended to include uncertainty in variable costs and prospective payment per admission, but the general results remain the same. If all costs are fixed, there is less objective financial risk to capitation contracts than to prospective payment contracts. If all costs are variable, there is less objective financial risk to prospective payment contracts than to capitation contracts.

When assessing the relative objective financial risk of capitation contracts, the key question to providers is “Are the costs at my organization predominantly fixed or predominantly variable?” If the costs are mostly fixed, then objective financial risk is actually reduced when moving from prospective payment to capitation because the fixed revenue stream better matches the fixed cost structure. On the other hand, if the cost structure is predominantly variable, moving to capitation will increase objective financial risk because the fixed revenue stream is a poor match for a cost structure that is highly correlated to volume.

Most healthcare providers, and hospitals in particular, have relatively high fixed-to-total-cost ratios.<sup>3</sup> Thus, for most providers, capitation contracts actually have less objective financial risk than prospective payment contracts because financial risk is reduced by matching the uncertainties inherent in the revenue and cost streams. When organizations have a high percentage of fixed costs, a fixed revenue stream stabilizes profits and hence reduces financial risk.

If objective financial risk is reduced under capitation contracts, why did our earlier descriptive analysis conclude that capitation is more risky than prospective payment? One reason, of course, is that the descriptive assessment did not consider in any systematic way the relationships between revenues and costs. More importantly, the numerical analysis ignored the subjective risk inherent in capitation contracts. The numerical analysis focused solely on objective financial risk—we assumed that providers know their cost structures and population characteristics well enough to be confident of the revenue and cost estimates. Under these conditions, capitation contracts are clearly less risky to providers with a high percentage of fixed costs.

However, to limit the overall financial risk of capitation contracts to objective risk, it is necessary that providers be able to accurately forecast costs and volumes for a large number of diagnoses for a given population. For example, assume that a hospital signs a capitation contract to provide all common inpatient services to a patient population of 100,000. If the hospital is to bear only objective financial risk, it must know with some confidence the expected volume by diagnosis, as well as the costs for treating those diagnoses. Thus, the hospital needs relatively sophisticated actuarial and cost data. In

addition to the confidence in cost and utilization data, providers must have a sufficient number of capitated lives to make the law of large numbers work in their favor. With too few patients covered by capitation, just one or two adverse cases can easily push expected profitability into realized losses. Only with tens of thousands of members can providers take advantage of the risk reduction inherent in treating a “portfolio” of patients.

Even if a contract has substantial underlying financial risk, whether objective or subjective, its effective riskiness is lessened if management can take actions to counter unexpected adverse trends as they develop. Suppose a hospital enters into a capitation contract without good estimates of volume and costs. If six months into the contract managers realize that total costs exceed estimates, and hence the contract will be less profitable than expected, they would try to take actions to increase the contract’s profitability. The only two managerial actions available to turn a bad capitation contract into a good one is to decrease volume, lower costs per admission, or both. In the past, hospitals with profitability problems solved such problems by raising charges and increasing volume. Under capitation, however, the prescription for increased profit requires actions—cutting costs and volume, which is more difficult to implement than previous prescriptions. Furthermore, when a high proportion of costs is fixed, cost-reduction efforts are extremely challenging because they can be achieved only by selling off plant and equipment and shrinking the labor force. Under capitation contracts, providers are less able to influence the profitability of a contract once it goes into force, so they are less able to cope with the given amount of financial risk faced.

Another risk that providers face under capitation is the impact of outliers. The costs associated with a single patient, especially to a hospital, can fall well beyond normal bounds, and hence one or just a few outliers can result in financial losses well beyond those estimated at the time a contract is signed. In general, prospective payment contracts have outlier provisions, so providers are somewhat protected against the risks associated with high-cost outliers. If capitation contracts do not contain such provisions, the risk of outliers increases the financial risk inherent in such contracts.<sup>4</sup> Furthermore, to increase the probability that realized volume, and hence cash flows, will be close to that forecasted, providers must have a relatively large number of covered lives under capitation contracts.

Our quantitative analysis leads to two primary conclusions about the relative risk of capitation contracts. First, the objective financial risk inherent in capitation contracts is not as high as most people think. Providers with a high percentage of fixed costs can actually stabilize earnings under capitation and hence reduce financial risk. Second, the overall financial risk of capitation contracts, including both objective and subjective risk, can be very high if providers (1) do not have the actuarial and cost data available to make sound capitation pricing decisions; (2) do not have a sufficient number of capitated patients to take advantage of the law of large numbers; and (3) do not have the

capability to reduce volume and cut costs, if necessary, to react to any adverse trends that might develop.

Taken together, these conclusions have several implications for health-care providers. To prosper in a capitated environment, providers must be able to estimate accurately not only their own costs but also the diagnoses and patient volumes that would result from a particular contract. This means that providers will need good costing systems as well as actuarial expertise, which is a domain historically left to insurers. Without these competencies, it will be impossible to enter into capitation contracts without bearing a high degree of subjective financial risk.

Also, providers will have to break with traditional paradigms. Financial problems can no longer be solved by raising charges and increasing volume. Under capitation, raising charges (having a high bid on a contract proposal) will mean fewer patients for the provider, which will have an adverse impact both on revenues and on achieving a capitated population sufficiently large to realize actuarial predictions. Furthermore, the key to success once the contract has been signed is to lower costs and utilization. This requires nontraditional strategies, so healthcare managers must exhibit flexibility and adaptability to successfully manage under capitation.

Finally, providers that are less efficient than their local counterparts confront very difficult issues when negotiating managed care contracts. Capitation contracts are usually set at rates that assume the efficient delivery of services to control unnecessary services and costs. Less-efficient providers will experience more challenges under capitation because they must choose between accepting rates, which, at least in the short run, may not cover costs, or lose market share that they may not be able to regain. The difficulties that inefficient providers face do not result from financial risk differentials but from prior management practices that did not sufficiently stress the efficient delivery of services.

1. Briefly, describe the following reimbursement systems and, using the descriptive approach, analyze the risks to providers under each system:
  - a. Fee-for-service
  - b. Discounted fee-for-service
  - c. Prospective payment
  - d. Per diem
  - e. Global pricing
  - f. Capitation
2. What is the basic source of financial risk?
3. Distinguish between objective and subjective financial risk.
4. What lessons can be learned from the quantitative risk assessment of prospective payment and capitation contracts?

## Self-Test Questions

## Development of Premium Rates

One of the primary financial management functions within health insurance companies is the development of premium rates for healthcare buyers, typically employers. This involves estimating the total costs of providing healthcare services to the covered population. In this section, we discuss several methodologies for estimating provider payments, which are then aggregated to estimate total costs, the basis for the premium rate. Although premium rates typically are developed by health insurers, some integrated health systems contract with insurers to provide all covered services at a fixed per member rate. In these situations, the health system, in effect, acts as an insurer because it assumes utilization risk. Thus, the material in this section is relevant in those circumstances. Finally, it is useful for managers at all healthcare providers to understand how health insurers set premiums because the premiums collected by insurers establish the dollars available to pay for provider services.

## Allocation of Premium Dollars

HMOs and other managed care organizations collect premium dollars from employers and other purchasers of healthcare, and then use those dollars to pay providers, cover administrative expenses, and earn profits. To help better understand how HMOs set their premium rates, first consider Table 17.4, which illustrates how a typical premium dollar is spent. First, HMOs have the same types of management and marketing expenses as any other business, and the premium dollar must cover such costs. Also, it is necessary for HMOs to earn profits, both to create reserves for contingencies and for distribution to stockholders if investor owned. About 16 percent of the premium dollar goes to administration and profit at the HMO, while the remaining 84 percent is paid out to providers. The biggest provider expense typically is for physician services, at 36 percent of the premium dollar. Of this amount, approximately 11 percent is spent on primary care, 16 percent on specialist care, 5 percent on ancillary services, and 4 percent on administration and profit of the physician group. (Often, physician services are contracted with a large medical group practice, which itself has administration costs and profit requirements.)

The next major item is payments for hospital and other institutional care provided within the system (within the HMO's provider panel), which totals 33 percent of the premium dollar. In addition to medical services, patients are consuming a larger and larger amount of prescription drugs, which amount to about 10 percent of the premium dollar. Finally, HMO members sometimes require services from providers that are out of the HMO's system, either because there are no in-system providers for that service or the services are required outside the geographic area served by the HMO. Payments to out-of-system providers, including both physicians and hospitals/institutions, average 5 percent of the premium dollar.



		<b>TABLE 17.4</b>
Total premium dollar	<u>100%</u>	Typical
HMO administration/profit	<u>16%</u>	Allocation of the
Paid to within-system physicians:		HMO Premium
Primary care	11%	Dollar
Specialists	16	
Ancillary services	5	
Administration/profit	<u>4</u>	
Total to within-system physicians	<u>36%</u>	
Paid to within-system hospitals/institutions	<u>33%</u>	
Paid for prescription drugs	<u>10%</u>	
Paid to out-of-system providers	<u>5%</u>	

Source: Jennings Ryan & Kolb.

Note that the Table 17.4 percentages are averages, and there are wide variations among HMOs as to how the premium dollar is allocated. Health-care purchasers want a high percentage of the premium dollar to go to providers to encourage them to provide needed services in a timely manner. Conversely, HMOs have an incentive to lower the amount paid to providers, both to increase profits and to ensure competitive pricing to buyers in an increasingly hostile marketplace.

### **Developing Premium Rates: An Illustration<sup>5</sup>**

There are many models used to develop the premium rates that managed care plans charge to purchasers. In this section, we illustrate several methods that an HMO or integrated delivery system can use to estimate the payments it must make to its providers to cover a defined population, which it can then aggregate and combine with its own costs to estimate a premium rate. Rates are developed as if all providers were capitated because, at least initially, the premium rate will be calculated on a per member per month basis. When the rate is quoted to purchasers of health insurance, it may be quoted on a per member per month basis or some other basis such as per individual and per family. Note, however, that the reimbursement to the providers of healthcare can be by capitation, by discounted fee-for-service, or by any other method.

Assume that BetterCare, Inc., an aggressively managed HMO, must develop a premium bid to submit to Big Business, a major employer in BetterCare's service area. To keep the illustration manageable, assume that all medically necessary in-area services can be provided by a single hospital that offers both inpatient and outpatient services, including emergency department services, a single nursing home, a panel of primary care physicians, and a panel of specialist physicians. In addition, BetterCare must budget for covered care to be delivered out of area when its members are traveling. Thus, to develop its bid, BetterCare has to estimate the amount of payments to this set



of providers for the covered population, plus allow for administrative expenses and profits. To keep the illustration manageable, we are excluding pharmacy and ancillary services benefits. (If you like, assume that they are being *carved out* and hence provided under a separate contract.)

### Hospital Inpatient Rate

The fee-for-service method is often used to set the within-system hospital inpatient capitation rate. This method is based on expected utilization and negotiated charges rather than underlying costs, although there clearly should be a link between charges and costs. To illustrate the concept, assume that BetterCare targets 350 inpatient days for each 1,000 members, or 0.350 inpatient days per member. Furthermore, BetterCare believes that a fair fee-for-service charge in a competitive environment would be \$938 per inpatient day. Note that the values chosen both for utilization and payment are not based on conventional reimbursement experience. Rather, the number of inpatient days reflects a highly managed working-age population, and the fee-for-service charge is designed to cover all hospital costs, including profits, in an efficiently run hospital that operates in a highly competitive environment. The inpatient cost per member per month (PMPM) is found as follows:

$$\begin{aligned} \text{Inpatient cost PMPM} &= \frac{\text{Per member utilization rate} \times \text{Fee-for-service rate}}{12} \\ &= \frac{0.350 \times \$938}{12} = \$27.35 \text{ PMPM.} \end{aligned}$$

Thus, using the fee-for-service method, BetterCare estimates inpatient costs for Big Business's HMO enrollees at \$27.35 PMPM.

### Other Institutional Rates

The rates for out-of-area hospital usage, hospital outpatient surgeries, and emergency department visits, as well as for skilled nursing home stays, were developed using the fee-for-service equivalent method discussed above. Here is a summary of BetterCare's estimates for these services:

<i>Service</i>	<i>Annual Utilization per 1,000 Members</i>	<i>Fee-for-Service Rate</i>	<i>Capitation Rate PMPM</i>
Out-of-area inpatient days	25	\$1,495	\$ 3.11
Outpatient surgeries	50	1,082	4.51
Emergency department visits	125	138	1.44
Skilled nursing home days	5	150	0.06
			<u>\$9.12</u>

Here, each PMPM capitation rate was calculated by multiplying annual utilization by the fee-for-service rate, and then dividing the resulting product first by 1,000 to obtain a per member amount and then by 12 to get the PMPM rate. The end result is a capitation estimate of \$9.12 PMPM for the services

listed above. Of course, actual payments to these providers typically would be made on a discounted fee-for-service basis.

We will use the *cost approach* to estimate primary physicians' costs for Big Business's enrollees. This method is the most common for setting physicians' payments, and it is based on utilization and underlying costs, as opposed to charges. The starting point is expected patient demand, by specialty, for physicians' services. This demand is then translated into the number of full-time equivalent (FTE) physicians required per member (enrollee), which depends on physician productivity. Finally, the cost for physician services is estimated by multiplying staffing requirements by the average cost per FTE, including base compensation, fringe benefits, and malpractice premiums. In addition, an amount—usually some dollar amount per member—is added for clinical and administrative support for physicians.

### Primary Care Rate

In developing its capitation rate for primary care physicians, BetterCare made the following assumptions:

- On average, each enrollee makes 3.0 visits to a primary care physician per year.
- Each primary care physician can handle 4,000 patient visits per year.
- Total compensation per primary care physician is \$175,000 per year.

Under these assumptions, each enrollee will require  $3 / 4,000 = 0.00075$  primary care physicians, and hence each enrollee will require  $0.00075 \times \$175,000 = \$131.25$  in primary care services annually. Finally, the cost PMPM =  $\$131.25 / 12 = \$10.94$ . Thus, the rate that BetterCare will propose to Big Business will include \$10.94 PMPM for primary care physician compensation. Note that, in practice, these calculations usually are first done on a per 1,000 member basis and then translated into a PMPM basis. For ease, we have simplified the calculations.

The capitation rate for specialists' care is developed using the cost approach in a similar manner to that for primary care. Here are BetterCare's assumptions:

### Specialty Care Rate

- On average, each enrollee is referred for 1.2 visits to specialty care physicians per year.
- Each specialty physician can handle 2,000 patient visits per year.
- Total compensation per specialist is \$284,000 per year.

Under these assumptions, each enrollee will require  $1.2 / 2,000 = 0.0006$  specialists, and hence each enrollee will require  $0.0006 \times \$284,000 = \$170.40$  in specialists' services. Finally, the cost PMPM =  $\$170.40 / 12 = \$14.20$ . Thus, the rate that BetterCare will propose to Big Business will include \$14.20 PMPM for specialist physician compensation.

### Other Physician- Related Costs Rate

Thus far, we have estimated the capitation rate for physicians' compensation, but we have not accounted for other costs associated with physicians' practices. First, physicians require, on average, 1.7 FTEs for clinical and administrative support, and each supporting staff member receives an average of \$35,000 per year in total compensation. Because the physician requirement to support each member is 0.00075 primary care plus 0.0006 specialists, for a total of 0.00135 physicians, each member will require  $0.00135 \times 1.7 \times \$35,000 = \$80.00$  of physician's support annually, or  $\$80.00 / 12 = \$6.67$  PMPM.

Next, expenditures on supplies, including administrative, medical, and diagnostic supplies, average \$10 per visit, and members are expected to make 4.2 visits per year to both primary and specialty care physicians. Thus, the annual cost per member is \$42, and the cost PMPM is estimated to be  $\$42 / 12 = \$3.50$  PMPM. Finally, overhead expenses, including depreciation, rent, utilities, and so on, are estimated at \$6.00 PMPM.

### Total Physician Rate

BetterCare has estimated numerous categories of costs related solely to physicians. For ease, assume now that BetterCare plans to contract with a single medical group practice to provide all physicians' service and to pay the group a capitated rate. Then, the total capitation rate for the medical group would be as follows:

Primary care	\$ 10.94 PMPM
Specialist care	14.20
Support staff	6.67
Supplies	3.50
Overhead	6.00
Subtotal	<u>\$ 41.31 PMPM</u>
Profit (10%)	<u>4.13</u>
In-area total	<u>\$45.44 PMPM</u>
Outside referrals	<u>3.40</u>
Total	<u><u>\$48.84 PMPM</u></u>

The \$48.84 PMPM total capitation rate for the medical group is merely the aggregate of the rates previously developed for physicians' services, plus two additional elements. First, BetterCare believes that a fair profit margin on group practice businesses is 10 percent, so \$4.13 PMPM is allowed for profit on the in-area physician subtotal of \$41.31 PMPM. Second, \$3.40 PMPM is allocated to cover referrals outside the group practice when needed either because a particular specialty is not available within the group or the member is outside the service area. Finally, note that the group might not capitate all its physicians even though it receives a capitated rate from BetterCare.

### An Alternative Method for Physician's Rates

In general, the rates obtained from the first two methods would include adjustments for age and gender. An alternative method would be to start with utilization data already broken down by these categories. The *demographic approach* focuses on the age/gender distribution of the population being

served, which is then coupled with cost or fee-for-service data to estimate the capitation rate.

Table 17.5 illustrates the demographic approach by applying it to the population that would be served if BetterCare wins the contract to provide an HMO plan for Big Business. The male/female costs were calculated by multiplying the population percentages for each gender by the applicable costs per member per month. The total cost for each service is merely the sum of the male and female costs.

Note that the total cost for in-area physician services,  $\$16.17 + \$29.27 = \$45.44$  PMPM, is the same as BetterCare estimated using the cost approach. If the data are consistent, both methods should lead to the same capitation rate. Also, the hospital/other institutional capitation rate of  $\$36.47$  PMPM is the same as the rate obtained earlier for these services:  $\$27.35 + \$9.12 = \$36.47$ . Clearly, we “fudged” the data so our results would be consistent. In most cases, capitation rates developed using different methodologies will be different, and hence a great deal of judgment will have to be applied in the rate-setting process.

Remember that our goal here is to set a premium rate that BetterCare can use to make a bid to cover Big Business’s employees. Thus far, we have estimated the PMPM rates required to pay all the providers needed to serve the population, both in area and out of area. In addition, we are assuming that pharmacy benefits will be handled separately, or *carved out*, and that the cost of these benefits will be  $\$7.00$  PMPM. After all costs have been considered, BetterCare concludes that it can submit a bid of  $\$108.21$  PMPM.<sup>6</sup>

### Finding the Total PMPM

#### Medical costs:

Hospital inpatient	\$27.35 PMPM
Other institutional	9.12
Outpatient prescription drugs	7.00
Physician care	<u>48.84</u>
Total medical costs	<u>\$92.31 PMPM</u>

#### HMO costs:

Administration	\$13.85 PMPM
Contribution to reserves/profits	<u>2.05</u>
Total HMO costs	<u>\$15.90 PMPM</u>
Total premium	<u>\$108.21 PMPM</u>

Note that if BetterCare wins the contract from Big Business, the monthly revenue to providers will be somewhat higher (usually about 5 percent) than the embedded PMPM rates because enrollees will be required to make co-payments for selected services.

### Setting the Premium Rates

Although we have developed the total PMPM required to cover both the medical and administrative costs associated with Big Business’s health plan,

**TABLE 17.5**  
Demographic Approach Rates for the Medical Group

Age Band	Demographics		Cost per Member per Month					
	Male	Female	Primary Care		Specialist/Referral		Hospital/Other	
			Male	Female	Male	Female	Male	Female
0-1	1.9%	1.9%	\$47.00	\$47.00	\$31.42	\$31.42	\$29.93	\$29.93
2-4	2.8	2.8	20.25	20.25	11.19	11.19	16.29	16.29
5-19	12.4	12.4	11.04	11.04	11.19	11.19	15.35	15.35
20-29	11.4	15.4	10.53	15.92	18.44	49.30	11.58	55.65
30-39	9.6	10.0	13.04	17.56	23.26	44.51	24.95	58.97
40-49	5.3	5.7	16.40	19.56	32.64	41.05	53.74	52.31
50-59	3.6	3.6	20.74	22.74	47.13	47.74	80.60	66.91
60+	0.7	0.5	24.93	25.60	73.43	58.91	121.54	87.60
Total	<u>47.7%</u>	<u>52.3%</u>						
Male/female cost			\$ 7.07	\$ 9.10	\$10.58	\$ 18.69	\$13.24	\$23.23
Total service cost				<u>\$16.17</u>		<u>\$29.27</u>		<u>\$36.47</u>

this aggregate amount now must be converted into the premiums paid by employees. Premium rates generally are categorized and quoted on a *tier basis*, where each tier defines the number of premium categories offered.

Here are some examples of premium tiers:

- **One-tier (composite) rates.** A single premium is applied regardless of whether the subscriber is single or has any number of eligible dependents.
- **Two-tier rates.** Here there are two premium categories—one for single individuals and one for subscribers with dependents (families).
- **Three-tier rates.** In this tier there are three premium categories—one for single individuals; one for subscriber and spouse; and one for a family, which is defined as all other dependent situations.
- **Four-tier rates.** This tier is similar to the three-tier category, but a fourth premium category is added—subscriber with children but no spouse.

It is clear that the lower the number of premium categories, the more cross-subsidization that takes place. For example, with only one tier, with single subscribers paying the same premium as employees with dependents, single employees are subsidizing the healthcare costs of those employees with dependents. Even in higher tiers, it is typical that a family with, say, two children would pay the same premium as a family with, say, five children.

Once the tier is decided on, the next step is to convert the aggregate PMPM into premium rates for each category in the tier. This is accomplished by use of a *rate ratio*, which is the markup factor applied to the single premium rate to obtain each other category rate. For example, in a three-tier plan, the rate ratios might be 2.0 for a subscriber and spouse and 2.7 for a family. In this situation, the single rate would be multiplied by 2.0 to get the subscriber and spouse rate and by 2.7 to get the family rate. The base (single) rate is a function of the premium category composition of the employee population. It must be set so that the premiums collected from all premium rate categories equal the PMPM multiplied by the number of covered lives.

Note that the rate ratios are somewhat arbitrary. Although they typically do consider family size, they often are based primarily on competitive factors and what the plan sponsor (employer) requests. In general, rate ratios are set so that some cross-subsidization exists. The reason has to do with employer contributions and coordination of employee benefits. For example, some employers pay 100 percent of the premium for single employees but only contribute a portion for other premium categories. In this situation, subsidization makes family rates more appealing, which increases the number of covered dependents. Also, some subscribers with families choose single coverage and then let their spouse include all dependents on the spouse's health plan. A higher single rate raises revenues for the health plan that enrolls only the subscriber.

In closing, note that BetterCare's bid most likely will be subject to market forces—that is, there will be multiple bidders for Big Business's health contract. If BetterCare's bid is to be accepted, it must offer the right combination of price and quality. If BetterCare's costs, and hence bid, is too high or its quality too low, it will not get the contract and it must reassess its cost and quality structure to ensure that it is competitive on future bids.

## Self-Test Questions

1. Roughly, what is the allocation of an HMO premium dollar?
2. Briefly, describe the following three methods for developing capitation rates:
  - a. Fee-for-service method
  - b. Cost approach
  - c. Demographic approach
3. Of the three approaches, which one do you think would be the most accurate? The easiest to apply in practice?
4. Explain the difference between the total PMPM and a premium rate.

## Risk-Sharing Arrangements

In an integrated delivery system, or within the provider panel of a managed care plan, different providers are brought together in some type of formal or informal arrangement to provide healthcare services to a defined population. Often, system participants are paid under different reimbursement methods, and different reimbursement systems clearly create different incentives. To illustrate, assume that an integrated delivery system uses capitation for primary care physicians, discounted fee-for-service for specialists, and per diem for institutional providers—hospitals and long-term care providers. In such a system, primary care physicians have the incentive to shift care to specialists and institutions because primary care physicians are capitated and hence not rewarded for higher utilization. On the other hand, specialists and institutions would welcome the added volume because they are being paid on the basis of the amount of services provided. Overall, this differential in reimbursement creates incentives that increase total system costs and hence costs to insurers and purchasers.

If both primary care and specialist physicians are capitated, primary care physicians would still have the incentive to make unnecessary referrals, but such referrals would no longer be welcomed by specialists. If the institutions also are capitated, no provider wants increased volume, so conflicts are bound to occur between primary care physicians and specialists and between physicians and institutions.

In such situations, *risk-sharing arrangements* are sometimes implemented to create incentives that encourage providers to act in the best interest of the system, rather than in their own self-interest. Generally, proper incen-

tives are created within provider panels by establishing *withholds*, or *risk pools*, which are pools of money that are initially withheld and then distributed to panel members only if pre-established goals are met.

### **Risk-Sharing Basics**

Risk pools can be used with any type of reimbursement system, such as the use of withholds in a per diem system, whereby the hospital is rewarded if utilization is less than expected and penalized by not receiving some portion or all of the amount withheld if utilization exceeds the target. In effect, risk pools are designed to reward those providers that are most able to control costs through better utilization management, better cost control, or both. Risk-sharing arrangements can occur among physicians only, among physicians and institutions, or among all providers. Furthermore, risk pools can be established to promote only financial goals or some combination of financial and nonfinancial (for example, quality) goals.

