

SEVENTH EDITION

# Financial Markets and Institutions

*Anthony Saunders / Marcia Millon Cornett*

McGraw Hill Education

seventh edition

# Financial Markets *and* Institutions

# THE MCGRAW-HILL EDUCATION SERIES IN FINANCE, INSURANCE, AND REAL ESTATE

## FINANCIAL MANAGEMENT

Block, Hirt, and Danielsen
**Foundations of Financial Management**
*Sixteenth Edition*

Brealey, Myers, and Allen
**Principles of Corporate Finance**
*Twelfth Edition*

Brealey, Myers, and Allen
**Principles of Corporate Finance, Concise**
*Second Edition*

Brealey, Myers, and Marcus
**Fundamentals of Corporate Finance**
*Ninth Edition*

Brooks
**FinGame Online 5.0**

Bruner, Eades, and Schill
**Case Studies in Finance: Managing for Corporate Value Creation**
*Eighth Edition*

Cornett, Adair, and Nofsinger
**Finance: Applications and Theory**
*Fourth Edition*

Cornett, Adair, and Nofsinger
**M: Finance**
*Fourth Edition*

DeMello
**Cases in Finance**
*Third Edition*

Grinblatt (editor)
**Stephen A. Ross, Mentor: Influence through Generations**

Grinblatt and Titman
**Financial Markets and Corporate Strategy**
*Second Edition*

Higgins
**Analysis for Financial Management**
*Twelfth Edition*

Ross, Westerfield, Jaffe, and Jordan
**Corporate Finance**
*Eleventh Edition*

Ross, Westerfield, Jaffe, and Jordan
**Corporate Finance: Core Principles and Applications**
*Fifth Edition*

Ross, Westerfield, and Jordan
**Essentials of Corporate Finance**
*Ninth Edition*

Ross, Westerfield, and Jordan
**Fundamentals of Corporate Finance**
*Twelfth Edition*

Shefrin
**Behavioral Corporate Finance: Decisions that Create Value**
*Second Edition*

## INVESTMENTS

Bodie, Kane, and Marcus
**Essentials of Investments**
*Tenth Edition*

Bodie, Kane, and Marcus
**Investments**
*Eleventh Edition*

Hirt and Block
**Fundamentals of Investment Management**
*Tenth Edition*

Jordan, Miller, and Dolvin
**Fundamentals of Investments: Valuation and Management**
*Eighth Edition*

Stewart, Piros, and Heisler
**Running Money: Professional Portfolio Management**
*First Edition*

Sundaram and Das
**Derivatives: Principles and Practice**
*Second Edition*

## FINANCIAL INSTITUTIONS AND MARKETS

Rose and Hudgins
**Bank Management and Financial Services**
*Ninth Edition*

Rose and Marquis
**Financial Institutions and Markets**
*Eleventh Edition*

Saunders and Cornett
**Financial Institutions Management: A Risk Management Approach**
*Ninth Edition*

Saunders and Cornett
**Financial Markets and Institutions**
*Seventh Edition*

## INTERNATIONAL FINANCE

Eun and Resnick
**International Financial Management**
*Eighth Edition*

## REAL ESTATE

Brueggeman and Fisher
**Real Estate Finance and Investments**
*Sixteenth Edition*

Ling and Archer
**Real Estate Principles: A Value Approach**
*Fifth Edition*

## FINANCIAL PLANNING AND INSURANCE

Allen, Melone, Rosenbloom, and Mahoney
**Retirement Plans: 401(k)s, IRAs, and Other Deferred Compensation Approaches**
*Twelfth Edition*

Altfest
**Personal Financial Planning**
*Second Edition*

Harrington and Niehaus
**Risk Management and Insurance**
*Second Edition*

Kapoor, Dlabay, Hughes, and Hart
**Focus on Personal Finance: An active approach to help you achieve financial literacy**
*Sixth Edition*