Note that if a system is fully integrated and all subsidiary providers are owned by, and hence directly responsible to, the same parent, there is only one bottom line and no need for risk-sharing arrangements, at least in theory. Proper incentives are created by managerial control. However, in most systems today, providers are loosely affiliated rather than belonging to the same business entity, and hence risk-sharing arrangements are needed to align the incentives of the diverse parties involved.

Typically, risk-sharing arrangements allocate 10 to 20 percent of each reimbursement dollar to one or more risk pools, often for primary care, specialty (referral) care, and institutional. Then, throughout the year, expenses are charged against the applicable pools, and at year-end, each pool's expenses are reconciled—that is, compared with those budgeted. Any surpluses are distributed to the participating providers on the basis of a prearranged formula, while any deficits typically are funded from network reserves. (Reserves, which are risk-management tools designed to help businesses cover system cost overruns, are discussed in Chapter 18.)

### **Primary Care Withhold: Single Risk Pool**

The best way to grasp the basics of risk sharing is through examples. In this section, we illustrate a withhold system for primary care physicians only. In the next section, we will illustrate a risk-sharing system that encompasses primary care physicians, specialists, and a hospital.

Here is the risk-pool arrangement for primary care physicians (PCPs) used by one HMO. The HMO pays its PCPs by capitation, but a percentage of the total capitated amount is held in reserve and distributed to individual physicians if certain financial goals are met. In general, PCP goals are based on specialty care and hospital costs. Of course, the goal is to lower the overall cost of providing care, but cost-reduction goals should not reduce the quality of care afforded to patients.



Assume that the HMO's capitation payment to PCPs is \$15 PMPM, but that 20 percent of this amount is placed into the PCP risk pool. The budgeted amount for specialty and hospital costs is \$45 PMPM. Of course, the purpose of the pool is to encourage PCPs to take actions that result in realized specialty and hospital costs that are less than those budgeted. For simplicity, assume that there are only three PCPs in the plan: (1) Physician L (for low cost), (2) Physician M (for medium cost), and (3) Physician H (for high cost), where cost is measured by the amount spent by the HMO on each physician's referrals. Furthermore, assume that each physician has 1,000 patients under the plan, so there are 3,000 patients in total.

Table 17.6 contains the risk-pool distributions under two different outcome scenarios. Line 1 gives each PCP's initial annual capitation payment:  $\$15 \text{ PMPM} \times 12 \text{ months} \times 1,000 \text{ members} = \$180,000$ . Thus,  $3 \times \$180,000 = \$540,000$  in total is allocated for PCP payments. However, 20 percent of the capitated amount is placed into the risk pool, so each PCP's annual capitated payment is reduced by  $0.20 \times \$180,000 = \$36,000$ . This reduction and the resulting \$144,000 initial allocation are shown on Lines 2 and 3. Note that each of the members served by the three PCPs is allocated \$45 for specialty and hospital costs, so the budgeted goal for these costs is  $1,000 \times \$45 \times 12 = \$540,000$  per PCP, or \$1,620,000 in total, as shown on Line 4. Also, note that the total amount in the PCP risk pool is  $3 \times \$36,000 = \$108,000$ .

Now, consider Scenario 1, contained on Lines 5, 6, 7, and 8. Here, the assumption is made that no PCP will receive any funds from the pool if it is empty at year end. The actual referral costs for each PCP are the amounts shown on Line 5. The referral gain (loss) for each PCP is shown

**TABLE 17.6**

Primary Care  
Physician (PCP)  
Risk Pool  
(annual  
amounts)

	<i>Physician L</i>	<i>Physician M</i>	<i>Physician H</i>
1. Allocated amount	\$ 180,000	\$ 180,000	\$ 180,000
2. Withhold (20 percent)	(36,000)	(36,000)	(36,000)
3. Initial allocation	\$ 144,000	\$ 144,000	\$ 144,000
4. Budgeted referral costs	\$ 540,000	\$ 540,000	\$ 540,000
<b>Scenario 1: Distribution Based on Aggregate PCP Performance</b>			
5. Actual referral costs	500,000	560,000	680,000
6. Referral gain (loss)	\$ 40,000	(\$ 20,000)	(\$ 140,000)
7. Withhold returned	0	0	0
8. Total compensation	\$ 144,000	\$ 144,000	\$ 144,000
<b>Scenario 2: Distribution Based on Individual PCP Performance</b>			
9. Actual referral costs	500,000	560,000	680,000
10. Referral gain (loss)	\$ 40,000	(\$ 20,000)	(\$ 140,000)
11. Withhold returned	36,000	16,000	0
12. Total compensation	\$ 180,000	\$ 160,000	\$ 144,000

on Line 6, while the total gain (loss) for all three PCPs is  $\$40,000 - \$20,000 - \$140,000 = -\$120,000$ . This exceeds the  $\$108,000$  in the risk pool, so no funds remain for distribution. In fact, BetterCare will have to fund the  $\$108,000 - \$120,000 = \$12,000$  shortfall from its own reserves. Because no funds remain in the pool for distribution, each PCP's realized compensation would be his or her initial allocation,  $\$144,000$ .

Clearly, there is a problem with the way that the risk pool is allocated. Because no funds remained in the pool, all three PCPs were equally penalized, even though Physician L did an excellent job of controlling costs and Physician M came in only  $\$20,000$  over budget. The real cause of the failure to meet the overall referral budget was Physician H, who was a whopping  $\$140,000$  over budget. Is it fair to penalize L and M because of H's actions? If, over time, it appears to Physicians L and M that the risk pool will always be exhausted as a result of actions beyond their control, they will have no motivation to continue to practice as efficiently as they do now. Also, it is important to know whether Physician H's failure to meet the risk-pool budget was a result of practice patterns, or did H have an extraordinary number of high-cost patients? If the patient mix is not equal across PCPs, obvious problems will arise, so the HMO must be careful in assigning patients to ensure, to the extent possible, that the utilization and intensity mix is evenly spread across PCPs or that adjustments are made to account for such differences.

Scenario 2 in Table 17.6 is similar to Scenario 1, except that payments are made from the withhold to individual physicians regardless of the aggregate position of the pool. In this situation, the aggregate pool is really an artificiality. Because the HMO will reward individual PCPs that come in at or under budget regardless of aggregate performance, each PCP really has his or her own individual risk pool. Thus, as shown on Line 11, Physician L, because he or she came in below budget, received the entire withhold amount from his or her pool, which resulted in total compensation of  $\$144,000 + \$36,000 = \$180,000$ . Physician M received  $\$36,000 - \$20,000 = \$16,000$  from his or her pool, for total compensation of  $\$160,000$ . Physician H, on the other hand, received nothing from his or her pool, for a total compensation of  $\$144,000$ . This type of arrangement creates better incentives for PCPs, but the HMO had to bear the total cost of the pool payments,  $\$52,000$ , because the actions of Physician H depleted the pool. The key here is to modify the behavior of Physician H so that funds remain in the pool to make the incentive payments. Perhaps, after one year, Physician H will be motivated to follow lower-cost practice patterns because of the potential monetary rewards.

Note that there is an almost infinite number of ways in which a PCP risk pool can be distributed. An alternative to Scenario 2 would be this: If the aggregate risk pool is depleted, payments to individual physicians will be cut in half. If this were the situation in Scenario 2 in Table 17.6, Physician L would get only  $\$18,000$  from the pool on Line 12, while Physician M would

be paid \$8,000. Now, the actions of Physician H have a direct bearing on the payments to L and M, so it is in the best interests of L, M, and the system to encourage H to lower costs. Also, with this distribution system, the HMO does not replace the full amount of the pool if it is depleted.

### **Primary Care and Referral Withholds: Two Risk Pools**

The previous illustration placed only one set of providers at risk, the primary care physicians. In this section, we illustrate the use of two risk pools.

Assume that HealthyHMO, with 10,000 covered lives in a given service area, reimburses its PCPs under a capitated system, its specialty care physicians under a discounted fee-for-service system, and the hospital under a per diem system. To create proper incentives, HealthyHMO establishes two risk pools: (1) a professional services risk pool for the physicians only and (2) an inpatient services risk pool shared equally by the HMO, physicians, and hospital.

### **Professional Services Risk Pool**

Ten percent of the funds budgeted for specialty services are withheld in the professional services risk pool (PSRP). The total amount budgeted for professional services, including both primary and specialty care physicians, is \$37 PMPM. With 10,000 members, the HMO's annual budget for professional services is  $\$37 \times 10,000 \times 12 = \$4,440,000$ .

The capitated payment for primary care physicians is \$12 PMPM, for a total of  $\$12 \times 10,000 \times 12 = \$1,440,000$ . The difference between the total allocated for professional services and the capitated total for primary care services is  $\$4,440,000 - \$1,440,000 = \$3,000,000$ , which is the amount allocated for specialty services. Because 10 percent of the specialists' budget is placed in the PSRP, it is funded at a level of \$300,000, and the budget for specialist payments, after withhold, is \$2,700,000.

When the budget year is over, a year-end reconciliation process adjusts for under- and overutilization and allocates the pool among the primary care and specialist physicians. If actual costs exceed the \$3 million total specialty care budget, no distributions are made from the PSRP, and HealthyHMO must cover the shortfall. Table 17.7 illustrates end-of-year reconciliation under four different scenarios. In Scenario 1, actual payments for specialty services are assumed to be \$3 million, as shown on Line 2. This results in a  $-\$300,000$  variance from the after-withhold budget, and the risk pool is depleted. Primary care physicians gain no additional income because the specialists have taken the entire amount in the pool in their fee-for-service payments.

Scenario 2 assumes specialist payments of \$3.1 million, which results in a  $-\$400,000$  budget variance. Like Scenario 1, nothing is left for the primary care physicians. In fact, the specialists have not only exhausted the pool, but receive \$100,000 in additional payments from HealthyHMO, which must bear all losses exceeding the amount placed into the pool.

TABLE 17.7

Professional  
Services Risk  
Pool (PSRP)  
(annual  
amounts)

**Scenario 1: Specialty Payments of \$3,000,000**

1. Budgeted payments for specialty services	\$ 2,700,000
2. Actual payments for specialty services	3,000,000
3. Variance from budget	(\$ 300,000)
4. Risk pool starting amount	300,000
5. Remainder in pool	\$ 0
6. Risk pool allocation	\$ 0

**Scenario 2: Specialty Payments of \$3,100,000**

7. Budgeted payments for specialty services	\$ 2,700,000
8. Actual payments for specialty services	3,100,000
9. Variance from budget	(\$ 400,000)
10. Risk pool starting amount	300,000
11. Remainder in pool	(\$ 100,000)
12. Risk pool allocation	\$ 0

**Scenario 3: Specialty Payments of \$2,800,000**

13. Budgeted payments for specialty services	\$ 2,700,000
14. Actual payments for specialty services	2,800,000
15. Variance from budget	(\$ 100,000)
16. Risk pool starting amount	300,000
17. Remainder in pool	\$ 200,000
18. Risk pool allocation	\$ 200,000

**Scenario 4: Specialty Payments of \$2,600,000**

19. Budgeted payments for specialty services	\$ 2,700,000
20. Actual payments for specialty services	\$ 2,600,000
21. Variance from budget	\$ 100,000
22. Risk pool starting amount	300,000
23. Remainder in pool	\$ 400,000
24. Risk pool allocation	
a. Physicians	\$ 300,000
b. HMO	\$ 100,000

Scenario 3, which begins on Line 13 in Table 17.7, presents a lower-cost situation, assuming specialty care payments of only \$2.8 million. Now, the budget variance is  $-\$100,000$ , which leaves \$200,000 in the pool for distribution. There are many methodologies that can be used to make the distribution. The \$200,000 can be evenly split among all physicians. Or, the pool can be distributed to physicians on a basis proportional to the amount of effort that they expend on HealthyHMO's patients, say, as measured by the number of patient visits or the dollar amount paid to each physician. Alternatively, the distribution can be based on the number of referrals made by primary care physicians and the number received by specialty physicians. In this situation, primary care physicians with fewer referrals would get a larger share of the pool, while specialists with a higher number of referrals would receive a larger share of the pool.

Scenario 4 is similar to Scenario 3, except that with only \$2.6 million paid to specialists over the year, the pool is left with \$400,000. Now, \$300,000 is available for distribution to physicians, and \$100,000 is reclaimed by HealthyHMO.

### **Inpatient Services Risk Pool**

HealthyHMO budgets for the inpatient services risk pool (ISRP) based on 350 inpatient days per 1,000 members, which is the rate experienced by the HMO last year for its entire membership. The negotiated per diem rate is \$750. Thus, its 10,000 members are expected to use  $10 \times 350 = 3,500$  inpatient days, which gives a before-withhold amount of  $3,500 \times \$750 = \$2,625,000$ . HealthyHMO withholds 10 percent of the inpatient budget for the ISRP, or \$262,500. Thus, the adjusted per diem rate is  $0.90 \times \$750 = \$675$ , which results in a total budgeted payment for inpatient services of  $3,500 \times \$675 = \$2,362,500$ .

For reconciliation, suppose that actual utilization was 385 inpatient days versus the 350 forecast (10 percent variance higher than forecasted). The resulting ISRP distribution is contained in Table 17.8. With overutilization (as compared to the budget), realized payments total  $3,850 \times \$675 = \$2,598,750$ , as shown on Line 2, which results in a dollar variance of  $-\$236,250$ , as shown on Line 3. Because the pool was initially funded with \$262,500, the amount left in the pool after reconciliation is  $\$262,500 - \$236,250 = \$26,250$ , which is shown on Line 5. This amount, according to distribution guidelines, is split evenly among primary care physicians, specialty care physicians, and the hospital, as shown on Lines 6a through 6c.

Note that the hospital's per diem payment before withhold was \$750. After reconciliation, the hospital's total payment is  $\$2,598,750 + \$8,750 = \$2,607,500$ . Because this total resulted from 3,850 inpatient days, the realized per diem payment was  $\$2,607,500 / 3,850 = \$677$ . This amount is less than the starting \$750 amount because more than the budgeted amount was spent on inpatient care. However, because some funds remained in the pool, the final per diem amount is slightly more than the \$675 after-withhold amount.

**TABLE 17.8**

Inpatient  
Services Risk  
Pool (ISRP)  
(annual  
amounts)

1. Budgeted payments for inpatient services	\$ 2,362,500
2. Actual payments for inpatient services	<u>2,598,750</u>
3. Variance from budget	(\$ 236,250)
4. Risk pool starting amount	<u>262,500</u>
5. Remainder in pool	<u>\$ 26,250</u>
6. Risk pool allocation	
a. Hospital (1/3)	\$ 8,750
b. Primary care physicians (1/3)	8,750
c. Specialty care physicians (1/3)	<u>8,750</u>
7. Total allocated	<u>\$ 26,250</u>

Note that even if less than the budgeted amount is spent on inpatient care, the hospital will still receive less than the initial \$750 per diem amount because any savings is split three ways.

The intent of the ISRP is to encourage the parties that have some control over hospital utilization to limit the number of inpatient days to those that are absolutely essential to patients' welfare. Of course, because the hospital is being reimbursed on a per diem basis, it has the incentive to maximize the number of inpatient days. Any gain from additional per diem payments will be three times as profitable as pool distributions because per diem payments are not shared with physicians. Therefore, the ISRP is really set up to motivate physicians, who actually control hospital admissions and discharges. Under per diem, the hospital does have the incentive to lower costs because lower costs lead to higher profits. However, the best way to motivate the hospital to control utilization would be to put it under capitation payments.

### **Performance-Based Pools**

In our discussion of risk pools thus far, we have focused exclusively on risk pools designed to control utilization and costs, but such pools can be structured to influence other types of behavior. For example, primary care, as well as specialty physicians, may participate in a *performance-based pool*, wherein the pool is distributed on the basis of both financial and nonfinancial performance.

Here is how a performance-based pool might work for primary care physicians. As before, some percentage—say, 20—of the total capitation payment is withheld. At the end of the year, the pool is distributed to physicians based on performance in four areas: (1) quality of care, (2) quality of service, (3) cost control, and (4) organizational participation. Thirty percent of the pool is allocated to each of the first three areas, and 10 percent is allocated to organizational participation. Physicians are “graded” in each area. For example, quality of care can be based on factors such as chart reviews (often emphasizing preventive medicine such as blood tests and cancer screenings), continuing medical education hours, and number of liability claims; quality of service can be based on patient satisfaction surveys as well as the ease with which patients can make appointments and visit waiting times; cost control can depend on the cost of referrals and other resource utilization; and organizational participation can be based on number of staff meetings attended and committee posts held.

At the end of the year, the pool distribution would reward those physicians that scored highest in each area and penalize those physicians that did worst. For example, assume that \$10,000 remained in a pool for three physicians, so  $0.30 \times \$10,000 = \$3,000$  is available for distribution based on quality-of-care performance. Furthermore, the physicians' quality-of-care performance scores are 55 for Physician X, 44 for Physician Y, and 33 for Physician Z. Note that these scores have no absolute meaning, but they do tell

us how well the physicians have performed relative to one another on the quality-of-care dimension. Because the scores total 132, Physician X would receive  $55 / 132 = 0.42$  of the \$3,000 pool, or \$1,260; Physician Y would receive  $44 / 132 = 0.33$  of the pool, or \$990; and Physician Z would receive the remaining \$750. Of course, some minimum score can be established so that physicians would receive nothing from the pool if the minimum level of performance were not met. It is clear that the type of risk pool described in this section creates incentives for physicians to perform well along both financial and nonfinancial dimensions.

## Self-Test Questions

1. What is the purpose of a risk pool?
2. Describe how a typical risk pool works.
3. Can a delivery system with multiple providers have more than one risk pool? Explain your answer.
4. What is a performance-based risk pool?

## Key Concepts

Capitation and managed care have a profound influence on the risk and behavior of providers. In this chapter, some of the more important aspects of capitation and managed care are discussed. Here are its key concepts:

- *Capitation* is a flat periodic payment to a physician or other healthcare provider; it is the sole reimbursement for providing services to a defined population.
- Capitation payments are generally expressed as some dollar amount *per member per month (PMPM)*, where the word “member” typically means enrollee in some managed care plan—usually an HMO.
- Although capitation payment is used mostly with *primary care physicians*, virtually any type of healthcare service can be reimbursed by capitation.
- Under *fee-for-service*, all volumes less than breakeven produce a loss for the provider, while all volumes greater than breakeven produce a profit. Under *capitation*, all volumes less than breakeven produce a profit, whereas all volumes greater than breakeven result in a loss. Thus, *provider incentives* under capitation are opposite those under conventional reimbursement.
- In markets where capitation and aggressive utilization management have made inroads, the trend is toward *fewer hospital beds* and a physician mix that contains a *greater proportion of primary care physicians*. Most importantly, as capitation and utilization management



gain in importance, historical utilization rates based on conventional reimbursement methodologies are not good predictors of future utilization.

- *Objective risk* occurs when the risk inherent in an uncertain outcome can be specified with confidence. *Subjective risk* occurs when the probability distribution itself is uncertain. Although the objective risk in capitation contracts is no greater, and potentially less, than that under conventional reimbursement, the subjective risk can be high.
- Several methods are used to set capitation rates for providers, including (1) the *fee-for-service method*, (2) the *cost approach*, and (3) the *demographic approach*.
- In *integrated delivery systems*, it is important to establish incentives that encourage providers to act in the best interest of the system, rather than in their own self-interest. One way to create proper incentives is to establish *withholds*, or *risk pools*, which are pools of money that are initially withheld and then distributed to providers only if preestablished goals are met.

This concludes our discussion of capitation, rate setting, and risk sharing. The next chapter, which is the final chapter of the book, covers financial risk management.

## Chapter Models and Problems

This chapter has no accompanying spreadsheet model. However, the chapter has two problems in spreadsheet format that focus on rate setting and risk sharing issues.

The problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

- To learn more about the health insurance industry, see America’s Health Insurance Plans (AHIP) site at [www.ahip.org](http://www.ahip.org).
- The HealthLeaders/InterStudy website will give you some idea of the data available on managed care plans and capitation; see [www.healthleaders-interstudy.com](http://www.healthleaders-interstudy.com) and then click on products&services.

## Selected Cases

There are three cases in *Cases in Healthcare Finance* that are applicable to this chapter:

- Case 5: Provident Healthcare, which focuses on the premium-setting process.
- Case 11: Bangor Family Physicians, which illustrates pay-for-performance plans.
- Case 30: Silverton Healthcare, which focuses on reimbursement and risk sharing plans.

## Notes

1. Decision scientists classify risk in a more rigorous fashion as follows: *Ignorance* is the condition when decision makers can’t even estimate the probable outcomes—say, the cash flows associated with a research and development project; *uncertainty* is present when outcomes can be predicted, but no probabilities can be attached; and *risk* occurs when both outcomes and probabilities can be forecasted. These classifications are not commonly used by real-world decision makers, so we will stick to the simpler objective and subjective risk classifications discussed in this paragraph.
2. This section summarizes results reported in the following two articles by Louis C. Gapenski and Barbara Langland-Orban, “The Impact of Capitation Contracts on Financial Risk: A Monte Carlo Simulation,” *Health Services Management Research*, August 1996, 181–191, and “The Financial Risk to Hospitals Inherent in DRG, Per Diem, and Capitation Reimbursement Methodologies,” *Journal of Healthcare Management*, July/August 1998, 323–338.
3. According to the American Hospital Association, the average general acute care hospital has a cost structure of roughly 75 percent fixed costs and 25 percent variable costs.
4. Providers that have capitation contracts can limit outlier risk by purchasing *stop-loss* insurance. However, such insurance reduces the profitability of the capitation contract. Stop-loss insurance is discussed in detail in Chapter 18.

5. Note that the utilization, charge, and cost data used in this section to develop capitation rates are for illustration only and do not necessarily reflect actual values being used today.
6. In early 2006, HMO single coverage premium rates were about \$300–\$500 PMPM, depending on the coverage details, which is much higher than the amount in our example.

## FINANCIAL RISK MANAGEMENT

### Learning Objectives

After studying this chapter, readers should be able to:

- Discuss the fundamentals of risk management, including some types of risk and the general approach that businesses take to manage risk.
- Explain how reserves and reinsurance can be used to manage the risk inherent in capitation contracts.
- Describe the features of options as well as the factors that influence a call option's value.
- Describe futures contracts and explain how they can be used within health services organizations to reduce the riskiness of financial transactions.
- Explain how interest rate swaps can be used to decrease risk and, in some situations, lower interest costs.

### Introduction

In this chapter, we discuss financial risk management—a topic of increasing importance to healthcare managers. The term *risk management* can mean many things, but in a financial context it involves identifying events that can have adverse financial consequences and then taking actions to prevent and/or minimize the damage caused by these events. Years ago, financial risk management dealt primarily with insurance—managers made sure a provider was adequately insured against fire, theft, and other casualty losses and that it had adequate medical liability coverage. More recently, the scope of financial risk management has been broadened to include such things as protecting against adverse changes in interest rates or ensuring that greater-than-expected utilization or illness severity will not have a catastrophic impact on the business's financial condition.

As the healthcare environment increases in complexity, it is becoming more and more difficult for managers to know what financial pitfalls might lie in wait. Therefore, providers need to have someone systematically look for potential problems and design safeguards to minimize potential damage. With this fact in mind, most large businesses have designated *risk managers* who report to the CFO, while the CFOs of medium-sized firms or the owners of

small businesses personally assume risk-management responsibilities. In any event, financial risk management is becoming increasingly important, and it is something health administration students should understand. In this chapter, we present a diverse collection of financial risk-management topics of relevance to healthcare providers.

## Fundamentals of Financial Risk Management

Risks can be categorized along several dimensions. In addition, there are multiple approaches to financial risk management within businesses. In this section, we introduce some fundamental concepts.

### *Risk Terminology*

We begin by defining some commonly used risk terminology.

- **Pure risks** are risks that offer only the prospect of a loss. Examples include the risk that a facility will be damaged by fire or that a medical liability suit will result in a judgment against the business.
- **Speculative risks** are situations that offer the chance of a gain but might result in a loss. Thus, investments in new service lines and securities involve speculative risks.
- **Utilization risks** are associated with the demand for a provider's services. Because the provision of services at appropriate volumes is essential to survival, regardless of the reimbursement methodology, utilization risk is one of the most significant risks that providers face.
- **Severity risks** stem from the fact that costs may be higher than expected because the realized severity of patients' illnesses is greater than that expected. For example, if a provider accepts a capitated or prospective payment contract with the expectation of a given average level of severity, and it turns out to be much higher, costs will be higher than expected with no matching increase in revenues.
- **Input risks** are associated with input costs, including both labor and supplies. For example, a provider faces the risk that its nursing costs will increase and that it will not be able to pass this increase on to its payers.
- **Financial risks** are risks that result from financial transactions. For example, if a hospital plans to issue new bonds, it faces the risk that interest rates will rise before the bonds can be brought to market, and hence financing costs will be higher than projected. As we will explain in a later section, this type of risk can be mitigated by taking a position in the futures market.
- **Property risks** are associated with destruction of productive assets. Thus, the threat of fire, floods, and riots imposes property risks on a business.
- **Personnel risks** are risks that result from employees' actions. Examples

include the risks associated with employee fraud or embezzlement, or suits against a business on the basis of age or sex discrimination.

- **Environmental risks** include risks associated with polluting the environment. Public awareness in recent years, coupled with the huge costs of environmental cleanup, has increased the importance of this risk.
- **Liability risks** are associated with product, service, or employee actions. For providers, the risk of very large judgments for medical mistakes is especially severe.
- **Insurable risks** are risks that can be covered by insurance. In general, property, personnel, environmental, liability, and even severity risks can be transferred to insurance companies. Note, though, that the ability to insure a risk does not necessarily mean that the risk should be insured. Indeed, a major function of risk management involves evaluating all alternatives for managing a particular risk, including self-insurance, and then choosing the optimal alternative.