Kapoor, Dlabay, Hughes, and Hart
**Personal Finance**
*Twelfth Edition*

Walker and Walker
**Personal Finance: Building Your Future**
*Second Edition*

seventh edition

# Financial Markets *and* Institutions

**Anthony Saunders**
*Stern School of Business*
*New York University*

**Marcia Millon Cornett**
*Bentley University*



McGraw Hill Education

FINANCIAL MARKETS AND INSTITUTIONS, SEVENTH EDITION



This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 LWI 21 20 19 18

ISBN 978-1-259-91971-8
MHID 1-259-91971-4

Brand Manager: *Charles Synovec*
Product Developer: *Noelle Bathurst*
Marketing Manager: *Trina Maurer*
Content Project Managers: *Heather Ervolino; Evan Roberts*
Buyer: *Sandy Ludovissy*
Design: *Matt Diamond*
Content Licensing Specialist: *Beth Thole*
Cover Image: © *Shutterstock / Rudy Balasko*
Compositor: *SPi Global*
Printer: *LSC Communications*



**Library of Congress Cataloging-in-Publication Data**

Names: Saunders, Anthony, 1949- author. | Cornett, Marcia Millon, author.
Title: Financial markets and institutions / Anthony Saunders, Stern School of Business, New York University, Marcia Millon Cornett, Bentley University.
Description: Seventh edition. | New York, NY : McGraw-Hill Education, [2019]
Identifiers: LCCN 2017031881 | ISBN 9781259919718 (alk. paper)
Subjects: LCSH: Securities—United States. | Stock exchanges—United States. | Financial institutions—United States. | Rate of return—United States. | Interest rates—United States.
Classification: LCC HG4910 .S28 2019 | DDC 332—dc23 LC record available at https://lccn.loc.gov/2017031881



mheducation.com/highered

To Ingo Walter: a mentor, coauthor, and friend.

—TONY SAUNDERS

To my parents, Tom and Sue.

—MARCIA MILLON CORNETT

# ABOUT THE AUTHORS

## Anthony Saunders

Anthony Saunders is the John M. Schiff Professor of Finance and former chair of the Department of Finance at the Stern School of Business at New York University. Professor Saunders received his PhD from the London School of Economics and has taught both undergraduate- and graduate-level courses at NYU since 1978. Throughout his academic career, his teaching and research have specialized in financial institutions and international banking. He has served as a visiting professor all over the world, including INSEAD, the Stockholm School of Economics, and the University of Melbourne.

Professor Saunders holds or has held positions on the Board of Academic Consultants of the Federal Reserve Board of Governors as well as the Council of Research Advisors for the Federal National Mortgage Association. In addition, Dr. Saunders has acted as a visiting scholar at the Comptroller of the Currency and at the International Monetary Fund. He is editor of the *Journal of Financial Markets, Instruments and Institutions,* as well as the associate editor of a number of other journals. His research has been published in all of the major finance and banking journals and in several books. He has just published a new edition of his textbook, with Dr. Marcia Millon Cornett, *Financial Institutions Management: A Risk Management Approach*, for McGraw-Hill/Irwin (ninth edition) as well as a third edition of his book on credit risk measurement for John Wiley & Sons. Professor Saunders was ranked the most prolific author out of more than 5,800 who have published in the seven leading finance academic journals from 1959 to 2008 ("Most Prolific Authors in the Financial Literature, 1959–2008," Jean Heck and Philip Cooley).

## Marcia Millon Cornett

Marcia Millon Cornett is the Robert A. and Julia E. Dorn Professor of Finance at Bentley University. She received her BS degree in economics from Knox College in Galesburg, Illinois, and her MBA and PhD degrees in finance from Indiana University in Bloomington, Indiana. Dr. Cornett has written and published several articles in the areas of bank performance, bank regulation, corporate finance, and investments. Articles authored by Dr. Cornett have appeared in such academic journals as the *Journal of Finance,* the *Journal of Money, Credit, and Banking,* the *Journal of Financial Economics, Financial Management,* and the *Journal of Banking and Finance.* She was recently ranked the 124th most published out of more than 17,600 authors and the number five female author in finance literature over the last 50 years. Along with Anthony Saunders, Dr. Cornett has recently completed work on the ninth edition of *Financial Institutions Management* (McGraw-Hill/Irwin). With Troy A. Adair Jr. (Harvard University) and John Nofsinger (University of Alaska, Anchorage), she has also recently completed work on the fourth edition of *Finance: Applications and Theory* and the third edition of *M: Finance* (McGraw-Hill/Irwin). Professor Cornett serves as an associate editor for the *Journal of Banking and Finance,* the *Journal of Financial Services Research, Review of Financial Economics, Financial Review,* and *Multi-national Finance Journal.* Dr. Cornett has served as a member of the Board of Directors, the Executive Committee, and the Finance Committee of the SIU Credit Union. She has also taught at Southern Illinois University at Carbondale, the University of Colorado, Boston College, Southern Methodist University, and Boston University.

# PREFACE

The last 30 years have been dramatic for the financial services industry. In the 1990s and 2000s, boundaries between the traditional industry sectors, such as commercial banking and investment banking, broke down and competition became increasingly global in nature. Many forces contributed to this breakdown in interindustry and intercountry barriers, including financial innovation, technology, taxation, and regulation. Then in 2008–2009, the financial services industry experienced the worst financial crisis since the Great Depression. Even into the mid-2010s, the U.S. and world economies have not recovered from this crisis. It is in this context that this book is written.

As the economic and competitive environments change, attention to profit and, more than ever, risk become increasingly important. This book offers a unique analysis of the risks faced by investors and savers interacting through both financial institutions and financial markets, as well as strategies that can be adopted for controlling and better managing these risks. Special emphasis is also put on new areas of operations in financial markets and institutions such as asset securitization, off-balance-sheet activities, and globalization of financial services.

While maintaining a risk measurement and management framework, *Financial Markets and Institutions* provides a broad application of this important perspective. This book recognizes that domestic and foreign financial markets are becoming increasingly integrated and that financial intermediaries are evolving toward a single financial services industry. The analytical rigor is mathematically accessible to all levels of students, undergraduate and graduate, and is balanced by a comprehensive discussion of the unique environment within which financial markets and institutions operate. Important practical tools such as how to issue and trade financial securities and how to analyze financial statements and loan applications will arm students with the skills necessary to understand and manage financial market and institution risks in this dynamic environment. While descriptive concepts so important to financial management (financial market securities, regulation, industry trends, industry characteristics, etc.) are included in the book, ample analytical techniques are also included as practical tools to help students understand the operation of modern financial markets and institutions.

## INTENDED AUDIENCE

*Financial Markets and Institutions* is aimed at the first course in financial markets and institutions at both the undergraduate and MBA levels. While topics covered in this book are found in more advanced textbooks on financial markets and institutions, the explanations and illustrations are aimed at those with little or no practical or academic experience beyond the introductory-level finance courses. In most chapters, the main relationships are presented by figures, graphs, and simple examples. The more complicated details and technical problems related to in-chapter discussion are provided in appendixes to the chapters (available through McGraw-Hill *Connect Finance* or your course instructor).

## ORGANIZATION

Since our focus is on return and risk and the sources of that return and risk in domestic and foreign financial markets and institutions, this book relates ways in which a modern financial manager, saver, and investor can expand return with a managed level of risk to achieve the best, or most favorable, return–risk outcome.

**Part 1** provides an introduction to the text and an overview of financial markets and institutions. Chapter 1 defines and introduces the various domestic and foreign financial markets and describes the special functions of FIs. This chapter also takes an analytical look at how financial markets and institutions benefit today's economy. In Chapter 2, we provide an in-depth look at interest rates. We first look at factors that determine interest rate levels,

as well as their past, present, and expected future movements. We then review the concept of time value of money. Chapter 3 then applies these interest rates to security valuation. In Chapter 4, we describe the Federal Reserve System and how monetary policy implemented by the Federal Reserve affects interest rates and, ultimately, the overall economy.