Note that the risk classifications given above are somewhat arbitrary and overlap, and different classifications are commonly used in specific situations—for example, when defining the risks associated with capitation contracts. Still, the list does give an idea of the wide variety of risks to which a provider can be exposed.

### **An Approach to Risk Management**

Although there are several alternative approaches to risk management, most businesses use the following process for managing risks.

- **Identify the risks faced by the business.** Here, the risk manager identifies the potential risks faced by his or her firm. Unfortunately, this process is neither glamorous nor exciting. Nevertheless, it is critical to the risk-management function. Generally, data from previous incidents, surveys, and annual reviews are used for this purpose as well as the risk-management literature.
- **Estimate the potential impact of each risk.** Some risks are so small that they are immaterial, whereas others are so severe that they have the potential to doom the business. Furthermore, some risks are extremely remote, while others may occur with relatively high frequency. It is useful to segregate risks by potential frequency and severity—often by use of a *frequency/severity matrix*—and then focus most risk-management attention on those risks with both high frequency and high severity.
- **Decide how each relevant risk should be handled.** In most situations, risk exposure can be reduced through one of the following techniques:
  1. **Transfer the risk.** Often, it is advantageous to use insurance to transfer risk to another company. However, the fact that a risk is insurable does

not necessarily mean that it should be covered by insurance. In some instances, it might be better for the company to *self-insure*, which means bearing the risk directly rather than paying another party to bear it.

2. **Transfer the function.** Sometimes it is best to transfer the entire risk-producing function to another party and hence eliminate the risk. For example, suppose a hospital is concerned about potential liabilities arising from its in-house disposal of medical wastes. One way to eliminate this risk would be to contract with another company to do the disposal, thus passing the risk to a third party.
3. **Purchase derivative contracts.** As we will discuss in more detail in later sections, businesses can use derivatives to hedge some types of risk. For companies using commodities as inputs, commodity derivatives can be used to reduce input risks. For example, a surgical equipment manufacturer may use metal futures to hedge against increases in raw material prices. Similarly, financial derivatives can be used to reduce risks that arise from changes in interest rates.
4. **Reduce the probability of occurrence.** The expected loss arising from any risk is a function of both the expected frequency of occurrence and the expected dollar loss if the adverse event occurs. In some instances, it is possible to reduce the probability that an adverse event will occur. For example, the probability that a fire will occur can be reduced by instituting a fire-prevention program, by replacing old electrical wiring, and by using fire-resistant materials in areas with the greatest fire potential.
5. **Reduce the magnitude of the loss.** Continuing with the fire risk example, the dollar cost associated with a fire can be reduced by such actions as installing sprinkler systems, designing facilities with self-contained fire zones, and locating facilities close to a fire station.
6. **Avoid the activity.** A business might discontinue a product or service line because the risks outweigh the rewards. For example, a hospital might decline an offer to participate in a medical device clinical trial because the liability risk is too great.

Note that risk-management decisions, like all corporate decisions, should be supported by a cost/benefit analysis of each feasible management alternative. For example, suppose it would cost a clinic \$50,000 per year to purchase a first-dollar-coverage medical liability policy. An alternative might be to purchase a lower-cost policy without first-dollar coverage and to use the money saved to establish a liability reserve. Both alternatives involve expected cash flows, and from an economic standpoint the choice should be made on the basis of the lowest present value of future costs. Thus, the same financial management techniques applied to other business decisions can also, at least in many situations, be applied to risk-management decisions.

## Self-Test Questions

1. Define the following terms:
  - a. Pure risks
  - b. Speculative risks
  - c. Demand risks
  - d. Input risks
  - e. Financial risks
  - f. Property risks
  - g. Personnel risks
  - h. Environmental risks
  - i. Liability risks
  - j. Insurable risks
  - k. Self-insurance
2. Briefly, describe one common approach to risk management.
3. Should a business insure itself against all of the insurable risks it faces? Explain your answer.

## Risk Management of Capitated Contracts

As discussed in previous chapters, capitated payments expose providers to financial risks that differ from those associated with conventional (fee-for-service) reimbursement. As with all financial risks, there are actions that can be taken to reduce the impact of capitation-induced risks. We discuss two in this section: (1) the establishment of reserves and (2) stop-loss provisions (reinsurance).

### Reserves

The first line of defense against financial risk by any organization is the maintenance of adequate *reserves*. Any provider, including medical practices and hospitals, that assumes the financial (utilization) risk for a covered population without having adequate reserves can easily end up, so to speak, as “road-kill along the capitation highway.” When healthcare providers accept capitated rates, they agree to provide whatever services are required for a fixed monthly fee. If all goes well—that is, if utilization and costs are controlled—the provider will end the year with a profit. But, if realized utilization, and hence costs, exceed estimates or if costs are higher than expected, on average, for each patient encounter, any losses that arise have to be covered. In such situations, the need for reserves becomes apparent. There are several classifications of reserves. We will cover the two most important types: (1) required reserves and (2) reserves for incurred but not reported costs.

### Required Reserves

*Required reserves* are those reserves specifically designed to cover random periods when costs exceed capitation revenues. The term “required reserves”



stems from the fact that insurance companies are required by state regulators to maintain reserves. Typically, such regulations specify a minimum fixed dollar amount of reserves, some percentage of premium income, or even some dollar amount per covered life. It is interesting to note that some state insurance regulators are now examining the risk positions of providers that accept capitation contracts, and hence assume the insurance function, to ascertain whether or not requiring licensure and mandatory reserves for these businesses is appropriate.

At the provider level, where reserves are not currently required by law, it makes good business sense to have sufficient cash and marketable securities on hand (in reserve) to cover losses that have a reasonable likelihood of occurring. One approach to setting reserve requirements within businesses is to use *Monte Carlo simulation*, which we discussed in Chapter 12 in regards to project risk assessment, to estimate the extent of the risk. Think in terms of a business's cash budget, which was discussed in Chapter 14. Here, we noted that a business's cash inflows and outflows are not known with certainty, so in any period—say, a month—cash outflows can exceed inflows. Most firms set their target cash balances high enough to cover routine shortfalls. The concept is exactly the same for capitation reserves, but here it is applied to a particular contract. By applying Monte Carlo simulation to utilization and costs, it is possible to estimate the sizes and probabilities of occurrence of potential contract losses. Then, based on the risk aversion of the organization's managers, a reserve can be established to cover all but the most unlikely loss scenarios.

To illustrate the concept, consider a capitation contract that Westside Memorial Hospital has with a local HMO to serve 50,000 enrollees. The capitation rate is \$27.50 per member per month (PMPM), resulting in \$16.50 million in total revenue. Table 18.1 contains Westside's best estimate for the cost distribution of enrollees, along with the resulting profit distribution. These distributions were developed on the basis of estimates of enrollee's admission rates, average length of stay, and average per diem cost. The expected total contract cost is \$15.78 million, resulting in an expected profit of \$720,000, which gives Westside a projected profit margin on the contract of 4.4 percent.

Focusing solely on this one contract, it is clear that Westside's profit is not guaranteed. There is a  $10 + 20 + 30 = 60\%$  chance that the profit realized will be greater than the \$720,000 estimate. That's the good news! The bad news is that there is a 40 percent chance that the profit will be less than expected, and a  $5 + 3 + 2 = 10\%$  chance that the contract will lose money. How can Westside protect itself against the possibility that losses on this contract will push the hospital into financial distress? Of course, one answer is to have sufficient reserves. On the basis of the Table 18.1 distributions, Westside can fund a \$5 million reserve that would totally protect it against losses on this contract, assuming that the probability distribution itself is

<i>Probability</i>	<i>Contract Cost</i>	<i>Contract Profit (Loss)</i>
0.10	\$14.00	\$ 2.50
0.20	15.00	1.50
0.30	15.50	1.00
0.20	16.00	0.50
0.10	16.50	0.00
0.05	17.50	(1.00)
0.03	19.00	(2.50)
<u>0.02</u>	<u>21.50</u>	<u>(5.00)</u>
<u>1.00</u>		
	Expected value = <u>\$15.78</u>	<u>\$0.72</u>

**TABLE 18.1**

Westside Memorial Hospital: Contract Cost and Profit Distribution (millions of dollars)

*Note:* Contract revenues are expected to total \$16.50 million.

correct. But this very conservative approach to reserves would, assuming a borrowing rate of 7 percent and short-term investment rate of 4 percent, cost Westside  $0.03 \times \$5$  million = \$150,000 annually, which would take a large chunk out of the contract's expected profit.

As an alternative, Westside might conclude that a 2 percent probability of occurrence represents a very unlikely event and hence does not warrant reserve protection. If this were the case, Westside would set a reserve for the contract of less than \$5 million—say, \$1 million or \$2.5 million. The choice is a risk/return trade-off, with more risk protection requiring a larger reserve, which in turn leads to lower contract profits.

Unfortunately, in most situations the reserve requirement is not as clear-cut as discussed here. First, it is not easy to estimate utilization and cost distributions, so it is very difficult to have much confidence in the Table 18.1 values. Second, most providers have a large number of contracts with numerous payers, and what is most relevant is the chance of an overall loss rather than the probability of a loss on a particular contract. If the loss distributions on the individual contracts are not perfectly positively correlated, then portfolio effects will somewhat mitigate the risks inherent in each contract. Also, the greater the number of patients under capitation, the lower the probability of profits far below that expected.

Note that financial withholds, as discussed in Chapter 17, are, in effect, a type of reserve. If certain financial goals are met, the withhold is distributed to providers. However, if goals are not met, the withhold is used to cover the excess costs incurred. Also, note that of all the providers, physicians are particularly vulnerable when entering capitation contracts because historically they have not used reserves. In most cases, medical practices distribute most, if not all, of their profits each year, reinvesting only those amounts absolutely necessary to fund new equipment. With this type of behavior historically setting the standard, it is especially difficult for physicians to think in terms of establishing reserves.

### **Reserves for Incurred but Not Reported Claims**

To illustrate the incurred but not reported (IBNR) reserve concept, consider the situation facing HealthyHMO at the end of 2006, at which time the HMO must close its books and reconcile its established risk pools. HealthyHMO uses capitation to pay for primary care services, but it uses fee-for-service reimbursement to pay for specialist services. When it closes its books, the HMO might not realize that there are specialist referrals that have been made by its primary care physicians in late 2006 that have not yet been billed. Indeed, some required specialist services may not have even been performed. The claims associated with referrals made in 2006 that have not yet been entered in the HMO's managerial accounting system are called *incurred but not reported (IBNR) claims*. Such claims (costs) must be estimated and reported as a liability in 2006 because they result from services provided (or obligated) in 2006. To make sure that IBNR claims can be met, insurers are required to set up reserves to cover those claims.

IBNR costs are also relevant for some providers. If a provider is capitated, yet has cost responsibility for referral services that it does not provide, there is a strong likelihood that at the end of the year there will be payment (cost) obligations that have been incurred but not reported. Obviously, such costs must be planned for and covered, and the impact of such costs on risk-pool distributions must be taken into account. There are relatively sophisticated methods available for establishing IBNR reserves, as well as some rather ad hoc methods such as setting two or three months worth of historical IBNR dollar claims aside as a reserve. It is not important for you to know the details of setting up IBNR reserves, we will leave that to the accountants, but it is important for you to recognize that providers bear extra risk whenever they are responsible for payments for services that they do not provide.<sup>1</sup>

### **Stop-Loss Provisions (Reinsurance)**

Rather than establish reserves to cover every conceivable cost situation, many providers elect to “reinsure” the risk. Such insurance, which is offered by dozens of insurance companies, is called *reinsurance* or medical *stop-loss insurance*.<sup>2</sup>

There are two general types of stop-loss coverage: (1) specific coverage and (2) aggregate coverage. *Specific stop-loss coverage*, which is by far the most common, provides protection against losses arising from individual cases. For example, suppose a capitated patient suffers a stroke that requires long-term hospitalization that far exceeds the average length of stay for the covered group. Specific coverage would protect the hospital against some of the losses incurred on this patient. Thus, such coverage is triggered on a case-by-case basis. *Aggregate stop-loss coverage* protects against losses on the aggregate covered population—that is, losses on the entire contract. The availability of stop-loss coverage makes full-risk (capitation) contracts much more attractive for providers. In the absence of such coverage, the provider might be placed in a situation where it must assume so much risk that its own financial

well-being is endangered, and hence it should not be willing to accept the contract.

Regardless of the type of coverage, an important feature of reinsurance is the *threshold*, or *attachment point*. This is the loss amount that must occur before the contract begins coverage. For example, the attachment point for specific stop-loss coverage on a hospital's capitation contract might be \$100,000 in patient costs. However, most coverage does not require the insurer to pay all costs above the attachment point. For example, the insurer may pay only 80 percent of costs above the threshold, which is called a 20 percent *participation rate* because the provider must still "participate" in 20 percent of the costs. Of course, the lower the threshold and the lower the participation rate, the higher the stop-loss coverage premium.

Sometimes, stop-loss coverage specifies a *corridor* of cost amounts. To illustrate, the insurer may pay 80 percent of costs between \$100,000 and \$500,000, after which the insurer pays full costs. The use of a corridor has two benefits. First, by not paying the full amount immediately after the threshold is met, the provider still has an incentive to control costs. If this were not the case, insurers would have to monitor providers to ensure that cost control did not "fall by the wayside" once the threshold was met. Second, the corridor creates certainty for the provider regarding the maximum per patient loss. In this example, the loss is limited to 20 percent of \$400,000, or \$80,000.

Providers typically have several alternatives for obtaining stop-loss insurance. One alternative is to have the HMO withhold a portion of the capitation rate for the sole purpose of buying insurance. However, if the HMO elects to self-insure and then fails to establish adequate reserves, the provider remains at risk. Another alternative is for the provider to receive the full capitation payment and then purchase stop-loss insurance directly from a company that specializes in such insurance. Of course, the alternative always exists for the provider to self-insure.

To illustrate the stop-loss insurance decision, assume that a hospital, in addition to its fee-for-service patients, has a capitated contract covering 60,000 lives that results in 2,016 admissions. The hospital can purchase stop-loss insurance with a \$30,000 attachment point and a 10 percent participation rate. Thus, the insurer pays 0 percent of costs up to \$30,000 and 90 percent of the cost above \$30,000.

Table 18.2 contains the relevant data for a stop-loss insurance analysis. The first column contains historical per patient cost data arranged by range of costs, while the second column contains the average per patient cost within each range. The final column of historical data reports the number of admissions in each cost range. The next two columns project the costs associated with each patient cost range for the following year. The column headed "Without SL" contains the total hospital cost projection for each range, assuming that no stop-loss insurance is purchased. The final column, headed "With SL," contains total costs, assuming stop-loss insurance is purchased.

**TABLE 18.2**  
 Stop-Loss (SL)  
 Illustration

Illustration	Cost Range	Historical Data		Projected Costs (\$000)	
		Average Cost	Admissions	Without SL	With SL
	\$0-\$4,999	\$ 3,288	535	\$ 1,759	\$ 1,759
	5,000-9,999	7,255	825	5,985	5,985
	10,000-14,999	12,207	273	3,333	3,333
	15,000-19,999	17,283	136	2,350	2,350
	20,000-24,999	22,510	101	2,274	2,274
	25,000-29,999	27,300	77	2,102	2,102
	30,000-39,999	35,429	57	2,019	1,740
	40,000-50,000	44,967	12	540	378
	Total		<u>2,016</u>	<u>\$20,362</u>	<u>\$19,921</u>
	Expected savings	\$441,000			
	Stop-loss premium	\$551,250			
	Expected true cost	\$110,250			

Note that the only difference in the two projected cost-column amounts occurs at (and beyond) the attachment point. In the \$0 – \$4,999 cost range (which is below the attachment point), total costs are  $535 \times \$3,288 = \$1,759,000$  with and without stop-loss protection. In the \$30,000 – \$39,999 cost range (which is above the attachment point), the hospital would incur  $57 \times \$35,429 = \$2,019,000$  in costs with no stop-loss protection. However, with the stop-loss insurance, the insurer would pay 90 percent of the cost above \$30,000, or  $0.9 \times (\$35,429 - \$30,000) = \$4,886$  per patient, for a total cost savings of  $57 \times \$4,886 = \$279,000$ . Thus, the total cost for that cost range with insurance would be  $\$2,019,000 - \$279,000 = \$1,740,000$ . The end result is that expected costs for the capitated population total \$20,362,000 without stop-loss insurance and \$19,921,000 with insurance, for a savings of \$441,000.

The insurer conducts a similar analysis to determine its expected cost, and then adds a percentage markup to cover administrative fees and the appropriate profit amount for the risk assumed in writing the insurance. If we assume that the insurer's analysis is identical to the hospital's and its markup is 25 percent, the insurance premium would be  $1.25 \times \$441,000 = \$551,250$ .

Thus, the hospital would bear an expected "true" cost of the stop-loss coverage of \$110,250, which is the \$551,250 premium cost less the expected cost savings of \$441,000. Of course, buying any type of insurance involves paying a premium to reduce the costs associated with an uncertain adverse event. Here, the adverse event is having more patients than expected with costs that exceed the \$30,000 threshold or higher costs than expected for the same number of patients. To protect the hospital from this risk, it must pay an expected "true" premium of \$110,250. The final decision regarding the purchase of stop-loss coverage would be based on this cost plus a number of

other factors, including the hospital's ability to bear the risk and the expected profitability of the capitated contract.

1. Why is it important that capitated providers establish reserves?
2. What are the two primary types of reserves?
3. What is stop-loss insurance?
4. Describe how a stop-loss insurance analysis is conducted.

## Self-Test Questions

### Debt Portfolio Immunization



Healthcare providers, especially not-for-profit hospitals, often maintain large portfolios of securities to either fund future capital investments or maintain endowments. For most providers, a significant portion of these portfolios consists of debt securities. As we discussed in Chapter 7, debt securities carry interest rate risk, which is composed of price risk and reinvestment rate risk. *Price risk* occurs because rising interest rates lower the values of existing securities, and *reinvestment rate risk* occurs because falling rates mean that reinvested principal and interest will earn less in the future.

To illustrate these risks, assume that a hospital is planning to add a new wing in ten years and is creating a portfolio of Treasury securities to pay for the required construction and equipment. Furthermore, assume that the yield curve is flat and the interest rate on such securities, regardless of maturity, is 6 percent. Finally, assume that the hospital will buy securities in \$10,000 increments and the bonds have annual coupons. Here are some possible interest rate scenarios and final values, assuming the bonds have a **ten-year maturity**:

- **Interest rates remain at 6 percent.** If interest rates remain at 6 percent, the value of one increment would be the initial \$10,000 plus \$7,908 future value of interest payments at the end of ten years for a total amount of \$17,908. This constant interest rate scenario is the base case, so the hospital is expecting each increment of bonds to be worth \$17,908 in ten years when it needs to pay for the new wing.
- **Interest rates drop to 4 percent immediately after purchase.** If interest rates fall, and remain at the new level, the value of one increment will be only  $\$10,000 + \$7,204 = \$17,204$ . Here, the lower interest rate means that the reinvested coupon payments will earn less than in the base case.
- **Interest rates rise to 8 percent immediately after purchase.** If interest rates rise, and remain at the new level, the value of one increment will be  $\$10,000 + \$8,692 = \$18,692$ . As opposed to the previous scenario, the reinvested coupon payments will now earn more than in the base case.

Because of interest rate risk, the hospital might find itself after ten years in a position with less money saved than it had expected. The shortfall would

be realized if interest rates fall because the bonds have reinvestment rate risk. However, because the bonds have a ten-year maturity, the hospital is not bearing any price risk at maturity—the bonds will be worth \$10,000 per increment at the end of ten years regardless of the level of interest rates.

Now, assume that the hospital invests in 30-year, rather than ten-year, Treasury securities. Here are the results, assuming a **30-year maturity**:

- **Interest rates remain at 6 percent.** If interest rates remain at 6 percent, the value of one increment would be the initial \$10,000 plus \$7,908 future value of interest payments at the end of ten years for a total amount of \$17,908. These results are the same as with ten-year bonds because the constant interest rate holds the value of the 30-year bonds at \$10,000 per increment over their entire maturity.
- **Interest rates drop to 4 percent immediately after purchase.** If interest rates fall, and remain at the new level, the value of one increment will be  $\$12,718 + \$7,204 = \$19,922$ . Note that the \$12,718 value per \$10,000 increment is the value of the bonds with 20 years remaining to maturity, which is the time remaining at the end of the ten-year holding period. In this scenario, the future value of the interest payments declines, but the bond is worth more when it would be sold. The net effect is an amount that is higher than the expected \$17,908.
- **Interest rates rise to 8 percent immediately after purchase.** If interest rates rise, and remain at the new level, the value of one increment will be  $\$8,036 + \$8,692 = \$16,728$ . Although the interest payments are worth more, the value of the bonds has dropped by an even greater amount, so the total value of one increment is now less than the amount expected.

With a 30-year bond, the hospital is bearing both price risk and reinvestment rate risk. Thus, the possible shortfall is greater than it was in the case of ten-year bonds. Because the price risk is much greater than the reinvestment rate risk, the shortfall occurs when interest rates rise.

There are two ways for the hospital to create a portfolio that is riskless, or close to it, in the sense that the ending amount is known with relative certainty today. The first way is to buy *zero-coupon bonds* with a ten-year maturity. If this way is followed, there is no reinvestment rate risk because there are no coupon payments, and there is no price risk at maturity because the maturity of the bond matches the hospital's ten-year holding period.

The second way is to *immunize* the portfolio. The term “immunize” is used because it allows the portfolio to be free of interest rate risk just as a vaccination allows an individual to be free of the risk of contracting some disease. The key to immunizing a portfolio is to buy bonds that have a *duration* equal to the holding period. Duration cannot be defined as easily as maturity, but it can be thought of as the weighted average maturity of a bond when all of its cash flows are considered, including both interest payments and



return of principal. For zero-coupon bonds, the duration is the same as the bond's maturity. Thus, when we said that interest rate risk could be eliminated by investing in ten-year zero-coupon bonds, we were actually choosing bonds with a duration that matched the hospital's ten-year holding period. However, when bonds have coupon payments, duration is shorter than maturity, and the higher the coupon payment, the shorter the duration. (Higher coupon payments mean that the cash flows from the bond, on average, occur earlier in the bond's life.)

Duration is calculated in the following way:

1. Lay out the cash flows expected from the bond in each Year  $t$ .
2. Find the present value of each cash flow when discounted at the required rate of return on the bond.
3. Divide each present value by the bond's current value.
4. Multiply each amount from the previous step by the year in which it occurs.
5. Sum the resulting products. This sum is the bond's duration.

To illustrate the calculation of duration, consider the ten-year, 6 percent annual coupon bonds described previously. Assume that the par value is \$10,000 and the current required rate of return on the bond is 6 percent. Because the required rate of return equals the coupon rate, the bond's par value is also its current value. Table 18.3 contains the duration calculation. As we stated previously, when a bond has coupon payments, its duration is shorter than its maturity. In this case, the duration is 7.8 years versus a maturity of ten years.

<i>Year (t)</i>	<i>Cash Flow</i>	<i>Present Value</i>	<i>Present Value / Current Value</i>	<i>t × (Present Value / Current Value)</i>
1	\$ 600	\$ 566.04	0.0566	0.0566
2	600	534.00	0.0534	0.1068
3	600	503.77	0.0504	0.1511
4	600	475.26	0.0475	0.1901
5	600	448.35	0.0448	0.2242
6	600	422.89	0.0423	0.2538
7	600	399.03	0.0399	0.2793
8	600	376.45	0.0376	0.3102
9	600	355.14	0.0355	0.3196
10	10,600	5,918.98	0.5919	<u>5.9190</u>
				<u>7.8017</u>

**TABLE 18.3**  
Duration  
Calculation

*Notes:* (1) The present value is found by discounting each cash flow back to Year 0 at the 6 percent required rate of return.

(2) The fourth column contains the present values divided by the \$10,000 current value.

(3) Values in the final column are found by multiplying each value in the fourth column by the corresponding value of  $t$  in the first column.



In addition to being used for immunization, duration can be used to estimate the sensitivity of a bond to changes in interest rates. For each 1 percent change in interest rates, the value of a bond will roughly change by a percentage amount equal to its duration. Thus, if interest rates rose by 1 percentage point, the bond in Table 18.3 would lose about 7.8 percent of its value, or fall to about \$9,220. The precise value is \$9,298, so using duration to determine the impact of interest rate changes is only an approximation, but it demonstrates that price risk is more closely related to duration than it is to maturity.<sup>3</sup>

Healthcare managers can immunize a bond portfolio—protect it against interest rate risk—by creating a portfolio with a duration that equals the holding period. Thus, in our example, the hospital would want to create a bond portfolio with a ten-year duration. To illustrate the effects of immunization, consider a 14-year bond with a 6 percent coupon when the required rate of return is 6 percent. Its duration is 9.85 years, so it closely matches the ten-year holding period. When we change the interest rate environment as before, here are the results:

- **Interest rates remain at 6 percent.** If interest rates remain at 6 percent, we again have the base case situation of \$10,000 in principal amount plus \$7,908 future value of interest payments for a total amount of \$17,908.
- **Interest rates drop to 4 percent immediately after purchase.** If interest rates fall, and remain at the new level, the value of one increment will be  $\$10,726 + \$7,204 = \$17,930$ . Here, the future value of the interest payments declines, but the bond is worth more when it would be sold, and the two value changes just about cancel each other out.
- **Interest rates rise to 8 percent immediately after purchase.** If interest rates rise, and remain at the new level, the value of one increment will be  $\$9,338 + \$8,692 = \$18,030$ . Although the interest payments are worth more, the value of the bond has dropped, and again the two value changes come close to offsetting one other.

With a duration roughly equal to the holding period, any gains from coupon reinvestment at a higher rate are offset by a loss of principal value, and vice versa. In effect, price risk and reinvestment rate risk are played off against one another, with the resulting value at the end of ten years being close to \$18,000 regardless of interest rate changes.

Unfortunately, life is not as easy as textbook examples. Although our example illustrates the basic concept of using duration to immunize bond portfolios, it oversimplifies the situation by assuming only one interest rate change during the hospital's ten-year holding period. In reality, interest rates change on a daily basis, which causes bonds' durations to change. This change in duration, in turn, means that real-world portfolios must be periodically *rebalanced* to remain immunized. Still, with the right software, rebalancing is

not an overwhelming task, and it is done by thousands of businesses as part of their financial risk-management programs.

1. What are the two components of interest rate risk?
2. Why do zero-coupon bonds that match the holding period eliminate interest rate risk?
3. What is duration?
4. How is duration used to immunize debt portfolios?

## Self-Test Questions

### An Overview of Derivatives

*Derivatives* are a type of security whose value stems from the value of a commodity item or other security, so its value is “derived” from the value of some other “instrument.” Because their values are derived from other instruments, or claims, derivatives are also called *indirect claims*. In contrast, stocks and bonds are *direct claims* because they have claims tied directly to the cash flows of a business. Because derivatives play an important role in financial risk management, an overview of these securities will help you understand the material to follow.

One of the first formal markets for derivatives was the *futures market* for wheat. Farmers were concerned when they planted in the spring about the price they would receive for their wheat when they sold it in the fall, and millers were concerned about the price they would have to pay. The risks faced by both parties could be reduced, or *hedged*, if they could establish a price earlier in the year. Accordingly, mill agents would go out to the wheat belt and make contracts with farmers that called for the farmers to deliver grain at a predetermined price. Both parties benefited from the transaction in the sense that their risks were reduced. The farmers could concentrate on growing their crop without worrying about the price of grain, and the millers could concentrate on their milling operations. Thus, in this case, hedging in the futures market reduced the price uncertainty to both parties and hence lowered aggregate risk in the economy.

These early futures dealings were between two parties who arranged the transactions themselves. Furthermore, the *underlying asset*, which is wheat in this illustration, was actually delivered when the contract expired. Such a contract is called a *forward contract*, and the two parties that establish the contract are called *counterparties*. Because forward contracts require delivery, they are most useful when one counterparty actually owns the underlying asset and the other needs that asset to produce some product. A *futures contract* is similar to a forward contract, but with three key differences:

1. Futures contracts are generally standardized instruments that are traded on exchanges, whereas forward contracts are generally tailor made, are

- negotiated between two counterparties, and are not traded after they have been signed.
2. Futures contracts are “marked to market” on a daily basis, which means that gains and losses are noted by the exchange, and when losses exceed a preset limit, money must be put up by buyers to cover those losses. This process greatly reduces the risk of default that exists with forward contracts.
  3. With futures, physical delivery of the underlying assets is virtually never taken—the two counterparties simply settle up with cash for the difference between the contracted price and the actual price on the expiration date.

The formation of futures markets allowed the contracts to be easily traded. The Chicago Board of Trade was an early marketplace for this dealing, and *futures dealers* helped make a market in futures contracts. Farmers could sell futures on the exchange, and millers could buy them there rather than contract directly. Thus, millers could buy wheat from any supplier at the prevailing harvest price, yet still lock in an effective price much earlier through futures contracts. Similarly, farmers could sell their crops to anyone at harvest and use the futures market to offset any adverse price trends that occurred during the growing season. The advent of a dealer system improved the efficiency and lowered the cost of hedging operations.

Quickly, a third group—*speculators*—entered the scene. Most derivatives, including futures, are highly leveraged, which means that a small change in the value of the underlying asset will produce a large change in the price of the derivative. This leverage appealed to speculators. At first blush, one might think that the appearance of speculators would increase risk, but this is not true. Speculators add capital and players (counterparties) to the market, and this tends to create more liquidity and stabilize the market. Of course, derivatives markets are inherently volatile because of the amount of leverage involved, and hence risk to the speculators is high. Still, their willingness to bear that risk makes the derivatives markets more efficient for hedging.

*Natural hedges*—defined as situations in which aggregate risk can be reduced by derivatives transactions between the counterparties—exist for many commodities, for foreign currencies, for interest rates on securities with different maturities, and even for common stocks where portfolio managers want to “hedge their bets.” Natural hedges occur when futures are traded between cotton farmers and cotton mills, copper mines and copper fabricators, importers and foreign manufacturers (which hedge currency exchange rates), electric utilities and coal companies, and oil producers and oil users. In all such situations, hedging reduces aggregate risk and thus benefits the economy.

Hedging can also be done in situations where no natural hedge exists. Here, one party wants to reduce some type of risk, and another party agrees to sell a contract that protects the first party from that specific event or situation. Insurance is an obvious example of this type of hedge. Note, though, that with

nonsymmetric hedges, risks are generally *transferred* rather than *eliminated*. Even here, though, insurance companies can reduce certain types of risk they face through diversification.

The derivatives market has grown more rapidly than any other major market in recent years for a number of reasons. First, analytical techniques have been developed to help establish “fair” prices, and having a better basis for pricing contracts makes the counterparties more comfortable with deals. Second, computers and electronic communications make it much easier for counterparties to deal with one another. Third, globalization has greatly increased the importance of currency markets and the need for reducing the exchange rate risks brought on by global trade. Recent trends and developments are sure to continue, if not accelerate, so the use of derivatives for risk management is bound to grow.

Note, though, that derivatives do have a potential downside. Because these instruments are highly leveraged, small miscalculations can lead to huge losses. Also, they are complicated and hence not well understood by most people. This complexity makes mistakes more likely than with less complex instruments, and it makes it harder for a firm’s top management to exercise proper control over derivative transactions. To illustrate, one 28-year-old, relatively low-level employee, who operated in the Far East, entered into transactions that led to the bankruptcy of Britain’s oldest bank—Barings—which held the accounts of the Queen of England. Hundreds of other horror stories can be told.

Still, derivatives are used far more often to hedge risks than in harmful speculations, but these beneficial transactions never make the headlines. Therefore, while the horror stories point out the need for top managers to exercise control over the personnel who deal with derivatives, they certainly do not justify the elimination of derivatives. In the balance of this chapter, we discuss some specific types of derivative securities and how healthcare businesses can use them for risk management.

1. What is the difference between direct and indirect claims?
2. How did derivatives begin?
3. What is a natural hedge? Give some examples of natural hedges.
4. What is the difference between using derivatives for hedging as opposed to speculation?
5. Why are derivatives better than direct claims for speculation?

## Self-Test Questions

## Options

An *option* is a particular type of derivative that gives its holder the right to buy, or sell, an *underlying asset* at some predetermined price within a specified period of time. Healthcare managers should have some understanding of

options both for risk management and also because of the impact of real options on the value of capital projects under consideration. (Real options are discussed in some detail in Chapter 12.)

### **Option Types and Markets**

There are many types of options and option markets.<sup>4</sup> To illustrate how options work, suppose you owned 100 shares of Midwest Healthcare, a for-profit hospital management company, which on Monday, July 10, 2006, sold for \$28.50 per share. You might sell to someone else the right to buy your 100 shares at any time during the next four months at a price of, say, \$30 per share. The \$30 is called the *strike*, or *exercise price*. Such options exist, and they are traded on a number of exchanges, with the Chicago Board Options Exchange being the oldest and the largest. This type of option is a *call option* because the purchaser has a “call” on 100 shares of stock. The seller of an option is called the option *writer*. An investor who “writes” call options against stock held in his or her portfolio is said to be selling *covered options*. Options sold without the stock to back them up are called *naked options*. When the exercise price exceeds the current stock price, a call option is said to be *out-of-the-money*. When the exercise price is below the current price of the stock, the option is *in-the-money*.

Suppose that the call options described above are selling for \$2.70. Thus, for \$270 an individual or business can buy the right to purchase 100 shares of Midwest Healthcare stock at a price of \$30 per share at any time over the next four months.<sup>5</sup> If the stock price stays below \$30 during that period, the buyer will lose \$270, but if it rises to \$40, the \$270 investment will increase in value to  $(\$40 - \$30) \times 100 = \$1,000$  in less than 120 days, which translates into a very healthy annual rate of return. Incidentally, if the stock price does go up, the holder will not actually exercise the options, buy the stock, and then resell it at a higher price. Rather, the holder will merely sell the options, which will then have a value of somewhat more than \$1,000 versus the \$270 purchase price, to another option buyer or back to the original seller.

An individual or business can also buy an option that gives the holder the right to sell a stock at a specified price within some future period—this is called a *put option*. For example, suppose someone believes Midwest Healthcare’s stock price is likely to decline from its current level of \$28.50 sometime during the next four months. This individual might buy a four-month put option for, say, \$150 that gives the buyer the right to sell 100 shares (which the option buyer would not necessarily own) at a price of \$25 per share (\$25 is the strike price). If the individual buys this 100-share contract and then Midwest’s stock price falls to \$20, the holder can, in theory, buy a share of stock for \$20 and exercise the put option by selling it for \$25. The profit from exercising the option will be  $(\$25 - \$20) \times 100 = \$500$ . After subtracting the \$150 you paid for the option, the profit (before taxes

and commissions) is \$350. As with call options, the holder will not actually exercise the put option. Rather, he or she will sell the put option, which will have a value of over \$500.

In addition to options on individual stocks, options are also available on several stock indexes such as the NYSE Index and the S&P 500 Index. Index options permit someone to hedge, or bet, on a rise or fall in the general market as opposed to individual stocks. Option trading is one of the hottest financial activities in the United States. The leverage involved makes it possible for speculators with just a few dollars to make a fortune almost overnight. Also, investors with sizable portfolios can sell options against their stocks and earn the value of the option (less brokerage commissions), even if the stock's price remains constant. Most importantly, though, options can be used to create *hedgies* that protect the value of an individual stock or portfolio.

Corporations on whose stocks options are written have nothing to do with the options markets. Corporations do not raise money in the options markets nor do they have any direct transactions in it. Moreover, option holders do not vote for corporate directors or receive dividends. There have been numerous studies conducted to ascertain whether option trading stabilizes or destabilizes the stock market and whether this activity helps or hinders corporations that seek to raise new capital. The studies have not been conclusive, but option trading is here to stay, and many regard it as the most exciting game in town.

### Factors That Affect the Value of a Call Option



Perhaps the best way to examine the factors that affect the value of a call option is to consider the concept of *exercise value*, which is defined as follows:

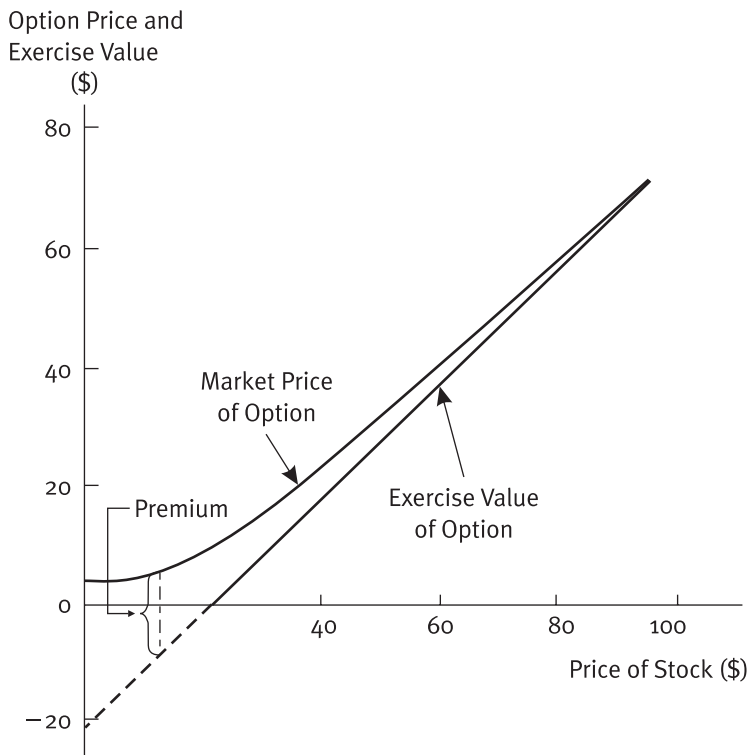
$$\text{Exercise value} = \text{Current price of the stock} - \text{Exercise (strike) price.}$$

In other words, the exercise value is what the option would be worth if it were exercised immediately. For example, if a stock sells for \$50 and its option has an exercise price of \$20, then you can buy the stock for \$20 by exercising the option. You would own a stock worth \$50, but you would have to pay only \$20. Therefore, the option would be worth \$30 if you exercised it immediately. Note that the calculated exercise value of a call option can be negative, but realistically the minimum “true” value of an option is zero because no one would exercise an out-of-the-money option. Note also that an option's exercise value is only a first-approximation value—it merely provides a starting point for finding the actual value of the option.

Now, consider Figure 18.1, which contains some call option data on West Coast Genetics, Inc. (WCG)—a company that recently went public and whose stock price has fluctuated widely during its short history. Column 1 in the tabular data section contains a list of selected recent stock prices, while Column 2 shows the constant \$20 strike price. Column 3 shows the exercise

**FIGURE 18.1**

West Coast  
Genetics, Inc.:  
Call Option  
Data



Price of Stock (1)	Strike Price (2)	Exercise Value of Option (1) - (2) = (3)	Market Price of Option (4)	Premium Premium (4) - (3) = (5)
\$20.00	\$20.00	\$ 0.00	\$ 9.00	\$9.00
\$21.00	\$20.00	\$ 1.00	\$ 9.75	\$8.75
\$22.00	\$20.00	\$ 2.00	\$10.50	\$8.50
\$35.00	\$20.00	\$15.00	\$21.00	\$6.00
\$42.00	\$20.00	\$22.00	\$26.00	\$4.00
\$50.00	\$20.00	\$30.00	\$32.00	\$2.00
\$73.00	\$20.00	\$53.00	\$54.00	\$1.00
\$98.00	\$20.00	\$78.00	\$78.50	\$0.50

values for WCG's call option when the stock was selling at the listed prices; Column 4 gives the actual market prices for the option; and Column 5 shows the premium of the actual call option price over its exercise value. At any stock price below \$20, the exercise value is set at zero but above \$20; each \$1 increase in the price of the stock brings with it a \$1 increase in the option's exercise value. Note, however, that the actual market price of the option lies



above the exercise value at each stock price, although the premium declines as the price of the stock increases. For example, when the stock sold for \$20 and the option had a zero exercise value, its actual price, and the premium, was \$9. Then, as the price of the stock rose, the exercise value's increase matched the stock's increase dollar for dollar, but the market price of the option climbed less rapidly, causing the premium to decline. The premium was \$9 when the stock sold for \$20 a share, but it had declined to \$1 by the time the stock price had risen to \$73 a share. Beyond that point, the premium virtually disappeared.

Why does this pattern exist? Why should a call option ever sell for more than its exercise value, and why does the premium decline as the price of the stock increases? The answer lies in part in the speculative appeal of options—they enable buyers to gain a high degree of personal leverage when buying securities. To illustrate the concept, suppose WCG's option **sold for exactly its exercise value**. Now, suppose you were thinking of investing in the company's common stock at a time when it was selling for \$21 a share. If you bought a share and the price rose to \$42, you would have made a 100 percent capital gain. However, had you bought the option at its exercise value—\$1 when the stock was selling for \$21—your capital gain would have been  $\$22 - \$1 = \$21$  on a \$1 investment, or 2,100 percent! At the same time, your total loss potential with the option would be only \$1 versus a potential loss of \$21 if you purchased the stock. The huge capital gains potential, combined with the loss limitation, is clearly worth something—the exact amount it is worth to investors is the amount of the premium. Note, however, that buying the option is riskier than buying WCG's stock because there is a higher probability of losing money on the option. If WCG's stock price fell to \$20, you would have a 4.76 percent loss if you bought the stock (ignoring transaction costs), but you would have a 100 percent loss on the option investment.

Why does the premium decline as the price of the stock rises? Part of the answer is that both the leverage effect and the loss protection feature decline as the stock price rises. For example, if you were thinking of buying WCG's stock when its price was \$73 a share, the exercise value of the option would be \$53. If the stock price doubled to \$146, you would have a 100 percent gain on the stock. But, the exercise value of the option would go from \$53 to \$126, for a percentage gain of only 138 percent versus 2,100 percent in the earlier case. Note also that the potential loss per dollar of potential gain on the option is much greater when the option is selling at high prices. These two factors—the declining leverage impact and the increasing danger of large losses—help explain why the premium diminishes as the price of the common stock rises.

Option pricing models can be used to precisely identify the factors that affect the value of a call option, but these factors can also be discussed in a more intuitive way.<sup>6</sup>



- The higher the stock's market price in relation to the exercise price, the higher will be the exercise value and hence the option's value.
- The lower the exercise price, the higher the call option value. Again, call option value stems from the spread between the stock price and the exercise price (the exercise value), so a higher strike price reduces call option value.
- The longer the option period, the higher the option value. This occurs because the longer the time before expiration, the greater the chance that the stock price will climb substantially above the exercise price. Thus, option premiums, and hence values, increase as the expiration date is lengthened.
- An option on an extremely volatile stock is worth more than one on a very stable stock. If the stock price rarely moves, then there is only a small chance of a large gain. However, if the stock price is highly volatile, the option can easily become very valuable. At the same time, losses on options are limited—you can make an unlimited amount, but you can lose only what you paid for the option. Therefore, a large decline in a stock's price does not have a corresponding bad effect on option holders. As a result of the unlimited upside but limited downside, the more volatile the stock price, the higher the premium, and hence value, of the call option.

## Self-Test Questions

1. What is an option? A call option? A put option?
2. Define a call option's exercise value. Why is the actual market price of a call option usually above its exercise value?
3. What are some factors that affect a call option's value?

## Futures

One of the most useful tools for reducing interest rate, exchange rate, and input risk is to hedge in the futures markets. Most financial and real-asset transactions occur in what is known as the *spot*, or *cash, market*, where the asset is delivered immediately or within a few days. *Futures markets* involve the purchase or sale of an asset at some future date, but at a price that is fixed today.

Futures contracts and options are similar to one another—so similar that people often confuse the two. A *futures contract* is a definite agreement on the part of one party to buy the underlying asset on a specific date and at a specific price, and the other party agrees to sell on the same terms. No matter how low or how high the price goes, the two parties must settle the contract at the agreed-on price. An *option*, on the other hand, gives someone the **right** to buy (call) or sell (put) an asset, but the holder of the option does not have to complete the transaction. The two types of instruments can be used for the same purposes. One is not necessarily better or worse than the other; they are simply different.

## Types of Contracts

Futures contracts are available on more than 30 real and financial assets traded on 14 U.S. exchanges, the largest of which are the Chicago Board of Trade (CBOT) and the Chicago Mercantile Exchange. Futures contracts are divided into two classes: (1) *commodity futures* and (2) *financial futures*. Commodity futures, which cover oil, various grains, oilseeds, livestock, meats, fibers, metals, and wood, were first traded in the United States in the mid-1800s. Financial futures, which were first traded in 1975, include Treasury bills, notes, bonds, certificates of deposit, Eurodollar deposits, foreign currencies, and stock indexes. Although commodity contracts are still very important, today more trading is done in foreign exchange and interest rate futures.

When futures contracts are purchased, the buyer does not have to put up the full amount of the purchase price; rather, the purchaser is required to post an *initial margin*, which for CBOT Treasury bond contracts is \$3,000 per \$100,000 contract. The fact that the full value of the contract is not required from the counterparties to initiate the contract creates significant leverage. However, investors are required to maintain a certain value in the margin account, called a *maintenance margin*. If the value of the contract declines, then the owner may be required to add additional funds to the margin account, and the more the contract value falls, the more money must be added. The value of the contract is checked at the end of every working day, and margin account adjustments are made at that time. This process is called *marking to market*.

## Using Futures to Hedge Interest Rate Risk

To illustrate the use of interest rate futures to hedge (manage) risk, assume that HCA decides to build a new hospital at a cost of \$100 million. It plans to finance the project with 20-year bonds that would carry a 10 percent interest rate if they were issued today. However, the company will not need the money for about six months. HCA can go ahead and sell 20-year bonds now, locking in the 10 percent rate, but it would have the money before it was needed, so it would have to invest the \$100 million in short-term securities that would yield significantly less than 10 percent. However, if HCA waits six months to sell the bond issue, interest rates might be higher than they are today, in which case the cost of financing would increase perhaps to the point of making the hospital unprofitable. One solution to HCA's dilemma is to hedge the bond issue transaction with *interest rate futures*, which are based on a hypothetical 20-year Treasury bond with a 6 percent semiannual coupon. If interest rates in the economy go up, the value of the hypothetical T-bond will go down, and vice versa.

Hedging involves protecting some underlying asset against adverse price trends. Because prices can go up or down, there are two basic types of futures hedges: (1) *long hedges*, in which a contract is purchased to guard

against price increases, and (2) *short hedges*, in which a contract is sold to guard against price declines. In our example, HCA is worried about an increase in interest rates, which is actually a fall in bond prices. Thus, HCA should use a short hedge; that is, it should sell T-bond futures for delivery in six months. Then, if interest rates rise, HCA will have to pay more when it issues its own bonds. However, it will make a profit on its futures position because it will have presold the hypothetical bonds at a higher price than it will have to pay to cover (repurchase) them. Of course, if interest rates decline, HCA will lose on its futures position, but this will be offset by the fact that HCA will pay a lower interest rate when it issues its bonds.

If futures contracts existed on HCA's own debt, and interest rates moved identically in the spot (current) and futures markets, HCA could construct a *perfect hedge*, in which gains on the futures contract would exactly offset losses on the bonds. In reality, it is virtually impossible to construct perfect hedges because in most cases the underlying asset is not identical to the futures asset, and even when they are, prices, and interest rates, may not move exactly together in the spot and futures markets.

Note that if HCA had been planning an equity offering, and if its stock tended to move fairly closely with one of the stock indexes, the company could have hedged against falling stock prices by selling short the index future. Even better, because options on HCA's stock are traded in the options markets, it could use options, rather than futures, to hedge against falling stock prices. The general approach would be the same as that just described using the futures market.

The futures and options markets permit flexibility in the timing of financial transactions because the firm can be protected, at least partially, against changes that occur between the time a decision is reached and the time when the transaction will be completed. However, this protection has a cost—the firm must pay commissions. Whether or not the protection is worth the cost is a matter of judgment. The decision to hedge also depends on management's risk aversion as well as the company's strength and ability to assume the risk in question. In theory, the reduction in risk that results from a hedge transaction should have a value exactly equal to the cost of the hedge. Thus, a firm should be indifferent to hedging. However, many firms believe that the peace of mind is worth the cost.

### **Using Futures to Hedge Input Price Risk**

As we noted earlier, futures markets were established for many commodities long before they began to be used for financial instruments. We can use American Dental Products (ADP), which uses large quantities of palladium for dental alloys, to illustrate input risk hedging. Suppose that in July 2006, ADP becomes especially concerned about the market price of palladium. Russia supplies about 60 percent of the world supply, and increasing worker unrest

has created concern among ADP's managers. Because ADP has many long-term fixed price contracts with buyers of dental alloys, a spike in palladium costs could easily result in significant damage to its bottom line.

ADP can, of course, go ahead and buy palladium today to meet its needs over, say, the next year, but if it does it will incur substantial carrying costs. As an alternative, the company can hedge against increasing palladium prices in the futures market. The New York Mercantile Exchange trades standard palladium futures contracts of 100 troy ounces each.<sup>7</sup> Thus, ADP can buy 100 contracts (go long) for delivery in, say, December, which would lock in a price of \$637 per ounce. If palladium prices do rise appreciably over the next five months, the value of ADP's long position in palladium futures would increase, thus offsetting some of the price increase in the commodity itself. Of course, if palladium prices fall, ADP will lose money on its futures contract, but the company will be buying the metal on the spot market at a cheaper price, so it will make a higher-than-anticipated profit on its dental alloy sales. Thus, hedging in the futures market locks in the cost of ADP's raw materials and removes some risk to which the firm would otherwise be exposed.

1. Briefly, describe the features of a futures contract.
2. How do options and futures differ?
3. How can futures contracts be used to hedge interest rate risk?
4. How can futures contracts be used to hedge input price risk?

## Self-Test Questions

## Swaps

A *swap* is just what the name implies. Two parties agree to swap something—generally obligations to make specified payment streams. Most swaps today involve either interest payments or currencies. Whereas swaps were at one time considered to be “too exotic” for healthcare providers, today both for-profit and not-for-profit hospitals have swap contracts covering about 10 percent of their debt obligations.

To illustrate an interest rate swap, suppose Hospital V has a 20-year, \$100 million floating (variable) rate bond outstanding, while Hospital F has a \$100 million, 20-year, fixed-rate issue outstanding. Thus, each hospital has an obligation to make a stream of interest payments, but one payment stream is fixed while the other will vary as interest rates change in the future.