**Part 2** of the text presents an overview of the various securities markets. We describe each securities market, its participants, the securities traded in each, the trading process, and how changes in interest rates, inflation, and foreign exchange rates impact a financial manager's decisions to hedge risk. These chapters cover the money markets (Chapter 5), bond markets (Chapter 6), mortgage markets (Chapter 7), stock markets (Chapter 8), foreign exchange markets (Chapter 9), and derivative securities markets (Chapter 10).

**Part 3** of the text summarizes the operations of commercial banks. Chapter 11 describes the key characteristics and recent trends in the commercial banking sector. Chapter 12 describes the financial statements of a typical commercial bank and the ratios used to analyze those statements. This chapter also analyzes actual financial statements for representative commercial banks. Chapter 13 provides a comprehensive look at the regulations under which these financial institutions operate and, particularly, the effect of recent changes in regulation.

**Part 4** of the text provides an overview describing the key characteristics and regulatory features of the other major sectors of the U.S. financial services industry. We discuss other lending institutions (savings institutions, credit unions, and finance companies) in Chapter 14, insurance companies in Chapter 15, securities firms and investment banks in Chapter 16, investment companies in Chapter 17, and pension funds in Chapter 18.

**Part 5** concludes the text by examining the risks facing a modern FI and FI managers and the various strategies for managing these risks. In Chapter 19, we preview the risk measurement and management chapters in this section with an overview of the risks facing a modern FI. We divide the chapters on risk measurement and management along two lines: measuring and managing risks on the balance sheet, and managing risks off the balance sheet. In Chapter 20, we begin the on-balance-sheet risk measurement and management section by looking at credit risk on individual loans and bonds and how these risks adversely impact an FI's profits and value. The chapter also discusses the lending process, including loans made to households and small, medium-size, and large corporations. Chapter 21 covers liquidity risk in financial institutions. This chapter includes a detailed analysis of the ways in which FIs can insulate themselves from liquidity risk and the key role deposit insurance and other guarantee schemes play in reducing liquidity risk.

In Chapter 22, we investigate the net interest margin as a source of profitability and risk, with a focus on the effects of interest rate risk and the mismatching of asset and liability maturities on FI risk exposure. At the core of FI risk insulation is the size and adequacy of the owner's capital stake, which is also a focus of this chapter.

The management of risk off the balance sheet is examined in Chapter 23. The chapter highlights various new markets and instruments that have emerged to allow FIs to better manage three important types of risk: interest rate risk, foreign exchange risk, and credit risk. These markets and instruments and their strategic use by FIs include forwards, futures, options, and swaps.

Finally, Chapter 24 explores ways of removing credit risk from the loan portfolio through asset sales and securitization.

## NEW FEATURES

- Tables and figures in all chapters have been revised to include the most recently available data.
- Revised "After the Crisis" boxes highlighting significant events related to the financial crisis have been added to chapters throughout the book.
- Updates on the major changes proposed for the regulation of financial institutions are included where appropriate throughout the book.
- Discussion of how financial markets and institutions continue to recover from the financial crisis has been added throughout the book. Virtually every chapter includes

new material detailing how the financial crisis affected risk management in financial institutions.

- Several chapters include a discussion of Brexit as its affects the risk and return for investors in financial markets and financial institutions.
- Several chapters include a discussion of the impact of initial interest rate increases by the Federal Reserve.
- Several chapters include a discussion of the impact of China's economic policies and economic slowdown on financial markets.
- Chapter 1 includes a new section on enterprise risk management. The chapter also provides an update on the implementation of the Wall Street Reform and Consumer Protection Act enacted as a result of the financial crisis.
- Chapter 4 provides an update on the Federal Reserve's actions intended to strengthen the U.S. economy, including the interest rate increases instituted by the Fed.
- Chapter 5 includes updates on the LIBOR scandal.
- Chapter 6 discusses China's and worldwide Treasury holdings and the potential impact of these holdings on the U.S. economy.
- Chapter 8 includes more on dark pools and Brexit's impact on worldwide stock markets.
- Excel spreadsheets containing bank financial statements and ratio calculations have been added to Chapter 12.
- Chapter 13 includes a discussion of how the Volcker Rule and Consumer Protection Regulation have affected the operations of financial institutions.
- Chapter 14 includes a discussion of new payday lending legislation
- Chapter 17 includes more on new regulations for money market mutual funds.
- Chapter 21 includes updates of the new international liquidity standards enacted as a result of the financial crisis.