Now, suppose Hospital V has stable cash flows and it wants to lock in its cost of debt. Hospital F, on the other hand, has cash flows that fluctuate with the economy, rising when the economy is strong and falling when it is weak. Recognizing that interest rates also move up and down with the economy, Hospital F has concluded that it would be better off with variable rate debt. If the companies swapped their payment obligations, an *interest rate swap* would

occur. Hospital V would now have to make fixed payments, which is consistent with its stable cash inflows, and Hospital F would have a floating stream, which for it is less risky.

Our example illustrates how swaps can reduce risk by allowing each company to match the variability of its interest payments with that of its cash flows. However, there are also situations where swaps can reduce both the riskiness of the debt and its cost. For example, Antron Pharmaceuticals, which has a high credit rating, can issue either floating rate debt at LIBOR + 1 percent or fixed rate debt at 10 percent.<sup>8</sup> Bosworth Medical Instruments is less creditworthy, and its cost for floating rate debt would be LIBOR + 1.5 percent, and its fixed rate cost would be 10.4 percent. Because of the nature of its operations, Antron's managers have decided that it would be better off with fixed rate debt, while Bosworth's managers would prefer floating rate debt. Paradoxically, both firms can benefit by issuing the type of debt they do not want but then swapping their payment obligations.

First, each company would issue an identical amount of debt, which is called the *notional principal*. Even though Antron wants fixed rate debt, it issues floating rate debt at LIBOR + 1 percent, and Bosworth issues fixed rate debt at 10.4 percent. Next, the two companies swap their interest payments: Antron will make 10.4 percent fixed rate payments to Bosworth, and Bosworth will make LIBOR + 1 percent payments to Antron.<sup>9</sup>

In addition, Bosworth must make an additional fixed payment of 0.45 percent to Antron. Antron ends up making fixed payments, which it desires, but because of the swap, the rate paid is 9.95 percent versus the 10 percent rate it would have paid had it issued fixed rate debt directly. At the same time, the swap leaves Bosworth with floating rate debt, which it wanted, but at a rate of LIBOR + 1.45 percent versus the LIBOR + 1.50 percent it would have paid on directly issued floating rate debt. As this example illustrates, swaps can sometimes lower the interest rate paid by each party.

As in the illustration, swap arrangements often involve *side payments*. For example, if interest rates had fallen sharply since Company F issued its bonds, then its old payment obligations would be relatively high, and it would have to make a side payment to get S to agree to the swap. Similarly, if the credit risk of one company were higher than that of the other, the stronger company would be concerned about the ability of the weaker counterparty to make the required payments. This high credit risk would also lead to the need for a side payment.

Major changes have occurred over time in the swaps market. First, standardized contracts have been developed for the most common types of swaps, and this has had two effects: (1) standardized contracts lower the time and effort involved in arranging swaps and thus lower transactions costs and (2) the development of standardized contracts has led to a secondary market for swaps, which has increased the liquidity and efficiency of the swaps market. A number of international banks now make markets in swaps and offer quotes

on several standard types. Also, banks now take counterparty positions in swaps, so it is not necessary to find another firm with mirror-image needs before a swap transaction can be completed. The bank would generally find a final counterparty for the swap at a later date, so its positioning helps make the swap market more operationally efficient.

*Currency swaps*, which are similar to interest rate swaps, are of significant value to businesses with overseas operations. They are structured in a manner similar to that described for interest rate swaps, except that the counterparties are exchanging currency types rather than interest rate types. Because few healthcare providers operate in foreign countries, we will not provide an illustration here.

1. What are swaps?
2. How can swaps be used to reduce risk? To lower borrowing costs?

## Self-Test Questions

### The Use and Misuse of Derivatives

Most of the news stories about derivatives are related to financial disasters. Much less is heard about the benefits of derivatives. However, because of these benefits, more than 90 percent of large U.S. companies use derivatives on a regular basis. These data lead to one conclusion: If a company can safely and inexpensively hedge its financial risks, it should do so.

There can, however, be a downside to the use of derivatives. Hedging is invariably cited by authorities as a “good” use of derivatives, whereas speculating with derivatives is often cited as a “bad” use. Some people and organizations can afford to bear the risks involved in speculating with derivatives, but others are either not sufficiently knowledgeable about the risks they are taking or else should not be taking those risks in the first place. Most would agree that the typical corporation should use derivatives only to hedge risks, not to speculate in an effort to increase profits. Hedging allows managers to concentrate on running their core businesses without having to worry about interest rate, currency, and commodity price variability. However, problems can arise quickly when hedges are improperly constructed or when managers, who are eager to report high returns, use derivatives for speculative purposes.

Our position is that derivatives can and should be used to hedge against certain risks, but that the leverage inherent in derivative contracts makes them potentially dangerous instruments. Also, healthcare managers should be reasonably knowledgeable about the derivatives their firms use, should establish policies regarding when they can and cannot be used, and should establish audit procedures to ensure that the policies are actually carried out. Moreover, a firm’s derivative position should be known by the board and reported to stockholders because stockholders have a right to know the extent to which companies are using derivatives.

Not surprisingly, the Financial Accounting Standards Board (FASB) recently issued new guidelines regarding the disclosure of derivative transactions. The rules, which became effective in 2000, require that the value of nearly all derivative contracts be reported and “marked to market” every quarter. This means that a derivative position that has lost value will have to be reported on the balance sheet at the new, lower value and the loss charged against earnings on the business’s income statement. These actions must occur even though the contract has not expired and may well rise in price later. Before these guidelines were issued, the values of derivative transactions were commonly deferred or shown only in footnotes. Critics of the guidelines contend that they cause reported earnings to fluctuate unnecessarily and hence force managers to rethink their use of hedging strategies. Proponents contend that the new guidelines allow investors to see what derivative strategies are being used and how well they are working.

## Self-Test Questions

1. How should derivatives be used in financial risk management? What problems can occur?
2. How are derivatives reported on a business’s financial statements?

## Key Concepts

This chapter provided an introduction to financial risk management. Here are its key concepts:

- In general, *financial risk management* involves the management of unpredictable events that have adverse financial consequences for the business.
- The three steps in risk management are as follows: (1) *identify* the risks faced by the company, (2) *measure* the potential impacts of these risks, and (3) *decide* how each relevant risk should be handled.
- In most situations, risk exposure can be mitigated by one or more of the following techniques: (1) *transfer the risk* to an insurance company, (2) *transfer the function* that produces the risk to a third party, (3) *purchase derivative contracts*, (4) *reduce the probability* that an adverse event will occur, (5) *reduce the magnitude* of the loss associated with an adverse event, and (6) totally *avoid* the activity that gives rise to the risk.
- *Derivatives* are securities whose values are determined by the market price of a commodity item or another security.
- A *hedge* is a transaction that lowers risk. A *natural hedge* is a transaction between two *counterparties* where both parties’ risks are reduced.
- *Options* are financial instruments that (1) are created by exchanges



rather than firms, (2) are bought and sold primarily by investors, and (3) are of importance to both investors and managers.

- The two primary types of options are (1) *call options*, which give the holder the right to purchase a specified asset at a given price (the *exercise*, or *strike*, *price*) for a given period of time, and (2) *put options*, which give the holder the right to sell an asset at a given price for a given period of time.
- A call option's *exercise value* is defined as the current price of the stock less the strike price.
- Under a *forward contract*, one party agrees to buy a commodity at a specific price on a specific future date and the other party agrees to make the sale. With a forward contract, delivery does occur.
- A *futures contract* is a standardized contract that is traded on an exchange and is “marked to market” daily, but where physical delivery of the underlying asset usually does not occur.
- *Financial futures* permit businesses to create hedge positions to protect themselves against fluctuating interest rates, stock prices, and exchange rates.
- *Commodity futures* can be used to hedge against input price increases.
- *Long hedges* involve buying futures contracts to guard against price increases.
- *Short hedges* involve selling futures contracts to guard against price declines.
- A *perfect hedge* occurs when the gain or loss on the hedged transaction exactly offsets the loss or gain on the underlying asset. Unfortunately, it is difficult to create perfect hedges in the real world because of inherent differences in spot and future markets.
- A *swap* is an exchange of cash payment obligations. Swaps occur because both counterparties involved prefer the other party's payment stream because of risk and/or cost differentials.
- Derivatives can and should be used to hedge against certain risks, but the leverage inherent in derivative contracts makes them potentially dangerous instruments.

This chapter ends our discussion of financial risk management as well as concludes the text. We sincerely hope that you have found this text useful to you as you develop your healthcare financial management skills.

## Chapter Models and Problems

This chapter has an accompanying spreadsheet model that illustrates how spreadsheets can be used in risk management.



In addition, the chapter has two problems in spreadsheet format that focus on risk management issues.

The model and problem spreadsheets can be accessed on this book's companion website: [ache.org/UnderstandingFinancialManagement5](http://ache.org/UnderstandingFinancialManagement5).

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## Selected Websites

- To learn more about the risk-management function in the health services industry, see the website of the American Society of Healthcare Risk Management at [www.ashrm.org](http://www.ashrm.org).
- For more information on options and futures markets, see the following:
  - [www.cbot.com](http://www.cbot.com) for the Chicago Board of Trade
  - [www.cme.com](http://www.cme.com) for the Chicago Mercantile Exchange

- [www.cboe.com](http://www.cboe.com) for the Chicago Board Options Exchange
  - [www.nymex.com](http://www.nymex.com) for the New York Mercantile Exchange
- All of the above websites contain a large amount of general information as well as specific information regarding the contracts offered.

## Notes

1. For more information on IBNR reserves, see J. Bruce Ryan and Scott B. Clay, “How to Determine Financial Reserves for Capitated Contracts,” *Healthcare Financial Management*, March 1995, 18.
2. The term “reinsurance” has traditionally been used to mean insurance bought by insurance companies from other insurance companies to limit the risk assumed by the first insurer in covering a potential loss. However, the term is also used in the health services industry when a provider seeks insurance to limit capitation risk.
3. There is a way to modify the duration of a bond to make it a more exact predictor of price risk. See Robert C. Radcliffe, *Investment: Concept, Analysis, and Strategy* (Reading, MA: Addison-Wesley, 1997), 430–431.
4. For an in-depth treatment of options, see Don M. Chance, *An Introduction to Derivatives* (Fort Worth, TX: Dryden Press, 1998).
5. Actually, the *expiration date*, which is the last date that the option can be exercised, is the Friday before the third Saturday of the exercise month. Also, note that option contracts are generally written in 100-share multiples.
6. Note that in addition to the four factors listed, the current level of interest rates also affects a call option’s value. However, the effect is quite small compared to the factors listed. Also, for purposes of our discussion of healthcare finance, it is not necessary to discuss option pricing models, which identified the factors. For a discussion of such models, see the text referenced in Note 4.
7. A *troy ounce* is a unit of weight commonly used in metals. It is equal to 1.0977 avoirdupois (regular) ounces.
8. LIBOR stands for London Interbank Offer Rate, which is the rate charged on dollar loans between banks in the Eurodollar market (the market for U.S. dollars traded overseas).
9. Actually, such transactions generally are arranged by large money-center banks, and payments are made to the bank, which in turn pays the interest on the original loans. The bank would assume the credit risk and guarantee the payments should one of the parties default. For its services, the bank would receive a percentage of the payments as its fee.



# GLOSSARY

**Abandonment value.** The value of a project if discontinued before the end of its economic life.

**Account receivable.** A balance sheet current asset created when a service is performed (or a good is shipped) but payment has not been received.

**Acquiring company.** A business that seeks to acquire another business.

**Actual (realized) return.** The return actually earned on an investment, as opposed to the return that was expected when the investment was made.

**Adverse selection.** The fact that individuals or businesses that are more likely to have claims have a greater incentive to purchase insurance.

**Agency costs.** A direct or indirect expense that is borne by a person (or group of persons) as a result of having delegated authority to an agent. For example, the costs borne by shareholders to ensure that the company's managers are acting in their best interests.

**Aging schedule.** A table that expresses a business's accounts receivable by how long each account has been outstanding.

**Alternative minimum tax (AMT).** A provision of the federal tax code that requires profitable businesses (or individuals) to pay a minimum amount of income tax regardless of the amounts of certain deductions.

**Ambulatory payment classification (APC).** A set of patient procedures that forms the basis for Medicare reimbursement for hospital outpatient services.

**Amortization schedule.** A table that breaks down the fixed payment of an installment (amortized) loan into its principal and interest components.

**Amortized (installment) loan.** A loan that is repaid in equal periodic amounts that include both principal and interest payments.

**Annual percentage rate (APR).** The stated annual interest rate when compounding occurs more frequently than annually. It is calculated by multiplying the periodic rate by the number of compounding periods per year. See effective annual rate (EAR).

**Annual report.** A report issued annually by a corporation to its stockholders (or stakeholders) that contains descriptive information as well as historical financial statements.

**Annuity.** A series of payments of a fixed amount for a specified number of equal periods.

**Annuity due.** An annuity with payments occurring at the beginning of each period. See ordinary annuity.

**Arbitrage.** The simultaneous buying and selling of the identical item in different markets at different prices, thus earning a risk-free return. See risk arbitrage.

**Arrearages.** Preferred dividends that have been passed (not paid).

- Asset management ratios.** Financial statement analysis ratios that measure how effectively a firm is managing its assets.
- Average collection period (ACP).** The average length of time it takes a business to collect its receivables. Also called days sales outstanding (DSO) and days in patient accounts receivable.
- Average length of stay (ALOS).** The average time a patient spends in an inpatient setting per admission. Also called length of stay (LOS).
- Balance sheet.** A financial statement that list a business's assets, liabilities, and equity (fund capital).
- Basic earning power (BEP) ratio.** Earnings before interest and taxes (EBIT) divided by total assets. The BEP ratio measures the basic return on assets (ROA) before the influence of financial leverage and taxes.
- Benchmarking.** The comparison of performance factors, such as financial ratios, of one company against those of other companies and industry averages. Also called comparative analysis.
- Best-efforts arrangement.** A type of contract between an investment banker and a company issuing stock, in which the banker commits only to making its best effort to sell the issue, as opposed to guaranteeing that the entire issue will be sold. See underwritten issue.
- Beta coefficient ( $\beta$ ).** A measure of the risk of one asset relative to the risk of a collection of assets. Often, beta refers to the risk of a stock relative to the risk of the overall market as measured by some stock index. See characteristic line.
- Bond.** Long-term debt issued by a business or government unit and generally sold to a large number of individual investors. See term loan.
- Bond indenture.** The loan agreement between the bond issuer and bondholders that spells out the terms of the bond.
- Bond insurance.** Insurance that guarantees the payment of interest and repayment of principal on a bond even if the issuing company defaults. Insured bonds are rated AAA. Also called credit enhancement.
- Book depreciation.** Depreciation calculated according to generally accepted accounting principles (GAAP). See depreciation.
- Breakup value.** The value of a business assuming its assets are sold off separately.
- Business risk.** The risk inherent in the operations of business assuming it uses zero debt (or preferred stock) financing.
- Call option.** A contract that gives the holder of the option the right to buy a specified asset at the specified price within the specified time period.
- Call provision.** A provision in a bond indenture (contract) that gives the issuing company the right to redeem (call) the bonds prior to maturity.
- Callable bond.** A bond having a call provision.
- Capital.** The funds used to finance a business.
- Capital Asset Pricing Model (CAPM).** An equilibrium model that specifies the relationship between a stock's value and its market risk as measured by beta. See security market line (SML).
- Capital budget.** A plan (budget) that outlines a company's future expected expenditures on new fixed assets (land, plant, and equipment).
- Capital budgeting.** The process of analyzing and choosing new fixed assets.
- Capital gain (loss).** The profit (loss) from the sale of certain assets at more (less) than their purchase price.
- Capital gains yield.** The percentage capital gain (loss), usually applied to stocks and bonds.

- Capital intensity.** The amount of assets required per dollar of sales (revenues), which is the reciprocal of the total assets turnover ratio.
- Capital market.** The financial markets for long-term capital (usually stocks and long-term debt). See money market.
- Capital rationing.** The situation that occurs when a business has more attractive investment opportunities than it has capital to invest.
- Capital structure.** The structure of the liabilities and equity section of a business's balance sheet. Often expressed as the percentage of debt financing.
- Capitalizing.** The process of listing a long-term asset on the balance sheet and then depreciating its cost over time. Applies to purchased assets and some leased assets.
- Capitation.** A reimbursement methodology that is based on the number of covered lives as opposed to the amount of services provided. See fee-for-service.
- Case mix index.** A measure of inpatient service intensity calculated by averaging the patient diagnosis related group (DRG) weights.
- Cash budget.** A schedule that lists a business's expected cash inflows, outflows, and net cash flows for some future period.
- Cash discount.** The amount by which a seller is willing to reduce the price for cash payment.
- Census.** The number of hospital inpatients.
- Characteristic line.** The simple linear regression line that results from a plot of individual investment returns on the y axis and portfolio returns on the x axis. The slope of the characteristic line is the investment's beta coefficient.
- Charge-based reimbursement.** A reimbursement methodology based on charges (chargemaster prices).
- Chargemaster.** A provider's official list of charges (prices) for goods and services rendered.
- Classified stock.** The term used to distinguish between stock classes when a business uses more than one type of common stock.
- Closely held corporation.** A corporation, typically small, in which the stock is held by a small number of individuals and is not publicly traded.
- Coefficient of variation.** A statistical measure of an investment's stand-alone risk calculated by dividing the standard deviation of returns by the expected return.
- Collection policy.** The procedures used by a business to collect its accounts receivable.
- Combination lease.** A lease that contains features of both an operating lease and a financial lease.
- Commercial paper.** Unsecured short-term promissory notes (debt) issued by large financially sound businesses.
- Commodity futures.** Futures contracts that involve the purchase or sale of commodities such as grain, livestock, fuel, metal, and wood.
- Common size analysis.** A technique to help analyze a business's financial statements that uses percentages instead of dollars for income statement items and balance sheet accounts.
- Community rating.** Premiums that are based on the health status of the entire community as opposed to the characters of one group or individual.
- Comparative analysis.** The comparison of key financial and operating indicators of one business with those of comparable businesses or averages. Also called benchmarking.
- Compensating balance.** A minimum checking account balance that a business must maintain at a bank to compensate the bank for other services or loans. When used with loans, the compensating balance often is 10 to 20 of the principal amount.

- Compounding.** The process of finding the future value of a lump sum, annuity, or series of unequal cash flows.
- Conglomerate merger.** A merger of businesses in unrelated lines.
- Consol.** Another name for perpetuity. The term stems from the government perpetual bonds, called Consols, issued in England in 1815.
- Convertible bond.** A bond that can be exchanged at the option of the bondholder for shares of stock of the issuing firm at a fixed price.
- Copayment.** The percentage of eligible medical expenses that must be paid by the insured individual; for example, 20 percent for each outpatient visit.
- Corporate alliance.** A cooperative venture between two businesses that is smaller in scope than a merger.
- Corporate bond.** Debt issued by for-profit businesses, as opposed to government or tax-exempt (municipal) bonds.
- Corporate cost of capital.** The discount rate (opportunity cost of capital) that reflects the overall (average) risk of the entire business. See divisional cost of capital and project cost of capital.
- Corporate goals.** Specific goals, including financial, that an organization strives to attain. Generally, corporate goals are qualitative in nature. See corporate objectives.
- Corporate objectives.** Quantitative targets that an organization sets to meet its corporate goals.
- Corporate risk.** A type of portfolio risk. That portion of the riskiness of a business project that cannot be diversified away by holding the project as part of the business's portfolio of projects. See market risk.
- Corporation.** A legal business entity that is separate and distinct from its owners (or community) and managers.
- Correlation.** The tendency of two variables to move together.
- Correlation coefficient.** A standardized measure of correlation that ranges from  $-1$  (variables move perfectly opposite from one another) to  $+1$  (variables move in perfect synchronization).
- Cost-based reimbursement.** A reimbursement methodology based on the costs incurred in providing services.
- Cost of capital.** A generic term for the cost of a business's financing. See corporate cost of capital.
- Cost of debt.** The return required (interest rate) on a business's debt financing. A component of the cost of capital.
- Cost of equity.** The return required on the equity investment in a business. A component of the cost of capital.
- Costly trade credit.** That credit taken by a company from a vendor in excess of the free trade credit.
- Cost shifting.** The process of billing some payers a higher amount than justified by costs to compensate for payers that are paying less than costs.
- Coupon (interest) rate.** The stated annual rate of interest on a bond, which is equal to the coupon payment divided by the par value.
- Coupon payment.** The dollar amount of annual interest on a bond.
- Coverage.** A debt management ratio that divides the amount of funds available to meet a set of fixed payment obligations by the amount of that obligation. It measures how many dollars are available to pay each dollar of fixed obligation. There are many different coverage ratios, depending on the fixed obligations included.

- Credit enhancement.** Insurance that guarantees the payment of interest and repayment of principal on a bond even if the issuing company defaults. Insured bonds are rated AAA. Also called bond insurance.
- Credit period.** The length of time that trade credit is offered by a supplier.
- Credit policy.** A business's rules and regulations regarding granting credit and collecting from buyers that take the credit.
- Credit rating.** Ratings that are assigned by rating agencies, such as Standard & Poor's or Moody's, and that measure the probability of default on a debt issue.
- Credit standards.** The minimum financial condition set by a seller to extend credit to a customer (buyer).
- Credit terms.** The statement of terms that extends credit to a buyer. For example, 2/10, net 30 means that a two percent discount is offered if the buyer pays in 10 days. If the discount is not taken, the full amount of the invoice is due in 30 days.
- Current ratio.** A liquidity ratio calculated by dividing current assets by current liabilities. It measures the number of dollars of current assets available to pay each dollar of current liabilities.
- Current (bond) yield.** The annual coupon payment divided by the current bond price.
- Dashboard.** A format for presenting a business's key performance indicators that resembles the dashboard of an automobile.
- Days in patient accounts receivable.** The average length of time it takes a provider to collect its receivables. Also called days sales outstanding (DSO) and average collection period (ACP).
- Days sales outstanding (DSO).** The average length of time it takes a business to collect its receivables. Also called average collection period (ACP) and days in patient accounts receivable.
- Debenture.** An unsecured bond.
- Debt capacity.** The amount of debt in a business's optimal (target) capital structure.
- Debt ratio.** A debt utilization ratio that measures the proportion of debt (versus equity) financing. Typically defined as total debt (liabilities) divided by total assets.
- Decision tree.** A form of scenario analysis that incorporates multiple decision points over time. The end result resembles a tree on its side with branches extending to the right.
- Declaration date.** The date on which a for-profit corporation's directors issue a dividend declaration statement.
- Deductible.** The dollar amount that must be spent on healthcare services before benefits are paid by the third-party payer; for example, \$250 per year.
- Default.** Failure by a borrower to make a promised interest or principal repayment.
- Default risk.** The risk that a borrower will not pay the interest (or repay principal) as agreed on in the loan agreement.
- Default risk premium.** The premium that creditors demand (add to the basic interest rate) for bearing default risk. The greater the default risk, the higher the default risk premium.
- Depreciation.** A noncash charge against earnings on the income statement that reflects the "wear and tear" on a business's fixed assets. See book depreciation and Modified Accelerated Cost Recovery System (MACRS).
- Derivative.** A security whose value stems from the value of another asset; for example, futures and options.



- Diagnosis-related group (DRG).** A numerical code for a single patient diagnosis. DRGs form the basis for Medicare reimbursement of hospital inpatient services.
- Discount bond.** A bond that sells for less than its par value.
- Discounted cash flow (DCF) analysis.** The use of time value of money techniques to value investments.
- Discounted payback (period).** The number of years it takes for a business to recover its investment in a project when time value of money is considered. See payback (period).
- Diversifiable risk.** That portion of the risk of an investment that can be eliminated by holding the investment as part of a diversified portfolio. See portfolio risk.
- Divestiture.** The selling off of a portion of a company's assets. The opposite of acquisition.
- Dividend.** The periodic payment paid to owners of common and preferred stocks.
- Dividend reinvestment plan (DRIP).** A plan under which the dividends paid to a stockholder are automatically reinvested in the company's common stock.
- Dividend yield.** The annual dividend divided by current stock price.
- Divisional cost of capital.** The discount rate (opportunity cost of capital) that reflects the unique riskiness of a division within a corporation. See corporate cost of capital and project cost of capital.
- Due diligence.** The process of research and analysis that takes place in advance of an investment, merger, or business alliance.
- Du Pont analysis.** A financial statement analysis tool that decomposes return on equity into three components: profit margin, total asset turnover, and equity multiplier.
- Duration.** A measure of the maturity of a debt security that considers both the interest payments and the return of principal. In essence, the weighted average maturity of the security.
- EBITDA.** A common measure of earnings used in business valuation. Defined as earnings before interest, taxes, depreciation, and amortization.
- Economic life.** The number of years that maximizes the value (NPV) of a project.
- Economic value added (EVA).** A measure of the economic profitability of a business that considers all costs, including the cost of equity.
- Economies of scale.** A situation that arises when the ratio of assets (or costs) to sales decreases as sales increase (the business gets larger).
- Effective annual rate (EAR).** The interest rate that, under annual compounding, produces the same future value as was produced by more frequent compounding. See annual percentage rate (APR).
- Efficient markets hypothesis.** The theory that states that (1) stocks are always in equilibrium and (2) it is impossible for investors to consistently earn excess returns (beat the market).
- Electronic claims processing.** The electronic transmission and processing of reimbursement claims and payments.
- Equivalent annual annuity.** A technique for comparing the profitability of competing projects that have different lives. See replacement chain.
- ESOP (employee stock ownership plan).** A retirement plan in which employees own the stock of the employing company.
- Ex-dividend date.** The date on which the right to the dividend is lost. If a stock is bought on or after this date, the dividend is paid to the seller.
- Exercise value.** The difference between the price of the stock and the exercise (strike) price of an option on that stock.