## ACKNOWLEDGMENTS

We take this opportunity to thank all of those individuals who helped us prepare this and previous editions. We want to express our appreciation to those instructors whose insightful comments and suggestions were invaluable to us during this revision.

Keldon Bauer
*Tarleton State University*
Jen-Chi Cheng
*Wichita State University*
Kathy English
*Wilmington University*
Andrew Fodor
*Ohio University–Athens*
Robert Goldberg
*Adelphi University*
Walt Nelson
*Missouri State University*
Abdullah Noman
*Nicholls State University*
Ozde Oztekin
*Florida International University–Miami*
O. John Paskelian
*University of Houston Downtown*
Blaise Roncagli
*Cleveland State University*
Matthew Ross
*Western Michigan University–Kalamazoo*
Benjamin Thompson
*Lincoln Memorial University*
Ann Marie Whyte
*University of Central Florida–Orlando*
David Zalewski
*Providence College*

We would like to thank the staff at McGraw-Hill for their help and guidance, especially Chuck Synovec, executive brand manager; Noelle Bathurst, senior product developer; Heather Ervolino, content project manager; Tobi Philips, digital product developer; Trina Maurer, senior marketing manager; and Dave O'Donnell, marketing specialist. Additional thanks to Alex Marden for his editorial assistance.

**Anthony Saunders**

**Marcia Millon Cornett**

# WALKTHROUGH

## Chapter Features

The following special features have been integrated throughout the text to encourage student interaction and to aid students in absorbing and retaining the material

### CHAPTER-OPENING OUTLINES

These outlines offer students a snapshot view of what they can expect to learn from each chapter's discussion.

OUTLINE

Major Duties and Responsibilities of the Federal Reserve System: Chapter Overview

Structure of the Federal Reserve System

- Organization of the Federal Reserve System
- Board of Governors of the Federal Reserve System

**Learning Goals**

- **LG 4-1** *Understand the major functions of the Federal Reserve System.*
- **LG 4-2** *Identify the structure of the Federal Reserve System.*
- **LG 4-3** *Identify the monetary policy tools used by the Federal Reserve.*
- **LG 4-4** *Appreciate how monetary policy changes affect key economic variables.*
- **LG 4-5** *Understand how central banks around the world adjusted their monetary policy during the recent financial crisis.*

### LEARNING GOALS

Learning goals (LGs) appear at the beginning of each chapter to provide a quick introduction to the key chapter material. These goals are also integrated with the end-of-chapter questions and problems, which allows instructors to easily emphasize the learning goal(s) as they choose.

**Federal Open Market Committee (FOMC)**

*The major monetary policy-making body of the Federal Reserve System.*

**open market operations**

*Purchases and sales of U.S. government and fed-*

The **Federal Open Ma**
body of the Federal Rese
members of the Federal
Bank of New York, and
basis). The chair of the
required to meet at least
scheduled meetings have

The main responsi
employment, economic
trade. The FOMC seeks
operations. **Open marke**
eral agency securities—i
gets (although the opera
Reserve Bank of New Yo

### BOLD KEY TERMS AND A MARGINAL GLOSSARY

The main terms and concepts are emphasized throughout the chapter by bold key terms called out in the text and defined in the margins

**www.occ.treas.gov**

**www.fdic.gov**

subsidiaries), (2) state-
(state-chartered membe
which U.S. banks condu
latory responsibilities w
including overseeing bo
States and the establishm
ing subsidiaries, and re
board approves member
activities of bank holdi
and administration of re
Truth in Lending Act, t
and Consumer Protecti

### PERTINENT WEB ADDRESSES

Website addresses are referenced in the margins throughout each chapter, providing additional resources to aid in the learning process.

# Pedagogical Features



**DO YOU UNDERSTAND:**

1. *What the main functions of Federal Reserve Banks are?*
2. *What the main responsibilities of the Federal Reserve Board are?*
3. *How the FOMC implements monetary policy?*
4. *What the main assets and*

as the Fed took
and housing ma
rities (MBS) ba
MBS purchase
of agency MBS
through 2016. T
the financial ma

**Gold and Fore**
holds Treasury

### "DO YOU UNDERSTAND" BOXES

These boxes allow students to test themselves on the main concepts presented within each major chapter section. Solutions are provided in Connect.

### "IN THE NEWS" BOXES

These boxes demonstrate the application of chapter material to real current events.

**IN THE NEWS**

**The Financial Crisis: Toward an Expla**

In the first half of 2007, as the extent of declining home prices became apparent, banks and other financial
to reas-
off the company's balance
month, the board also ann
the creation of the Term S
Lending Facility (TSLF), sw

### IN-CHAPTER EXAMPLES

These examples provide numerical demonstrations of the analytical material described in many chapters.

**EXAMPLE 4–1** Purchases of Securities by the Federal R

Suppose the FOMC instructs the FRBNY Trading Desk to purchase $5
sury securities. Traders at the FRBNY call primary government securiti
commercial and investment banks (such as Goldman Sachs and Morg
provide a list of securities they have available for sale, including the de
seek to purchase th
ible price) until th
ernment bond dep

**AFTER THE CRISIS**

**Goldman Reaches $5 Billion Settlement ov**

In January 2016, Goldman Sachs agreed to pay more than $5 billion, the largest regulatory penalty in its history. In settling with the Justice Department and a collection of other state and
residential mortgages, and wh
banks deceived investors by
senting the quality of underlyi
The government's inquiry into
related to mortgage-backed s

### "AFTER THE CRISIS" BOXES

These boxes use articles pertaining to events caused or affected by the 2008–2009 financial crisis to elaborate on chapter material.

### INTERNATIONAL COVERAGE

An international icon appears in the margin to easily communicate where international material is being introduced.

**INTERNATIONAL MONETARY POLICIES AND STRATE**

Central banks guide the monetary polic
European Central Bank (ECB) is the centr
of England is the central bank of the Unite
independent central banks whose decision
In contrast, the People's Bank of China, t
of Brazil are less independent in that the g
the operations of these central banks. Inde
the bank is free from pressure from poli

# WALKTHROUGH

## End-of-Chapter Features

### EXCEL PROBLEMS

Excel problems are featured in selected chapters and are denoted by an icon. Spreadsheet templates are available in Connect.

**7.** eXcel **Using a Spreadsheet to Calculate Mortgage Payments:** What is the monthly payment on a $150,000, 30-year mortgage if the mortgage rate is 5.75 percent? 6.25 percent? 7.5 percent? 9 percent? (*LG 7-4*)

| Present Value | Periods | Interest Rate | ⇒ | The Payment Will Be |
|---|---|---|---|---|
| $150,000 | 30 × 12 | 5.75%/12 | | $ 875.36 |
| 150,000 | 30 × 12 | 6.25%/12 | | 923.58 |
| 150,000 | 30 × 12 | 7.50%/12 | | 1,048.82 |
| 150,000 | 30 × 12 | 9.00%/12 | | 1,206.93 |