- Expected rate of return.** The return expected on an investment when the purchase is made. See realized rate of return.
- External financing plan.** The organization's plan for meeting its external financing needs.
- Fee-for-service.** A reimbursement methodology that provides payment each time a service is provided. See capitation.
- Financial asset.** A security such as a stock or bond that represents a claim on a business's cash flows. See real asset.
- Financial distress costs.** The direct and indirect costs associated with the probability of business bankruptcy. These costs play a key role in the trade-off theory of capital structure.
- Financial future.** A contract that provides for the purchase or sale of a financial asset some time in the future at a fixed price.
- Financial intermediary.** A business that buys securities with funds that it obtains by issuing its own securities. Examples include commercial banks and mutual funds.
- Financial lease.** A lease agreement that has a term (life) approximately equal to the expected useful life of the leased asset. See operating lease.
- Financial leverage.** The use of fixed-cost financing, such as debt and preferred stock.
- Financial merger.** A merger in which the companies will continue to be operated as separate entities. See operating merger.
- Financial plan.** That portion of the operating plan that focuses on the finance function.
- Financial risk.** Generically, the risk that the return on an investment will be less than expected. In a capital-structure context, the additional risk placed on the business's owners (or community) when debt (or preferred stock) financing is used.
- Financial statement analysis.** The process of using data contained in a business's financial statements to make judgments about financial condition.
- Fixed assets turnover (utilization) ratio.** The ratio of revenues to net fixed assets. It measures the ability of fixed assets to generate sales.
- Fixed rate debt.** Debt that has an interest rate that is fixed for its entire life. See floating rate debt.
- Floating rate debt.** Debt with interest payments that are linked to the rate on some other debt (or index). As the index goes up and down, so does the interest rate on the floating rate debt. See fixed rate debt.
- Float.** The difference between the balance shown on a business's (or individual's) checkbook and the balance shown on the bank's books.
- Flotation cost.** The administrative costs associated with issuing new securities, such as legal, accounting, and investment banker's fees.
- Free cash flow.** The cash flow available for distribution after all costs have been considered, including investments in fixed assets.
- Free trade credit.** The amount of credit received from a supplier that has no explicit cost attached. In other words, credit received during the discount period.
- Friendly merger.** A merger that is supported by the management of the target company. See hostile merger.
- Full-time equivalent (FTE).** The number of employees, assuming that everyone is employed on a full-time basis.
- Fund capital.** Equity capital in a not-for-profit corporation.
- Future value (FV).** The ending amount of an investment of a lump sum, annuity, or uneven cash flow stream. See present value (PV).

- Global reimbursement (pricing).** The payment of a single amount for the complete set of services required to treat a single episode.
- Going public.** The initial selling of stock to the general public by a closely held corporation. See initial public offering (IPO).
- Goodwill.** An accounting term for the amount paid in a business acquisition that exceeds the value of the assets of the target business.
- Growth option.** A managerial option whose value stems from the opportunity that a project creates to make other profitable investments.
- Guideline lease.** A lease contract that meets the Internal Revenue Service (IRS) requirements for a genuine lease, thus allowing the lessee to deduct the full amount of the lease payment from taxable income.
- Hedging.** A transaction undertaken to lower the risk caused by price fluctuations in such things as input commodities and interest rates.
- Historical (embedded) cost.** In cost of capital, the average cost of a business's existing capital. See marginal cost.
- Holding company.** A corporation formed for the sole purpose of owning other companies.
- Horizontal merger.** A merger between two companies in the same line of business.
- Hostile merger.** A merger that occurs in spite of the fact that the target firm's management resisted the offer. See friendly merger.
- Hurdle rate.** The minimum required rate of return on an investment. Also called opportunity cost rate.
- Immunization.** The process of structuring a debt portfolio to eliminate interest rate risk.
- Income statement.** A financial statement that summarizes a business's revenues, expenses, and profitability.
- Incremental cash flow.** A cash flow that arises solely from a project that is being evaluated, and hence one that should be included in the project analysis. See nonincremental cash flow.
- Indenture.** A legal document that spells out the rights and obligations of both bondholders and the issuing corporation. In other words, the loan agreement for a bond.
- Independent projects.** Projects that are not related to one another and hence can be accepted or rejected independently. See mutually exclusive projects.
- Inflation premium.** The premium that debt investors add to the base interest rate to compensate for inflation.
- Initial public offering (IPO).** The initial sale of stock to the general public by a closely held corporation. See going public.
- Insiders.** The officers, directors, and major stockholders of a company.
- Integrated delivery system.** A single organization that offers a broad range of health-care services in a unified manner.
- Interest rate risk.** The riskiness to current debtholders that stems from interest rate changes. See price risk and reinvestment rate risk.
- Internal rate of return (IRR).** A project return on investment (ROI) measure that focuses on percentage rate of return. See net present value (NPV).
- Inventory turnover (utilization) ratio.** Revenues divided by inventory value. The average length of time it takes to convert inventory into revenues.
- Inverted yield curve.** A downward-sloping yield curve. See normal yield curve.
- Investment banker.** The middleman between businesses that want to raise capital and the investors who supply the capital.

- Investment timing option.** A managerial option to delay a project rather than to commence immediately.
- Investment-grade bond.** A bond with a BBB or higher rating. See junk bond.
- Investor-owned business.** A for-profit business whose capital is supplied by owners (stockholders, in the case of corporations). See not-for-profit corporation.
- Joint venture.** The combining of parts of two different companies to accomplish a specific, limited objective.
- Junk bond.** A bond with a BB or lower rating. See investment-grade bond.
- Key performance indicator (KPI).** A financial statement or operating indicator metric that is considered by management to be critical to the business's financial performance.
- Law of large numbers.** A statistical concept that states that the standard deviation of a large number of identical independent probability distributions is much smaller than the standard deviation of only one of the distributions.
- Length of stay (LOS).** The average time a patient spends in an inpatient setting per admission. Also called average length of stay (ALOS).
- Lessee.** In a lease agreement, the party that uses the leased asset and makes the rental payments. See lessor.
- Lessor.** In a lease agreement, the party that owns the leased asset and receives the rental payments. See lessee.
- Leveraged lease.** A lease in which the lessor borrows a portion of the purchase price to buy the leased asset.
- Limited liability company (LLC).** A corporate form of organization that combines some features of a partnership with others of a corporation.
- Limited liability partnership (LLP).** A partnership form of organization that limits the professional (malpractice) liability of its members.
- Limited partnership.** A partnership form of organization with general partners that have control and unlimited liability and limited partners that have very little control and limited liability.
- Line of credit.** A loan arrangement in which a bank agrees to lend some maximum amount to a business over some designated period.
- Liquid asset.** An asset that can be quickly converted to cash at its fair market value.
- Liquidity.** The ability of a business to meet its cash obligations as they become due.
- Liquidity premium (LP).** The premium that debt investors add to the base interest rate to compensate for lack of liquidity.
- Lumpy assets.** Fixed assets that cannot be acquired smoothly as demand grows but rather must be added in large increments. For example, hospital beds.
- Managerial options.** Options inherent in projects that give managers the opportunity to create additional value. For example, a project to build a small outpatient surgery center provides the managerial option to expand the center should patient demand increase. Also called real options.
- Marginal cost.** In cost of capital, the cost of the next dollar of capital raised. See historical cost.
- Market multiple method.** A technique for valuing a business that applies a market-determined multiple to some proxy for value such as net income.
- Market portfolio.** A portfolio that contains all publicly traded stocks. Often proxied by some market index such as the S&P 500.
- Market risk.** A type of portfolio risk. That portion of the risk of a stock investment that cannot be eliminated by holding the stock as part of a diversified portfolio. Also, that portion of the riskiness of a business project that cannot be diversified

away by holding the stock of the company as part of a diversified portfolio. See corporate risk.

**Market risk premium ( $RP_M$ ).** The difference between the expected rate of return on the market portfolio and the risk-free rate. In other words, the premium above the risk-free rate that investors require to bear average stock risk.

**Marketable securities.** Securities that are held in lieu of cash. Typically very safe, short-term securities such as Treasury bills.

**Market/book ratio.** The market value (price) of a stock divided by its book value, which measures the number of dollars that investors are willing to pay for each dollar of book value.

**Materials management.** The management of the procurement, storage, and utilization of supplies inventories. Also called supply chain management.

**Maturity.** The amount of time until a loan matures (must be repaid).

**Maturity date.** The date on which the principal amount of a loan must be repaid.

**Maturity matching.** The matching of the maturities of assets being financed and the financing used to acquire the assets.

**Maturity risk premium (MRP).** The premium that debt investors add to the base interest rate to compensate for interest rate risk.

**Medicaid.** A federal and state government health insurance program that provides benefits to low-income individuals.

**Medicare.** A federal government health insurance program that provides benefits to individuals 65 years and older.

**Merger.** The combination of two businesses into a single entity.

**Miller model.** A capital structure theory model that introduces the effects of personal taxes to the Modigliani and Miller (MM) model.

**Mission statement.** A statement that defines the overall purpose of the organization.

**Modified Accelerated Cost Recovery System (MACRS).** The system specified by the Internal Revenue Service to calculate depreciation for tax purposes. See depreciation.

**Modigliani and Miller (MM) model.** A capital structure theory model that defines the relationship between the use of debt financing and firm value. The model has two variants: one with zero taxes and one with corporate taxes. See Miller model.

**Modified internal rate of return (MIRR).** A project return-on-investment (ROI) measure similar to IRR but with a different reinvestment rate assumption. See internal rate of return (IRR).

**Money market.** The financial markets for debt securities with maturities of one year or less. See capital market.

**Monte Carlo simulation.** A computerized risk-analysis technique that uses continuous distributions to represent the uncertain input variables.

**Moral hazard.** The risk that an insured individual or business will purposely take actions that increase the likelihood of a claim.

**Mortgage bond.** A bond issued by a business that pledges real property (land and buildings) as collateral.

**Municipal bond (muni).** A tax-exempt bond issued by a governmental entity such as a healthcare financing authority. See corporate bond.

**Mutual fund.** A company that sells shares and then uses the proceeds to buy securities.

**Mutually exclusive projects.** Projects that are related to one another such that the acceptance of one precludes the acceptance of the other. See independent projects.

- Net advantage to leasing (NAL).** The discounted cash flow dollar value of a lease to the lessee. Similar to net present value (NPV).
- Net cash flow.** The sum of net income and noncash expenses (typically depreciation).
- Net operating profit after taxes (NOPAT).** The amount of profit a business would generate if it had no debt. Generally defined as earnings before interest and taxes (EBIT) multiplied by  $(1 - \text{Tax rate})$ .
- Net present value (NPV).** A project return-on-investment (ROI) measure that focuses on expected dollar return. See internal rate of return (IRR).
- Net present social value.** The present value of a project's social value. Added to the financial net present value (NPV) to obtain a project's total value.
- Net working capital.** A liquidity measure equal to current assets minus current liabilities. See working capital.
- Nominal (stated) interest rate.** The interest rate stated in a debt contract. It does not reflect the effect of compounding that occurs more frequently than annually. See effective annual rate (EAR).
- Nonincremental cash flow.** A cash flow that does not stem solely from a project that is being evaluated. Nonincremental cash flows are not included in a project analysis. See incremental cash flow.
- Non-normal cash flows.** Project cash flows that contain one or more outflows after the inflows have begun. See normal cash flows.
- Nonprofit corporation.** A not-for-profit corporation.
- Normal cash flows.** Project cash flows that have all of the outflows occurring before all of the inflows. See non-normal cash flows.
- Normal yield curve.** An upward-sloping yield curve. See inverted yield curve.
- Not-for-profit corporation.** A corporation that has a charitable purpose, is tax exempt, and has no owners. Also called nonprofit corporation. See investor-owned business.
- Occupancy rate.** The percentage of hospital beds occupied.
- Off-balance sheet financing.** Debt financing used by a business that does not appear on the balance sheet. For example, short-term (operating) leases.
- Operating indicator.** A ratio that focuses on operating data rather than on financial data.
- Operating indicator analysis.** The process of using operating indicators to help explain a business's financial condition.
- Operating lease.** A lease whose term is much shorter than the expected life of the asset being leased. See financial lease.
- Operating margin.** Net operating income divided by total operating revenues. It measures the amount of operating profit per dollar of operating revenues and hence focuses on the core activities of a business. See profit (total) margin.
- Operating merger.** A merger in which the operations of the two companies are combined into a single entity.
- Operating plan.** An organizational road map for the future—typically, for five years.
- Opportunity cost.** The cost associated with alternative uses of the same asset. For example, if land is used for one project, it is no longer available for other uses, and hence an opportunity cost arises.
- Opportunity cost rate.** The rate of return expected on alternative investments similar in risk to an investment being evaluated. Also called hurdle rate.
- Optimal capital structure.** That mix of debt and equity financing that management believes to be appropriate for the business. Generally based on both quantitative and qualitative factors. Becomes the business's target capital structure.

- Option.** A contract that gives the holder the right to buy (or sell) an asset at a specified price within a specified period of time.
- Ordinary (regular) annuity.** An annuity with payments occurring at the end of each period. See annuity due.
- Par value.** The face (nominal) value of a security. The par value of a debt security is the amount to be repaid at maturity.
- Partnership.** A nonincorporated business entity created by two or more individuals.
- Payback (period).** The number of years it takes for a business to recover its investment in a project without considering the time value of money. See discounted payback.
- Payment (PMT).** In time value of money, the dollar amount of an annuity cash flow.
- Payment date.** The date on which a corporation pays its dividend to stockholders.
- Per diem.** A reimbursement methodology that pays a set amount for each inpatient day.
- Percentage change analysis.** A technique to help analyze a business's financial statements that expresses the year-to-year changes in income statement items and balance accounts as percentages.
- Percent of sales method.** A technique for forecasting financial statements that assumes that most income statement items and balance sheet accounts are tied directly (proportionately) to sales.
- Periodic rate.** In time value of money (discounted cash flow analysis), the interest rate per period. For example, 2 percent quarterly interest, which equals an 8 percent stated (annual) rate. See effective annual rate (EAR).
- Permanent assets.** The minimum amount of assets held by a business, including seasonal and cyclical periods. See temporary assets.
- Permanent current assets (working capital).** The dollar amount of current assets that is permanent in nature. See permanent assets.
- Perpetuity.** A debt security that has no stated maturity.
- Poison pill.** A provision in a company's charter that makes it an unattractive hostile-takeover target. For example, a provision that allows existing stockholders to buy more stock at a low price if a hostile takeover occurs.
- Pooling of losses.** Losses that are spread over a large group of individuals rather than borne solely by one individual.
- Portfolio.** A number of individual investments held collectively.
- Portfolio risk.** The riskiness of an individual investment when it is held as part of a large portfolio as opposed to held in isolation. There are two types of portfolio risk: corporate risk and market risk. See stand-alone risk, corporate risk, and market risk.
- Post-audit.** The feedback process in which the performance of projects previously accepted is reviewed and necessary actions are taken.
- Preemptive right.** The right that gives current shareholders the opportunity to purchase any newly issued shares (in proportion to their current holdings) before they are offered to the general public.
- Preferred stock.** A hybrid security issued by for-profit corporations that has characteristics of both debt and equity.
- Premium tier.** A category of employee health insurance coverage. For example, a two-tier system might offer individual and family coverage.
- Present value (PV).** The beginning amount of an investment of a lump sum, annuity, or uneven cash flow stream. See future value.



- Price/earnings ratio.** Price per share divided by earnings per share. It measures how much investors are willing to pay for each dollar of dividends.
- Price risk.** The risk that rising interest rates will lower the values of outstanding debt. See interest rate risk.
- Primary market.** The market in which newly issued securities are sold for the first time. See secondary market.
- Private placement.** The sale of newly issued securities to a single investor or small group of investors. Private placements have lower costs and may be accomplished more quickly than a public offering. See public offering.
- Probability distribution.** All possible outcomes of a random event along with their probabilities of occurrence. For example, the probability distribution of rates of return on a proposed project.
- Professional corporation (PC).** A type of corporate business organization in which the owners/managers still have professional (medical) liability. Called a professional association (PA) in some states.
- Profit (total) margin.** Net income divided by total revenues. It measures the amount of total profit per dollar of total revenues. See operating margin.
- Profitability index (PI).** A project return-on-investment (ROI) measure defined as the present value of cash inflows divided by the present value of outflows. It measures the numbers of dollars of inflow per dollar of outflow (on a present value basis), or the “bang for the buck.”
- Profitability ratios.** A group of ratios that measures different dimensions of profitability and hence the combined effects of operational decisions.
- Pro forma.** As applied to financial statements, a statement that is constructed under assumptions that differ from generally accepted accounting principles (GAAP). The term is also used to indicate forecasted financial statements.
- Project cost of capital.** The discount rate (opportunity cost rate) that reflects the unique riskiness of a project. See corporate cost of capital and divisional cost of capital.
- Project scoring.** An approach to project assessment that considers both financial and nonfinancial factors.
- Promissory note.** A document that specifies the terms and conditions of a loan. Also called loan agreement or, in the case of bonds, indenture.
- Proprietorship.** A simple form of business owned by a single individual. Also called sole proprietorship.
- Prospective payment.** A reimbursement methodology that is established beforehand by the third-party payer and, in theory, is not related to costs or charges.
- Provider.** An organization that provides healthcare services (treats patients).
- Proxy.** A document giving one person the authority to act for another—typically, the power to vote on shares of common stock.
- Proxy fight.** An attempt to take control of a corporation by soliciting the votes (proxies) of current shareholders.
- Public offering.** The sale of newly issued securities to the general public through an investment banker. See private placement.
- Publicly held corporation.** A corporation whose shares are held by the general public as opposed to closely (privately) held, where the shares are held by a small number of individuals, usually the managers.
- Qualitative risk assessment.** A process for assessing project risk that focuses on qualitative issues as opposed to profit variability.
- Ratio analysis.** The process of creating and analyzing ratios from the data contained in a business’s financial statements to help assess financial condition.



- Real asset.** Property such as land, buildings, and equipment that creates a business's cash flows. See financial asset.
- Real options.** Options inherent in projects that give managers the opportunity to create additional value. For example, a project to build a small outpatient surgery center provides the real option to expand the center should patient demand increase. Also called managerial options.
- Real rate of return.** The rate of return on an investment net of inflation effects.
- Real risk-free rate.** The rate of interest on a riskless investment in the absence of inflation.
- Realized rate of return.** The return actually achieved on an investment when it is sold. See expected rate of return.
- Refunding.** The process of calling (redeeming) a debt security. Usually involves issuing new debt at a lower interest rate and using the proceeds to redeem existing higher-interest-rate debt.
- Reinvestment rate risk.** The risk that falling interest rates will reduce the returns earned on the reinvestment of debt interest payments (and perhaps principal repayments). See interest rate risk.
- Replacement chain.** A technique for comparing the profitability of competing projects that have different lives. See equivalent annual annuity.
- Required rate of return.** The minimum rate of return required on an investment considering its riskiness. Also called hurdle rate.
- Required reserves.** Insurance company reserves that are mandated by state regulators. See reserves.
- Reserve borrowing capacity.** The practice of businesses to use less than the true optimal amount of debt to ensure easy access to new debt at reasonable interest rates regardless of circumstances.
- Reserves.** Funds that are accumulated by a business to protect against future adverse events. See required reserves.
- Residual value.** The estimated market value of a leased asset at the end of the lease.
- Restrictive covenant.** A provision in a bond indenture (loan agreement) that protects the interests of bondholders by restricting the actions of management.
- Retained earnings.** That portion of net income that is retained within the business as opposed to paid out as dividends. Not-for-profit corporations must retain all earnings.
- Return on assets (ROA).** Net income divided by the book value of total assets. Measures the dollars of earnings per dollar of book asset investment.
- Return on equity (ROE).** Net income divided by the book value of equity. Measures the dollars of earnings per dollar of book equity investment.
- Revenue cycle.** The set of recurring activities and related information processing required to provide patient services and to collect for those services.
- Revolving credit agreement.** A formal line of credit extended by a lender (or group of lenders).
- Rights offering.** The mechanism by which new common stock is offered to existing shareholders. Each stockholder receives an option (right) to buy a specific number of new shares at a given price.
- Risk-adjusted discount rate (RADR).** A discount rate that accounts for the specific riskiness of the investment being analyzed.
- Risk arbitrage.** The buying and selling of stocks that are likely takeover targets. See arbitrage.
- Risk aversion.** The tendency of individuals and businesses to dislike risk. The impli-

cation of risk aversion is that riskier investments must offer higher expected rates of return to be acceptable.

**Risk management.** The management of the risks encountered by a business, including the minimization of both the occurrence of adverse events and the costs associated with an event should it occur.

**Risk pool.** A fund set up by an insurer that is dispersed to providers only if specified goals are met. Also called a withhold.

**S corporation.** A corporation with a limited number of stockholders that is taxed as a proprietorship or partnership.

**Salvage value.** The expected market value of an asset (project) at the end of its useful life.

**Scenario analysis.** A project risk-analysis technique that assesses how best and worst case scenarios for multiple input values affect profitability.

**Secondary market.** The market in which previously issued securities are sold.

**Secured loan.** A loan backed by collateral, often inventories or receivables.

**Securities and Exchange Commission (SEC).** The government agency that regulates the sale of securities and the operations of securities exchanges.

**Security market line (SML).** That portion of the Capital Asset Pricing Model (CAPM) that specifies the relationship between market risk and required rate of return.

**Sensitivity analysis.** A project-analysis technique that assesses how changes in single input variables, such as utilization, affect profitability.

**Shelf registration.** A procedure for selling securities that uses a master statement prefiled with the Securities and Exchange Commission (SEC) to speed up the issuance process.

**Sinking fund.** A bond feature that calls for funds to be used to refund a portion of the issue each year until maturity.

**Sole proprietorship.** A simple form of business owned by a single individual. Also called proprietorship.

**Spontaneously generated funds.** Financing that occurs when a business's accruals and accounts payable increase automatically because of sales growth.

**Stakeholder.** An individual or business that has an interest, typically financial, in an organization. For example, owners (in for-profit businesses), managers, patients, and suppliers.

**Stand-alone risk.** The riskiness of an investment that is held in isolation as opposed to held as part of a portfolio. See portfolio risk.

**Standard deviation ( $\sigma$ ).** A statistical measure of the variability of probability distribution equal to the square root of the variance.

**Statement of cash flows.** A financial statement that focuses on the cash flows that come into and go out of a business.

**Stop-loss insurance.** Insurance taken by providers that pays some amount when individual patient expenses are higher than the specified threshold.

**Strategic option.** A managerial (real) option that deals with strategic issues.

**Stretching.** The practice of paying receivables late.

**Subordinated debenture.** A debt security that, in the event of bankruptcy, has a claim on assets below (subordinate to) other debt.

**Sunk cost.** A cost that has already occurred or is irrevocably committed. Sunk costs are nonincremental to project analyses and hence should not be included.

**Supply chain management.** The management of the procurement, storage, and utilization of supplies inventories. Also called materials management.

- Swap.** An exchange of cash-payment obligations. For example, one business might exchange its fixed-rate debt payments with another business that has floating-rate payments.
- Synergy.** A feature sought after in mergers in which the merged entity is worth more than the sum of the individual businesses.
- Takeover.** The taking of control of a business by an individual (or group) against the wishes of its management.
- Target capital structure.** That capital structure (mix of debt and equity) that a company strives to achieve and maintain over time. Generally the same as optimal capital structure.
- Target company.** A business that another company (or individual or group) seeks to acquire.
- Temporary assets.** Assets held temporarily by a business to meet peaks in sales as a result of seasonal or cyclical fluctuations.
- Tender offer.** A means to acquire a firm without gaining approval from the target's management. Stockholders are asked to sell (tender) their shares directly to the acquiring company (or investor group).
- Term loan.** Long-term debt obtained from a financial institution. See bond.
- Term structure.** The relationship between yield to maturity and term to maturity for debt of a single risk class—say, Treasury securities. See yield curve.
- Third-party payer.** An entity other than the patient that pays for healthcare services. Examples include commercial insurance companies and government programs such as Medicare.
- Time line.** A graphical representation of time and cash flows. May be an actual line or cells on a spreadsheet.
- Times-interest-earned (TIE) ratio.** Earnings before interest and taxes (EBIT) divided by interest charges. Measures the number of times that a business's interest expense is covered by earnings available to pay that expense.
- Total assets turnover (utilization) ratio.** Total revenues divided by total assets. Measures the amount of revenue generated by each dollar of total assets.
- Trade credit.** The credit offered to businesses by suppliers (vendors) when credit terms are offered.
- Trade discount.** Discounts from invoice prices that suppliers offer to businesses to encourage prompt payment.
- Trade-off model.** A capital structure model that hypothesizes that a business's optimal capital structure balances the costs and benefits associated with debt financing.
- Treasury security.** Debt security issued by the federal government. Treasury bills have maturities of one year or less, notes have maturities of greater than one year to ten years, and bonds have maturities over ten years.
- Trend analysis.** A ratio-analysis technique that examines the value of a ratio over time to see if it is improving or deteriorating. See comparative analysis.
- Trustee.** An individual or institution, typically a bank, that represents the interests of bondholders.
- Underwritten issue.** A new securities issue in which the investment banker agrees to buy the entire issue and then resell it to the public. See best-efforts arrangement.
- Underwriting.** The process of selling new securities through an investment banker.
- Variance ( $\sigma^2$ ).** A statistical measure of the variability of a probability distribution. Standard deviation is the square root of variance.