### QUESTIONS

1. Describe the functions performed by Federal Reserve Banks. (*LG 4-1*)
2. Define the discount rate and the discount window. (*LG 4-2*)
3. Describe the structure of the Board of Governors of the Federal Reserve System. (*LG 4-2*)
4. What are the primary responsibilities of the Federal Reserve Board? (*LG 4-1*)
5. What are the primary responsibilities of the Federal Open Market Committee? (*LG 4-2*)
6. What are the major liabilities of the Federal Reserve System? Describe each. (*LG 4-2*)
7. Why did reserve deposits increase to the point that this account represented the largest liability account on the Federal Reserve's balance sheet in the late 2000s? (*LG 4-2*)
8. What are the major assets of the Federal Reserve System? Describe each. (*LG 4-2*)
9. Why did U.S. government agency securities go from nothing to being the largest asset account on the Federal Reserve's balance sheet in the late 2000s? (*LG 4-2*)

### PROBLEMS

1. Suppose the Federal Reserve instructs the Trading Desk to purchase $1 billion of securities. Show the result of this transaction on the balance sheets of the Federal Reserve System and commercial banks. (*LG 4-3*)

### END-OF-CHAPTER QUESTIONS AND PROBLEMS

The questions and problems in the end-of-chapter material appear in separate sections, allowing instructors to choose whether they prefer students to engage in quantitative or qualitative analysis of the material. Selected problems are assignable online in Connect.

### SEARCH THE SITE

Featured among the end-of-chapter material in most chapters, these Internet exercises weave the web, real data, and practical applications with concepts found in the book.

**SEARCH THE SITE**

Go to the Federal Reserve Board website and find the latest information available on t
the three-month T-bill rate using the following steps. Go to **www.federalreserve.gov**.
click on "Selected Interest Rates." Click on the most recent date. The data will be in th

**Questions**

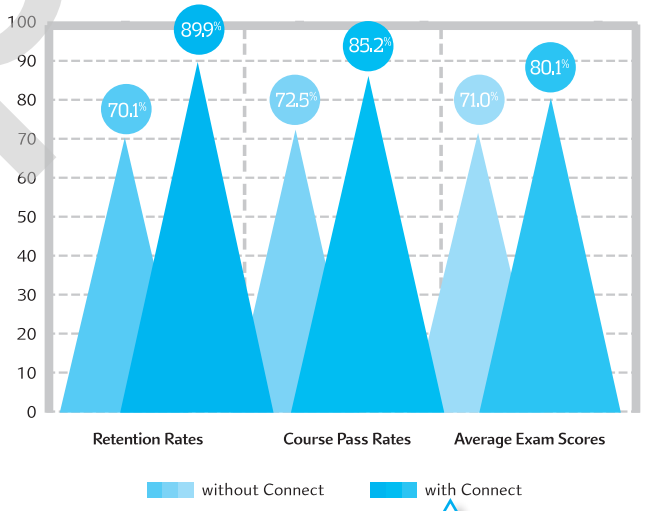
1. What are the current levels for each of these interest rates?
2. Calculate the percentage change in each of these rates since June 2016.

McGraw-Hill Connect® is a highly reliable, easy-to-use homework and learning management solution that utilizes learning science and award-winning adaptive tools to improve student results.

## Homework and Adaptive Learning

- Connect's assignments help students contextualize what they've learned through application, so they can better understand the material and think critically.
- Connect will create a personalized study path customized to individual student needs through SmartBook®.
- SmartBook helps students study more efficiently by delivering an interactive reading experience through adaptive highlighting and review.

### Connect's Impact on Retention Rates, Pass Rates, and Average Exam Scores




Using **Connect** improves retention rates by **19.8%**, passing rates by **12.7%, and** exam scores by **9.1%.**

Over **7 billion questions** have been answered, making McGraw-Hill Education products more intelligent, reliable, and precise.

73% of instructors who use **Connect** require it; instructor satisfaction **increases** by 28% when **Connect** is required.