- Vertical merger.** A merger between an upstream and a downstream company. For example, a hospital that acquires a medical practice.
- Warrant.** A type of call option issued by a company that gives the holder the right to buy a stated number of shares of stock at a given price. Warrants are generally distributed with debt (or preferred stock) to induce investors to accept a lower interest rate.
- Window dressing.** An action taken by a business for the sole purpose of making its financial condition look better. For example, issuing long-term debt and then putting the funds into marketable securities will improve the current ratio.
- Withhold.** A fund that is set up by an insurer that is dispersed to providers only if specified goals are met. Also called a risk pool.
- Working capital.** A business's short-term (current) assets. See net working capital.
- Yield curve.** A plot of the term structure of interest rates (yield to maturity versus term to maturity). See term structure.
- Yield to call.** The expected rate of return on a debt security, assuming it is held until it is called.
- Yield to maturity.** The expected rate of return on a debt security, assuming it is held until maturity.
- Zero coupon bond.** A bond that pays no interest. It is bought at a discount from par value, and hence its return comes solely from price appreciation.
- Zero sum game.** A situation wherein gains to one party are exactly matched by losses to another party. Leasing is a zero sum game when the economics of the lease are same to both the lessee and lessor.



# INDEX

- Abandonment (of projects), 410–11, 447, 449–51
- Abnormal returns, 604
- Accounts payable, 543–44, 564–67
- Accounts receivable, 167–68, 478, 539, 542–43, 547–53
- Accruals, 563–64
- ACHE. *See* American College of Healthcare Executives (ACHE)
- Acquirers, 583, 585
- Adjusted betas, 302, 303
- Adverse selection, 44–46
- Agency problem, 21–22, 581
- Aggregate stop-loss coverage, 654
- Aggressive approach (as debt maturity policy), 368, 369
- Aging schedules, 549
- AHA. *See* American Hospital Association (AHA)
- Allowable costs, 50
- All patient case mix index, 488
- All-patient refined (APR) DRGs, 65–66
- Alternative investments, 546
- Alternative minimum tax (AMT), 282–83
- Alternative straight-line method (of depreciation), 33–34
- AMA. *See* American Medical Association (AMA)
- Ambulatory payment classifications (APCs), 66
- American College of Healthcare Executives (ACHE), 7
- American Hospital Association (AHA), 16, 57, 62, 556
- American Medical Association (AMA), 57
- American Stock Exchange (AMEX), 13, 201, 205
- Amortization schedule, 109
- Amortized loans, 108–9
- AMT. *See* Alternative minimum tax (AMT)
- Annual compounding, 105–7
- Annual reports, 464, 467
- Annuities, 94–101
- Annuity due, 96–98
- Antitrust regulation, 586–88
- APCs. *See* Ambulatory payment classifications (APCs)
- Appraisers, 590
- Arbitrage, 604
- Arbitrage proof, 343
- Area wage index, 64
- Asset management (activity) ratios, 476, 478
- Assets: *See also* Fixed assets; capital and, 27, 151, 153; capital budgeting and, 417; capital structure decisions and, 363; financial, 79; liquid/illiquid, 178; nonearning, 540; real, 79, 116, 141, 221, 222; simple linear regression and, 522; temporary/permanent, 367, 369; underlying, 661, 663–68
- Asymmetric information, 45, 250
- Asymmetric information model of capital structure, 355–58, 360, 362, 364
- Automated clearinghouses, 543
- Average age of plant, 479

- Average collection period (ACP). *See* Days in patient accounts receivable
- Average daily sales (ADS), 548–49
- Average length of stay (ALOS). *See* Length of stay (LOS)
- Average-to-average method, 307
- Bad-debt losses, 52
- Balanced Budget Act of 1997 (BBA), 62, 66, 174, 577
- Balanced Budget Relief Act of 1999 (BBRA), 62
- Balance sheets, 464, 466–67; common size analysis and, 483; constant growth method and, 511, 512, 514, 515, 516; derivatives and, 674; inflation and, 490; mergers and, 607; percentage change analysis and, 484–85; ratio analysis and, 470, 474; simple linear regression and, 522; specific item forecasting and, 524
- Bank credit lines, 545
- Bank loans, 165–66
- Bankruptcy: collection tactics and, 556; financial distress and, 351–52; leasing and, 285; multiple discriminant analysis and, 490
- Base case, 429
- Base inventory, 557
- Beating the market, 250–51
- Benchmarking, 492–93
- Best-efforts basis, 211
- Betas, 302–4, 426; adjusted, 302, 303; corporate beta, 135–36, 143, 425; fundamental, 302, 303; historical, 302, 303; market beta, 137, 138–39, 140, 147, 299; portfolio, 140–41
- Bid price, setting, 598–600
- Billed charges, 50, 52, 59
- Blue Cross/Blue Shield, 56–58, 59, 61, 577–78
- Blue sky laws, 209
- Board of trustees, 15
- Bond insurance. *See* Credit enhancement
- Bonds, 158–63; *See also* Corporate bonds; Municipal bonds (“munis”); bond pools, 163; call provisions and, 170; call risk premium (CRP) and, 179; credit ratings and, 173; debt valuation and, 223–36; default risk premium (DRP) and, 176–78; equilibrium and, 248; financial risk management and, 657–60; junk, 604; maturity date of, 224; price risk and, 178; private placements and, 199; public offerings and, 157; rating of, 159; sinking funds and, 171; treasury, 158
- Book value, 33, 36
- Breakeven analysis, 397–99, 405–6
- Breakup value, 581
- Budgets, 527; *See also* Capital budgeting
- Build-up method, 325, 326
- Business organization, 8–13
- Business risk, 337, 338–41
- Business valuation, 590–98
- Bylaws, 11
- Calendar-year deductible, 47
- Call options, 664, 665, 666, 668
- Call premium, 170, 232, 253
- Call provisions, 159, 170, 193, 237
- Call risk premium (CRP), 179
- Cancellation (of projects), 447
- Cancellation clause, 262, 263, 283
- Cannibalization, 384
- Capacity options, 451
- Capacity sales, 518
- Capacity utilization, 518–19
- Capital, securities valuation and, 221
- Capital Asset Pricing Model (CAPM), 144, 147, 242, 309, 310; cost of capital and, 298, 299–305, 324–25; cost of equity and, 315
- Capital assets, 27
- Capital finance, 6
- Capital gains/losses, 25, 27–28, 31, 120, 154; common stock and, 194–96; cost of capital and, 327; mergers and, 601
- Capital gains yield, 228, 239, 245
- Capital intensity ratio, 518
- Capital investment decisions, 377
- Capital investment policy, 327
- Capitalization rates, 596–97, 598

- Capitalization ratios, 474–75
- Capitalized cost, 33, 238
- Capitalizing the lease, 267, 269
- Capital leases, 267–68; *See also* Financial leases
- Capital loss, 27
- Capital markets, 155
- Capital rationing, 455–56
- Capital structure policy, 327
- Capitation, 49, 51, 53–54, 55, 71, 613–25, 634; contract risk management, 649, 651–57; defined, 614; financial risk under, 617–25; introduction to, 613–14; inventory management and, 558; overview of, 614; provider incentives under, 615–17; risk pools and, 641; risk sharing and, 634, 635, 636, 638
- CAPM. *See* Capital Asset Pricing Model (CAPM)
- Carrying costs, 559–60
- Carved out, 628, 631
- Case mix index, 63–64
- Case mix management, 70–71
- Cash budget, 527–32, 540, 652
- Cash equivalents, 545
- Cash flow coverage (CFC) ratios, 476–77
- Cash flows, 32–33; *See also* Cash budget; Time value analysis; business valuation and, 591–95, 598; capital budgeting and, 380–96, 408–9, 410–11, 417; certainty equivalent (CE) method and, 439–41; common stock valuation and, 239–40; joint ventures and, 606; leasing and, 270–72, 272–74, 275–76, 278–79, 280, 281; mergers and, 579–80; non-normal, 404; pro forma statements and, 527; project risk analysis and, 424, 444–46; risk-adjusted discount rate (RADR) method and, 441; securities valuation and, 222–23; statement of, 464, 465, 467–69; synchronization, 540–41; uneven, 100–102
- Cash management, 540–44
- C corporations, 13
- Centers for Medicare and Medicaid Services (CMS), 60–61, 64, 65, 67
- Centralized disbursement, 543
- Certainty equivalent (CE) method, 439–41
- Certificate of public advantage (COPA) laws, 587
- CHAMPUS (Civilian Health and Medical Program of the Uniformed Services). *See* TRICARE (formerly CHAMPUS)
- Change in net working capital, 385–86
- Charge-based reimbursement, 54, 55, 58
- Chargemaster, 50
- Charges, 618
- Charitable contributions, 214–15, 311, 360
- Charitable organizations, defined, 15
- Charitable trust doctrine, 588
- Charity care, 16
- Charity/indigent care losses, 52
- Charter, 11
- Check Clearing for the 21st Century (2004), 542
- Chicago Board of Trade (CBOT), 662, 669
- Chicago Board Options Exchange, 664
- Chicago Mercantile Exchange, 669
- Chief executive officers (CEOs), 7
- Chief financial officers (CFOs), 6, 7, 647
- Churning, 52, 618
- Claims production, 552
- Claims submission, 552
- Classified stock, 197–98
- Clayton Act, 586
- Closely held firms, 14
- Closely held stock, 201
- Coefficient of variation (CV), 123
- Collateral, 167
- Collection policy, 553, 554, 556
- Collections float, 541
- Collections worksheet, 528
- Columbia clause, 590
- Commercial health insurance, 58–59
- Commercial paper, 165
- Commodity futures, 669



- Common size analysis, 483–84
- Common stock, 13, 194–202, 206–7, 208; asymmetric information model of capital structure and, 356; capital structure decisions and, 364; valuation, 237–47
- Community ratings, 45, 46
- Comparative analysis, 480
- Compensating balance, 166
- Competitive bids, 209
- Component costs, 294
- Compounding, 81–86, 105–9
- Computers, 4; capital budgeting and, 405–6; computerized inventory control systems, 557; derivatives and, 663; financial forecasting and, 525–26; leasing and, 286–87; Monte Carlo simulation and, 435
- Concentration banking, 542–43
- Conglomerate mergers, 581
- Conservative approach (as debt maturity policy), 368–69
- Consolidated tax returns, 31
- Constant growth, 241–45, 305, 511–17, 520–21, 524–25; *See also* Nonconstant growth stock valuation
- Consumer-driven healthcare, 49
- Contra asset account, 467
- Contract management, 7
- Contribution capital, 519–20
- Control, business valuation and, 597–98
- Control interests, 598
- Controlled disbursement accounts, 543
- Conventional reimbursement, 613
- Conventional terms, 262
- Conversions, 57–58
- Convertible, 193
- Corporate alliances, 19, 606
- Corporate beta, 135–36, 143, 425
- Corporate bonds, 158–60; credit ratings and, 171, 173; default risk premium (DRP) and, 176–77
- Corporate characteristic line, 135
- Corporate cost of capital (CCC), 293–94, 316–21, 327, 343, 346; capital budgeting and, 381; inflation and, 386; project risk analysis and, 422–23
- Corporate goals, 502–3
- Corporate loss carry-back/carry-forward, 31
- Corporate objectives, 503–4
- Corporate risk, 134–37, 142, 143; project risk analysis and, 424–25, 426, 427, 442
- Corporate taxes, 10, 11, 13, 28–32
- Corporations, 10–11, 12–13, 203; *See also* Investor-owned businesses; Not-for-profit organizations
- Correlation, 127–28, 426, 442
- Corridor, 655
- Cost approach (to primary care rate), 629
- Cost-based reimbursement, 49–50, 52, 54, 55, 58, 68, 71
- Costly trade credit, 566–67
- Cost of equity: financial distress and, 352; large investor-owned businesses and, 298–311; not-for-profit businesses and, 311–16; small businesses and, 324–26
- Cost outliers, 65
- Cost shifting, 69–70
- Counterparties, 661
- Coupon interest rate, 224, 229
- Coupon payment, 224
- Coverage ratios, 474, 475–76, 476–77
- Covered options, 664
- Credit: leasing and, 286; terms of, 565; working capital management and, 547
- Credit card payments, 554–55
- Credit/credit policy, 548, 553–56
- Credit enhancement, 162, 174–75
- Creditors, 153
- Credit period, 553
- Credit policy, 565
- Credit quality, 555
- Credit ratings, 171–74, 312
- Credit-scoring systems, 555
- Credit standards, 553
- CreditWatch, 173
- Creditworthiness, 171, 314
- Cross-subsidies, 45
- Currency swaps, 673

- Current ratio, 169, 473, 474  
Curvilinear regression, 523–24, 525
- Dashboards, 494  
Days-cash-on-hand ratio, 473  
Days in patient accounts receivable, 478, 548  
DCF. *See* Discounted cash flow (DCF)  
Debentures, 160  
Debt capacity, 268, 443–44  
Debt contracts, 169–71  
Debt cost plus risk premium approach, 309, 310, 324  
Debt management (capital structure) ratios, 474–77  
Debt maturity structure, 365–69  
Debt portfolio immunization, 657–61  
Debt ratios, 474–75  
Debt refunding, 252–57  
Debt service requirements, 163, 224  
Debt-to-equity ratios, 475  
Decision science, 3  
Decision tree analysis, 447–49, 450–51  
Deductibles, 47  
Default, 159–60  
Default risk premium (DRP), 176–78  
Deferred call, 170  
Demographic approach (to primary care rate), 630–32  
Denials management, 552  
Department of Defense (DOD), 60  
Department of Health and Human Services (DHHS), 60  
Department of Veterans Affairs (VA), 60  
Depreciable basis, 34  
Depreciation, 32–36; balance sheets and, 467; capital budgeting/cash flow and, 393; funded, 539, 546; leasing and, 265, 281; specific item forecasting and, 524  
Derivatives, 650, 661–74; defined, 661; futures, 668–71; options, 663–68; overview of, 661–63; swaps, 671–73; use/misuse of, 673–74  
Diagnosis-related group (DRG) system, 51, 58, 63–64, 69–70  
Differential risk-adjusted NPV, 440, 442  
Direct claims, 661  
Direct purchase plans, 201  
Disbursement float, 541, 542  
Discounted cash flow (DCF), 79, 298–99, 301, 305–6, 309, 310; business valuation and, 590, 591–95; capital budgeting and, 400, 402, 403; project risk analysis and, 450, 452  
Discounted fee-for-service, 618, 629, 634  
Discounted payback, 399  
Discount rate: capital budgeting/cash flow and, 386; project risk analysis and, 423  
Discounts, 79, 87–90, 117; accounts payable and, 566–67; bonds and, 230  
Diversifiable risk, 131  
Diversification, 131, 137; business valuation and, 597; capital structure decisions and, 361; mergers and, 580–81  
Dividend income, 25, 27, 29–30  
Dividend reinvestment plans (DRIPs), 200–201  
Dividends, 14, 120, 154, 192, 194–97, 309; asymmetric information model of capital structure and, 355; common stock valuation and, 238, 239–41, 242, 244–45, 247; cost of capital and, 298; cost of equity and, 305–6; external financing requirement and, 519  
Dividends per share (DPS), 306, 307, 308  
Dividend yield, 239  
Divisional cost of capital, 322  
Dow Jones Wilshire 5000 Index, 303  
DRG. *See* Diagnosis-related group (DRG) system  
DRIPs. *See* Dividend reinvestment plans (DRIPs)  
Due diligence, 591, 602  
Du Pont analysis, 481–83  
Du Pont equation, 481, 482  
Duration, 658–61
- EAR. *See* Effective annual rate (EAR)  
Earnings before interest and taxes

- (EBIT), 342, 345, 346; business valuation and, 591; capital structure decisions and, 335; ratio analysis and, 475, 476
- Earnings before interest, taxes, depreciation, and amortization (EBITDA), 595–96
- Earnings per share (EPS), 243, 306, 307, 308
- Economic life (of project), 411, 449
- Economic ordering quantity (EOQ) model, 522, 523, 559–63
- Economic value, 580
- Economic value added (EVA), 22, 463, 491–92, 503
- Economies of scale, 520
- Effective annual rate (EAR), 106–8, 111
- Effective tax rate, 29
- Efficient Markets Hypothesis (EMH), 248–50
- Electronic claims processing, 542, 552–53
- Electronic data interchange (EDI), 552
- Employee stock ownership plan (ESOP), 200
- Environmental risks, 649
- Equilibrium, 247–48
- Equilibrium risk/return relationship, 299
- Equity multiplier, 482
- Equity ratios, 475
- Equity residual method, 594
- Equivalent annual annuity (EAA), 408–9
- Escape clauses, 212
- EVA. *See* Economic value added (EVA)
- Exercise price, 22; *See also* Strike price
- Exercise value, 665, 666–67
- Expansion project, 396
- Expected rate of return, 120–21; constant growth stock, 245; constant growth stock and, 243; cost of equity and, 305; post-audits and, 416; risk/return trade-off and, 251; security market equilibrium and, 247
- Experience ratings, 45–46
- Exposure units, 44
- External financing requirement, 516–20
- Face/par value, 117, 192, 223
- Factoring/factors, 167–68
- Federal Reserve Board, 183, 208
- Federal Reserve Bulletin*, 180
- Federal Reserve wire system, 543
- Federal Trade Commission (FTC), 586, 587, 588, 603
- Fee-for-service payment method, 49–50, 52, 55, 613, 614, 615, 616, 617–18, 619, 627, 628–29, 654
- Finance charge, 567
- Financial Accounting Standards Board (FASB), 674
- Financial analysis, capital budgeting, 379–81
- Financial asset, 79
- Financial controls, 526–27
- Financial distress, 350–51, 361–62; summary of capital structure models and, 359; trade-off models and, 354
- Financial futures, 669
- Financial Guaranty Insurance Company, 174
- Financial intermediary, 154
- Financial leases, 262–63; *See also* Capital leases
- Financial leverage, 341, 474
- Financial mergers, 591
- Financial planning, 504–7
- Financial reporting, 464–69
- Financial statement analysis, 463, 470; *See also* Financial statements; limitations of, 489–91; operating indicator analysis and, 463
- Financial statements, 464, 505, 506, 507, 527; *See also* Financial statement analysis; Pro forma financial statements (pro formas); creating forecasted, 510–11; leasing and, 266–69; notes to, 469
- Financing decisions, 6–7
- First mortgage bonds, 159
- Fitch Ratings (Fitch), 171
- 501(c)(3) or (4) corporations, 15
- Fixed assets, 6; capital budgeting and, 377–78; cash budget and, 527; constant growth method and, 521;

- occupancy rate and, 487; ratio analysis and, 477–78; specific item forecasting and, 524; working capital management and, 539, 546
- Fixed asset turnover ratios, 477–78
- Fixed-fee prospective reimbursement, 68
- Fixed rates, 158, 159
- Flexibility options, 451
- Float, managing, 541–442
- Floating rates. *See* Variable rates
- Flotation costs, 252–55, 296, 321, 364; *See also* Issuance costs
- For-profit corporations. *See* Investor-owned businesses
- Forward contract, 661
- Foundations, 589
- Founders' shares, 197
- Four-tier rates, 631
- Free cash flow to equityholders method, 594
- Free operating cash flow, 591
- Free trade credit, 566
- Frequency/severity matrix, 649
- Friendly merger, 583
- Full-time equivalent (FTE), 629
- Fundamental betas, 302, 303
- Fund capital, 191, 360–61
- Funded depreciation, 539, 546
- Futures, 668–71
- Futures contracts, 661–62, 668, 669, 670
- Futures dealers, 662
- Futures markets, 661, 662, 668, 670, 671
- Future value (FV), 94–97, 101–2
- Generally accepted accounting principles (GAAP), 464, 592
- General partners, 12
- Global pricing, 51, 53, 55, 619
- Goals, 20–21, 502–3
- Going public, 202
- Going rate, 224
- Golden parachutes, 586, 603
- “Gold plating,” 61
- Goodwill, 607
- Go private, 204
- Governmental grants, 360
- Government bonds. *See* Treasury bonds
- Government grants, 214
- Grossed up, 476
- Group policies, 58–59
- Growth rates, 306–9, 363–64
- Guideline/tax-oriented lease, 264, 269, 272, 281
- Half-year convention, 35
- Hamada's equation, 314–16, 325
- Health insurance, 4, 48–49, 58–59; *See also* Third-party payer system
- Health Insurance Portability and Accountability Act (HIPAA), 46, 552–53
- Health maintenance organizations (HMOs), 50, 589; *See also* Managed care; Risk-sharing arrangements; premium rate development and, 626–27; reserves and, 654; stop-loss insurance and, 655
- Health savings accounts (HSAs), 48–49
- Hedging, 131, 661, 662–63, 665, 669–71, 673, 674
- High-deductible health plans (HDHPs), 48–49
- Hill-Burton Act, 215
- HIPAA. *See* Health Insurance Portability and Accountability Act (HIPAA)
- Historical betas, 302, 303
- Historical/embedded costs of capital, 295
- HMOs. *See* Health maintenance organizations (HMOs)
- Holding companies, 17–18
- Home health care, 66–68
- Homogeneous expectations, 342
- Homogeneous risk class, 342
- Horizontal mergers, 581
- Hospital service plans, 57
- Hostile mergers/takeovers, 21–22, 204, 583–84, 585–86
- Hurdle rate, 319
- Illiquid assets, 178
- Incentive compensation plans, 22

- Incentives, provider, 52–54
- Income statements, 464, 465–66; cash flow estimation and, 382; common size analysis and, 483; constant growth method and, 511, 512, 513, 515; derivatives and, 674; inflation and, 490; percentage change analysis and, 484; ratio analysis and, 470; simple linear regression and, 522; specific item forecasting and, 524
- Incremental cash flows, 381
- Incurred but not reported (IBNR) claims, 654
- Indemnification, 44
- Indenture, 169
- Index rate, 158
- Indirect claims, 661
- Individual/personal income taxes, 25–28
- Inflation, 154, 176, 184, 386–87, 409; constant growth method and, 520; cost of capital and, 327; limitations of financial statement/operating indicator analyses and, 490–91
- Inflation premium (IP), 176
- Inflow terminal value, 404
- Informational efficiency, 248–51
- Initial margin, 669
- Initial public offering (IPO), 202, 212, 213
- Inpatient full-time equivalent (FTE) employees per occupied bed, 488–89
- Inpatient prospective payment system (inpatient PPS or IPPS), 61–63, 64–66
- Inpatient services risk pool (ISRP), 640
- Input risks, 648
- Insiders, 208
- Institutional Brokers Estimate System (I/B/E/S)*, 308
- Insurable risks, 649
- Insurance: *See also* Health insurance; risk and, 649; stop-loss, 654–57
- Integrated delivery systems, 19–20, 634
- Interest/current yield, 228
- Interest income, 26, 29
- Interest rate futures, 669
- Interest rate risk, 234–36
- Interest rates, 92–93, 153; bonds and, 159, 161, 178, 230, 233; cost of capital and, 327; coupon, 224; debt financing and, 154, 155–56, 175–79; debt refunding and, 257; economic factors that influence, 182–84; Efficient Markets Hypothesis (EMH) and, 249; equilibrium and, 248; financial risk management and, 647, 650, 657–60; fixed, 158, 159; futures and, 670; review of types of, 110–11; short-term debt and, 164; stated/nominal, 106, 110; swaps and, 671–73; term loans and, 157–58; term structure of, 180–82; variable, 158–59
- Intermediaries, 61
- Internal rate of return (IRR), 104–5; bonds and, 231; capital budgeting and, 402–5, 406; corporate mergers and, 417; leasing and, 276, 279, 281–82; sensitivity analysis and, 429; stand-alone risk and, 424
- Internal Revenue Service (IRS), 590; leasing and, 264, 265, 269, 271, 272, 281; mergers and, 601; tax book value, 396; Tax Code Section 501(c)(3) or (4), 15
- In-the-money, 664
- Inventory. *See* Supply chain management
- Inventory blanket lien, 168
- Inverted/abnormal yield curve, 181
- Investment banking, 207, 209–12, 602–4
- Investment decisions, 6
- Investment grade, 172
- Investment horizon, 116, 236
- Investment opportunities, 154
- Investor-owned businesses, 4, 10, 11, 13–15, 215–16; capital rationing and, 455; capital structure decisions for small, 364–65; capital structure theory and, 342; corporate bonds and, 158; corporate cost of capital and, 317; corporate risk and, 427; cost of capital and, 294, 295, 297,

- 298–311; economic value added (EVA) and, 492; financial analysis for capital budgeting in, 379; financial reporting and, 464–65; goals of, 21; interest/dividend income received by, 29–30; interest/dividends paid by, 30–31; large, 21–23; market risk and, 137, 140, 425, 426–27; mergers and, 579; mission statements and, 501–2; preferred stock and, 191; ratio analysis and, 478, 479; risk and, 142; securities valuation and, 221; tax effects of leasing and, 264–66
- IPO. *See* Initial public offering (IPO)
- IPPS. *See* Inpatient prospective payment system (inpatient PPS or IPPS)
- IRR. *See* Internal rate of return (IRR)
- Issuance costs, 164, 296; *See also* Flotation costs
- Joint ventures, 606
- Junior mortgages/junior liens, 160
- Junk bonds, 177, 604
- Junk debt, 172
- Justice Department (JD), 586, 587, 588, 603, 606
- Just-in-time (JIT) (inventory control), 557–58
- Key performance indicators (KPIs), 494
- Labor/nonlabor-related costs, 64
- Law of large numbers, 43
- Lead/managing underwriter, 213
- Length of stay (LOS), 54–55, 62, 64, 65, 463, 487–88
- Lessee, 261, 269–77
- Lessor, 261, 277–79
- Leverage, 665, 666–67, 673
- Leveraged leases, 280–82
- Liability risks, 340, 649
- Limited liability, 10, 11
- Limited liability company (LLC), 12
- Limited liability partnership (LLP), 12
- Limited partnerships, 12
- Line of credit, 166
- Liquid assets, 178
- Liquidation, 15
- Liquidity, 11, 169; business valuation and, 597, 598; cash budget and, 528, 531; leasing and, 286; marketable securities investments and, 545; payback and, 399; ratios, 472–74, 478; swaps and, 672
- Liquidity premium (LP), 325–26
- Listed stock, 201
- LLC. *See* Limited liability company (LLC)
- LLP. *See* Limited liability partnership (LLP)
- Loan agreement, 169
- Lockboxes, 542
- Log-linear least squares regression, 307
- Long hedges, 669–70
- Long-term capital gain/loss, 27–28, 31
- Long-term debt, 156–57, 158, 294
- Long-term investments, 546
- Long-term securities management, 546–47
- LOS. *See* Length of stay (LOS)
- LOS outliers, 65
- LP. *See* Liquidity premium (LP)
- Lump sum, 80, 81
- MACRS. *See* Modified Accelerated Cost Recovery System (MACRS)
- Maintenance margin, 208, 669
- Major diagnostic categories (MDCs), 63
- Managed care: *See also* Capitation; Health maintenance organizations (HMOs); Premium rates, development of; Risk-sharing arrangements; Blue Cross/Blue Shield and, 58; commercial insurers and, 59; precertification of managed care patients, 551; reimbursement methods and, 69
- Marginal cost, 317
- Marginal tax rate, 25–26
- Margin call, 208
- Margin requirements, 208
- Marketable securities, 544–45, 652
- Market beta, 137, 138–39, 140, 147, 299

- Market/book (M/B) ratios, 479–80  
Market characteristic line, 138  
Market multiple, 590, 595–96, 597  
Market portfolio, 130–31, 137, 142, 299  
Market power, 579  
Market price, 239  
Market risk, 137–39, 142, 143, 147;  
  project risk analysis and, 425, 426–27, 442  
Market risk premium, 300–302, 309  
Market value ratios, 479  
Marking to market, 669, 674  
Master account, 543  
Materials management. *See* Supply chain management  
Maturity, 156  
Maturity date, 224, 230  
Maturity matching, 367–68  
Medicaid, 68  
Medicare, 7, 60–68; case mix index, 488;  
  reimbursement methods and, 50, 51, 58; reimbursement rates and, 577  
Medicare Payment Advisory Commission (MedPAC), 68  
Merger waves, 576  
Metrics, 494  
Miller, Merton, 342, 348  
Miller Model, 347–50; criticisms of, 350–51; summary of capital structure models and, 357; as trade-off model, 352–55  
Minority interests, 598  
MIRR. *See* Modified IRR (MIRR)  
Mission statements, 23–24, 143, 501–2  
MM. *See* Modigliani-Miller (MM) models  
Modified Accelerated Cost Recovery System (MACRS), 33–36, 265, 272, 273, 394, 396  
Modified IRR (MIRR), 404–5, 406, 429  
Modigliani, Franco, 342  
Modigliani-Miller (MM) models, 342–47, 349, 365; criticisms of, 350–51; summary of capital structure models and, 357; as trade-off models, 352–55  
Money market, 155  
Monitoring/reporting, 552  
Monte Carlo simulation, 435–38, 526, 595, 652  
Moody's Investors Service (Moody's), 171  
Moral hazard, 47–49  
Mortgage bonds, 159–60  
Multihospital systems, 18–19  
Multiple discriminant analysis (MDA), 490, 555  
Multiple regression, 524, 525  
Municipal Bond Investors Assurance Corporation (MBIA), 162, 174  
Municipal bonds (“munis”), 26–27, 160–63; Columbia clause and, 590; corporate bonds and, 158; credit enhancement and, 174–75; credit ratings and, 171; default risk premium (DRP) and, 177; sinking funds and, 171  
Mutual businesses, 58  
Mutually exclusive projects, 406  
Naked options, 664  
NAL. *See* Net advantage leasing (NAL)  
National Association of Securities Dealers (NASD), 209  
Natural hedges, 662  
Negotiated deals, 209  
Negotiated/discounted charges, 50  
Net advantage leasing (NAL), 275, 276, 277, 279  
Net asset value, 607  
Net cash flow from operations, 467–69  
Net cash gain (loss), 528  
Net cash outflow from financing, 467–69  
Net decrease in cash, 467–69  
Net float, 541  
Net operating profit after taxes (NOPAT), 491, 492, 593, 594  
Net present social value (NPSV), 412–14  
Net present value (NPV), 101, 103–4; bonds and, 233; bond valuation model and, 225–27; capital budgeting and, 398, 400–404, 406, 407–12; certainty equivalent (CE) method



- and, 440; corporate mergers and, 417;
  - debt refunding and, 255–57; leasing and, 276–77, 278, 279, 281, 282;
  - Monte Carlo simulation and, 435, 436;
  - project risk analysis and, 442, 446, 449–52, 453, 455, 456;
  - scenario analysis and, 432–34;
  - sensitivity analysis and, 429, 430;
  - stand-alone risk and, 424
- Net price per discharge, 486–87
- New issue, 224
- New issue market, 202
- New/marginal costs of capital, 295
- New service options, 451
- New York Mercantile Exchange, 671
- New York Stock Exchange (NYSE), 13, 129, 138, 201–2, 205–6, 303, 325, 665
- Nonconstant growth stock valuation, 245–47
- Nonearning asset, 540
- Nonincremental cash flows, 383
- Non-normal cash flows, 404
- Nonpayment, 51–52
- Nonprofit corporations. *See* Not-for-profit organizations
- Non-tax-oriented lease, 264
- NOPAT. *See* Net operating profit after taxes (NOPAT)
- Normal yield curve, 180
- Notes payable, 165
- Not-for-profit hospital service corporations, 57
- Not-for-profit organizations, 4, 13, 15–17, 23–24; application of capital structure theory to, 359–61; Blue Cross/Blue Shield and, 57; capital budgeting in, 412–16; capital rationing and, 455; capital structure theory and, 342; contribution capital and, 519; corporate risk and, 426, 427; cost of capital and, 295, 297, 298, 317–18; cost of equity and, 311–16; debt securities and, 657; economic value added (EVA) and, 492; equity financing and, 214–16; financial analysis for capital budgeting in, 379–80; interest/dividend income received by, 30; market risk and, 137; mergers and, 579, 581, 588–90; mission statements and, 502; nonpayment and, 52; risk and, 143; tax effects of leasing and, 266; working capital management and, 539, 546–47
- Notional principal, 672
- NPV. *See* Net present value
- Nursing homes, 66–68
- Objective risk, 620, 623
- Objectives, corporate, 503–4
- Occupancy rate, 487
- Off-balance-sheet financing, 266
- Official statement, 161
- One-tier (composite) rates, 631
- Operating indicator analysis, 463, 485–91
- Operating indicators, 485–86
- Operating leases, 262
- Operating leverage, 340, 341
- Operating margin, 471
- Operating plan, 504
- Operational mergers, 591
- Operational planning, 504
- Operational value, 595
- Opportunity cost principle, 298
- Opportunity cost rate, 87
- Opportunity costs, 90–92, 137; capital budgeting/cash flow and, 384; capitation and, 614; cost of capital and, 293, 311, 313, 314, 315, 316, 319; not-for-profit businesses and, 359
- Optimal capital budget, 453
- Optimal capital structure. *See* Target capital structure
- Option pricing techniques, 238
- Options, 663–68
- Option to delay, 452
- Option writer, 664
- Ordering costs, 560–63
- Ordinary annuities, 94–96
- Ordinary income, 25
- Organizational goals, 20–21
- Organizational structures, 17–20



- Original issue discount bonds. *See*  
Zero-coupon bonds
- Outflow, 80
- Outlier payments, 65
- Out-of-pocket maximums, 48
- Out-of-the-money, 664
- Outpatient Prospective Payment System  
(OPPS), 66
- Outpatient services, 66
- Outstanding bond, 224
- Outstanding/used shares (of stock),  
202
- Over-the-counter (OTC) market, 13,  
201–2, 205–6, 209, 305
- Pacific Exchange, 201
- Par/face value, 117, 192, 223
- Participation rate, 655
- Partnerships, 9–10, 12, 203
- Patient accounts manager, 550, 554
- Payables. *See* Accounts payable
- Payables centralization, 543
- Payback period, 398–99
- Payment (PMT), 94, 100–102
- Payment-in-kind (PIK) bonds, 159
- Payment receipt/posting, 552
- PC. *See* Professional corporation  
(PC)/professional association (PA)
- Percentage change analysis, 484–85
- Percentage of revenues/sales method,  
511; *See also* Constant growth
- Percentage return. *See* Rate of return
- Per diagnosis reimbursement, 50–51,  
53, 54, 58
- Per diem reimbursement, 51, 53, 54, 68,  
619, 634; risk pools and, 635, 640,  
641
- Perfect capital markets, 342
- Perfect hedge, 670
- Perfect negative correlation, 127
- Perfect positive correlation, 127
- Performance-based pools, 641–42
- Performance shares, 22
- Periodic interest rate, 106–8, 110
- Periodic interim payments (PIPs), 50
- Permanent assets, 367, 369
- Permanent capital, 294, 369
- Per member per month (PMPM), 614,  
619, 628–33, 636, 638
- Perpetual preferred stock, 236
- Perpetuities, 237, 342
- Per procedure lease, 283
- Per procedure reimbursement, 50, 53,  
54
- Per procedure terms, 262
- Personnel risks, 648–49
- PHS. *See* Public Health Service (PHS)
- Physical life (of project), 410–11
- Physician Payment Review Commission  
(PPRC), 68
- PI. *See* Profitability index (PI)
- Planning, 6; financial, 504–7;  
operational, 504; strategic, 501–  
4
- Pledging, 167
- PMT. *See* Payment (PMT)
- Point-of-service distribution, 558
- Point-to-point rate, 306
- Poison pills, 196, 586, 603
- Policy limits, 48
- Pooling/sharing of losses, 44
- Pools, 208
- Portfolios, 124–41; beating the market  
and, 251; capital structure decisions  
and, 361; financial risk management  
and, 657–60; market, 130–31, 137,  
142, 299; of marketable securities,  
544; options and, 665; portfolio betas,  
140–41; portfolio risk of business  
investments, 133–39; portfolio risk of  
stocks, 139–40; portfolio risk/return,  
124–33; relevance of risk measures  
and, 141–43
- Post-audits, 387, 416
- PPOs. *See* Preferred provider  
organizations (PPOs)
- Precertification of managed care patients,  
551
- Preemptive/knockout bid, 600
- Preemptive right, 196–97, 198
- Preexisting conditions, 46
- Preferred provider organizations (PPOs),  
50
- Preferred stock, 191–94, 236–37

- Preinsurance verification, 551  
Premium, 229  
Premium rates, development of, 626–34  
Present values (PVs), 81, 100–101;  
    bonds and, 233; capital budgeting  
    and, 404; leasing and, 271–72, 274;  
    profitability index (PI) and, 455–56;  
    project risk analysis and, 444–46  
Preservice patient financial counseling,  
    551  
Price/earnings (P/E) ratios, 479  
Price risk, 178, 234, 236, 657  
Price risk premium (PRP), 178  
Primary care rate, 629  
Primary market offering, 202  
Primary market transactions, 13  
Privately held firms, 14  
Privately held stock. *See* Closely held  
    stock  
Private placements, 157, 199  
Probability distributions, 119–20  
Probability of occurrence, 119–20  
Professional corporation (PC)/  
    professional association (PA), 12–13  
Professional services risk pool (PSRP),  
    638  
Profitability, 519  
Profitability analysis, 405–6  
Profitability index (PI), 455–56  
Profitability ratios, 471–72  
Profit margin. *See* Total margin  
Profit per discharge, 486  
Pro forma financial statements,  
    517; business valuation and, 591;  
    computerized forecasting models and,  
    526; simple linear regression and, 522  
Pro forma financial statements (pro  
    formas), 510–11  
Progressive taxes, 25  
Project classifications (for capital  
    budgeting), 378–79  
Project cost of capital, 320, 423, 442,  
    453  
Projects: abandonment of, 410–11,  
    447, 449–51; cash flows and life of,  
    382–83; evaluating projects with  
    unequal lives, 406–10; expansion,  
    396; portfolios and, 124, 129,  
    133; as real asset investments, 141;  
    safety/environmental, 379  
Project scoring matrix, 414–15  
Promissory note. *See* Loan agreement  
ProPAC. *See* Prospective Payment  
    Assessment Commission (ProPAC)  
Property risks, 648  
Proprietorships, 9–10  
Prospective Payment Assessment  
    Commission (ProPAC), 68  
Prospective payment system, 50–51, 53,  
    58, 66, 618–19  
Prospectus, 207, 208, 212  
Proxy, 14, 21–23, 196, 204, 584  
Public Health Service (PHS), 60  
Publicly held firms, 14  
Public offerings, 157, 199  
Purchase accounting, 607  
Pure play, 323, 324, 325, 326  
Pure risks, 648  
Put options, 664, 665  
PVs. *See* Present values (PVs)  
  
Qualitative risk assessment, 438–39  
Quality Review Organization (QRO),  
    67–68  
  
RADR. *See* Risk-adjusted discount rate  
    (RADR) method  
Random loss, 44  
Rate of return, 104–5, 125, 126; *See also*  
    Realized rate of return; Required rate  
    of return  
Rate ratios, 631  
Rating agencies, 362  
Ratio analysis, 470–83; asset  
    management (activity) ratios,  
    477–78; average age of plant ratios,  
    479; benchmarking and, 492–93;  
    comparative/trend analysis; debt  
    management (capital structure)  
    ratios, 474–77; Du Pont analysis  
    and, 481–83; limitations of financial  
    statement/operating indicator  
    analyses and, 490; liquidity ratios,  
    472–74; market/book (M/B) ratios,

- 479–80; market value ratios, 479;
- price/earnings (P/E) ratios, 479;
- profitability ratios, 471–72
- Real assets, 79, 116, 141, 221, 222
- Realized rate of return, 121
- Real/managerial options, 388, 446–47
- Real options, 664
- Real option value, 454, 455
- Real risk-free rate (RRF), 176
- Real-world forecasting, 521–25
- Reasonable charges, 67
- Rebalanced, 660–61
- Recalibrated, 63
- Recapture, 396
- Receivables. *See* Accounts receivable
- Recovery period, 34
- Recovery risk, 177
- Redeem/retire, 170
- Redemption, 170
- “Red herring” prospectuses, 208
- Refunding, 252
- Refunding decision, 170
- Registration statement, 207, 212
- Reimbursement methods, 49–56, 634;
  - See also* Capitation; Fee-for-service payment method; commercial insurers and, 59; conventional reimbursement, 613; cost-based reimbursement, 49–50, 52, 54, 55, 58, 68, 71; fixed-fee prospective reimbursement, 68; Medicaid and, 68; Medicare and, 61–68; risk pools and, 635
- Reinsurance. *See* Stop-loss insurance
- Reinvestment rate risk, 234–35, 236, 657
- Relative weights, 63
- Remote disbursement, 543
- Renewal risk, 165
- Replacement chain (common life)
  - approach, 407
- Replacement decisions, 396
- Required rate of return, 77, 115, 143–46, 147, 301; bonds and, 230–31, 233; common stock valuation and, 239, 242, 243; cost of capital and, 298; cost of equity and, 305; preferred stock valuation and, 236–37; securities valuation and, 222–23, 224, 227, 229; security market equilibrium and, 247
- Required reserves, 651–52
- Reserve borrowing capacity, 356
- Reserves, 635, 651–54
- Residual value, 264
- Resource-based relative value system (RBRVS), 67
- Restricted charitable contributions, 215
- Restrictive covenants, 169
- Retained earnings, 298, 311, 360
- Retention growth method, 308
- Return on assets (ROA), 472, 481–83
- Return on equity (ROE), 308; capital structure decisions and, 335, 336, 337, 338, 341, 365; corporate objectives and, 503; cost of capital and, 312, 313; ratio analysis and, 472, 480, 481–83
- Return on investment (ROI), 102–5; capital budgeting and, 399–405; profitability index (PI) and, 455–56; stand-alone risk and, 424
- Reuters*, 304
- Revenue bonds, 161
- Revenue cycle, 551–52
- Revenue forecasts, 507–10
- Revenue growth rate, 518
- Revolving credit agreement/revolver.
  - See* Line of credit
- Right. *See* Stock purchase right
- Rights offering, 198
- Risk, business, 337, 338–41
- Risk-adjusted discount rate (RADR)
  - method, 441
- Risk arbitrage, 604
- Risk averse, 118–19
- Risk-free rate (RF), 176, 299–300, 309, 342, 440
- Riskless/riskfree, 117, 342
- Risk managers, 647
- Risk neutral, 118
- Risk pools, 635–42
- Risk premium, 155, 299, 309, 310
- Risk/return, 251–52, 334–37, 369
- Risk seeker, 118

- Risk-sharing arrangements, 634–42;  
basics of, 635; inpatient services risk pool (ISRP), 640–41; performance-based risk pools, 641–42; professional services risk pool (PSRP), 638–40; single risk pool, 635–38; two risk pools, 638
- Risk transfer, 44
- ROA. *See* Return on assets (ROA)
- ROE. *See* Return on equity (ROE)
- Rollover risk, 164
- Rule of 72, 94
- Rule of reason analysis, 586–87
- Safety/environmental projects, 379
- Safety stock, 557
- “Safety zone” guidelines, 587
- Salary per FTE, 489
- Sale and leaseback, 263
- Salvage value, 33
- Sarbanes-Oxley Act (2002), 204
- Scenario analysis, 432–34, 440, 595
- S corporations, 13
- Seasoned issue. *See* Outstanding bond
- SEC. *See* Securities and Exchange Commission (SEC)
- Secondary market, 13, 202
- Second mortgage bonds, 160
- Securities and Exchange Commission (SEC), 212, 214; bonds and, 158, 161; financial reporting and, 464; going public and, 204; mergers and, 601; private placements and, 199; Rule 415, 214; securities regulation and, 207–9
- Securities regulation, 207–9
- Security instrument, 168–69
- Security Market Line (SML), 144–46, 242, 299
- Self-dealings, 204
- Self-insurance, 44, 59–60, 650
- Self-payers, 555–56
- Selling group, 213
- Semiannual compounding, 105–7
- Sensitivity analysis, 429–32, 526
- Service leases. *See* Operating leases
- Severity risks, 648
- Shareholders. *See* Stockholders
- Shareholder wealth maximization, 21, 23, 142, 379–80, 425
- Sherman Act, 586
- Shipping/installation costs, 385
- Short hedges, 670
- Short-term capital gain/loss, 27
- Short-term debt, 157, 163–69, 294
- Short-term investments, 544
- Side payments, 672
- Simple linear regression, 522–23, 524–25
- Sinking funds, 171, 193, 237
- Skilled nursing facility (SNF), 66
- Sliding-scale discounts, 50
- Small businesses, 324–26, 365
- SML. *See* Security Market Line (SML)
- Social value, 412–14, 454, 455, 492
- Sole proprietorships, 203. *See* Proprietorships
- Specialty care rate, 629
- Specific item forecasting, 524
- Specific stop-loss coverage, 654
- Speculative risks, 648
- Speculators, 662
- Spot/cash market, 668
- Spreadsheets, 4, 83–85
- Stakeholders, 23–24
- Stand-alone risk, 122–24, 126, 130, 132, 137, 139, 141, 142, 143; Monte Carlo simulation and, 438; project risk analysis and, 424, 425–26, 442; scenario analysis and, 432, 434; sensitivity analysis and, 430
- Standard (accelerated) method (of depreciation), 33–34
- Standard & Poor, 129, 138, 171, 172, 303, 325, 362, 665
- Standard deviation, 122–24, 126, 131, 132–33, 424
- Stated/nominal interest rate, 106, 110
- Statement of cash flows, 464, 465, 467–69
- Statements of operations/revenues and expenses. *See* Income statements
- Statistical supplements, 464
- Step-up provisions, 159

- Stock, 191; *See also* Common stock; classified, 197–98; closely held, 201; preferred, 191–94, 236–37; unlisted, 201; unsyndicated stock offering, 213
- Stock businesses, 58
- Stockholders, 14, 15; market risk and, 137–39; net income and common, 298; rights/privileges of common, 194–97; risk and, 142
- Stockless inventory, 557–58
- Stock option plans, 199–200
- Stock options, 22
- Stock-out, 558
- Stockout costs, 559–63
- Stock purchase plan, 200
- Stock purchase rights, 198, 603
- Stock repurchases, 14
- Stop-loss insurance, 654–57
- Stop-loss limits, 48
- Straight-line method (of depreciation), 33
- Strategic planning, 501–4
- Strategic value, 388
- Stratified per diems, 51, 619
- Stretching, 566
- Strike price, 664, 665; *See also* Exercise price
- Subjective risk, 620, 623
- Subordinated debt, 160
- Sunk costs, 383
- Supernormal growth, 247
- Supplies worksheet, 528
- Supply chain management, 556–58
- “Surveillance fee,” 174
- Swaps, 671–73
- Synchronization of cash flows, 540–41
- Synergy, 579, 581, 591, 592, 595
- Taking down, 166–67
- Target capital structure, 333, 354
- Targets, 583, 585
- Tax arbitrage, 30
- Tax book value, 396
- Tax depreciation, 33
- Taxes: *See also* Internal Revenue Service (IRS); Tax laws; capital budgeting/cash flow and, 394, 396; capital structure decisions and, 335, 364–65; corporations and, 10, 11, 12–13, 15–16, 28–32; cost of capital and, 294, 327; depreciation and, 33–36; holding companies and, 18; individual/personal income, 25–28; leases and, 264–66, 281, 282–83; limited liability companies and, 12; mergers and, 600–601; Miller Model and, 350; Modigliani-Miller (MM) models and, 342–47, 350; not-for-profit businesses and, 359; partnerships and, 9; preferred stock and, 193, 194; proprietorships and, 9; summary of capital structure models and, 359; trade-off models and, 354
- Tax-exempt corporations. *See* Not-for-profit organizations
- Tax-exempt lease, 266
- Tax laws, 24–32; corporate income taxes, 28–32; individual/personal income taxes, 25–28
- Tax shield, 33, 270
- Technical default, 169
- Technology: capital budgeting and, 378; leasing and, 283
- Temporary current assets, 367, 369
- Tender offers, 21–22, 583, 585, 586
- Terminal value, 382–83, 594
- Term loans, 157–58
- Terms of credit, 565
- Term structure of interest rates, 180–82
- Third-party follow-up, 552
- Three-tier rates, 631
- Threshold/attachment point, 655
- Tier basis (for premium rates), 631
- Time lines, 80–81
- Time of service verification, 552
- Time preferences for consumption, 154
- Times-interest-earned (TIE) ratios, 475–76
- Timing options, 451–52
- Total asset turnover ratios, 478
- Total inventory costs (TIC), 560–63
- Total margin, 471
- Total net present value (TNPV), 412
- Total ordering costs (TOC), 560–63

- Total profit margin. *See* Total margin
- Total Stock Market Index. *See*  
Dow Jones Wilshire 5000  
Index
- Trade credit. *See* Accounts payable
- Trade groups, 19
- Trade-off models, 352–55, 357, 360,  
361
- Transactions costs, 178
- Treasury bonds, 158
- Trend analysis, 480
- TRICARE (formerly CHAMPUS),  
60
- Triple taxation, 29
- Trustees, 170
- Trust receipt. *See* Security instrument
- Two-tier rates, 631
- Unbundling, 53, 619
- Underlying asset, 661, 663–68
- Underwriting, 45, 211, 213
- Unlisted stock, 201
- Unrelated business income (UBI),  
28–29
- Unsyndicated stock offering, 213
- Upcoding, 53, 619
- Upward sloping curve, 180
- Utilization risks, 648
- VA. *See* Department of Veterans Affairs  
(VA)
- Value Line*, 153, 308
- Variable rates, 158, 159
- Variances, 122–23, 527
- Venture capitalists, 203
- Vertical mergers, 581
- Wall Street Journal*, 180, 231, 300, 305,  
306
- Wash sales, 208
- Well-diversified portfolio, 131
- White knights, 585, 603
- White squires, 603
- Williams Act (1968), 585
- Withholds. *See* Risk pools
- Yield curve, 180
- Yield to call (YTC), 232
- Yield to maturity (YTM), 231, 232, 234,  
296
- Zacks Investment Research, 308
- Zero-balance accounts (ZBAs), 543
- Zero-coupon bonds, 159, 230–31, 236,  
657–60
- Zero growth, 342
- Zero-sum game, 279, 282



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