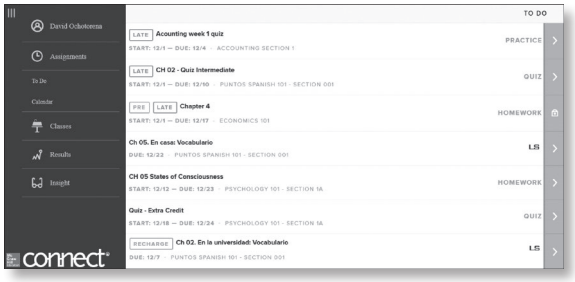
## Quality Content and Learning Resources

- Connect content is authored by the world's best subject matter experts, and is available to your class through a simple and intuitive interface.
- The Connect eBook makes it easy for students to access their reading material on smartphones and tablets. They can study on the go and don't need internet access to use the eBook as a reference, with full functionality.
- Multimedia content such as videos, simulations, and games drive student engagement and critical thinking skills.

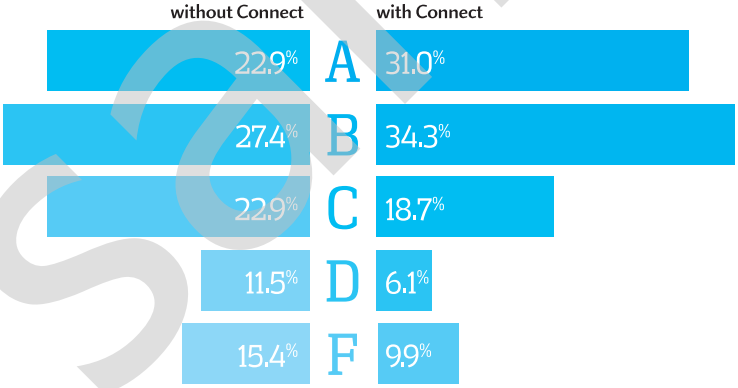
# Robust Analytics and Reporting

©Hero Images/Getty Images

- Connect Insight® generates easy-to-read reports on individual students, the class as a whole, and on specific assignments.
- The Connect Insight dashboard delivers data on performance, study behavior, and effort. Instructors can quickly identify students who struggle and focus on material that the class has yet to master.
- Connect automatically grades assignments and quizzes, providing easy-to-read reports on individual and class performance.




### Impact on Final Course Grade Distribution




More students earn **As** and **Bs** when they use **Connect**.

# Trusted Service and Support

- Connect integrates with your LMS to provide single sign-on and automatic syncing of grades. Integration with Blackboard®, D2L®, and Canvas also provides automatic syncing of the course calendar and assignment-level linking.
- Connect offers comprehensive service, support, and training throughout every phase of your implementation.
- If you're looking for some guidance on how to use Connect, or want to learn tips and tricks from super users, you can find tutorials as you work. Our Digital Faculty Consultants and Student Ambassadors offer insight into how to achieve the results you want with Connect.

# FOR THE INSTRUCTOR

Instructors will have access to teaching support such as electronic files of the ancillary materials, described below, available within Connect.

- **Instructor's Manual** Prepared by Tim Manuel, University of Montana, the Instructor's Manual includes detailed chapter contents and outline, additional examples for use in the classroom, and extensive teaching notes.
- **Test Bank** Prepared by Ohaness Paskelian, University of Houston–Downtown, the Test Bank includes nearly 1,000 additional problems to be used for test material.
- **Solutions Manual** Prepared by coauthor Marcia Millon Cornett, this manual provides worked-out solutions to the end-of-chapter questions. Author involvement ensures consistency between the approaches presented in the text and those in the manual.
- **PowerPoint** Developed by Courtney Baggett, Troy Univerity, the PowerPoint presentation includes full-color slides featuring lecture notes, figures, and tables. The slides can be easily downloaded and edited to better fit your lecture.

## Student Resources

The Students Resources page in Connect is the place for students to access additional resources. The Student Study Center offers quick access to the web appendixes, Excel files and templates, eBooks, and more.

## Student progress tracking

*Connect Finance* keeps instructors informed about how each student, section, and class is performing, allowing for more productive use of lecture and office hours. The progress-tracking function enables you to:

- View scored work immediately and track individual or group performance with assignment and grade reports.
- Access an instant view of student or class performance relative to learning objectives.
- Collect data and generate reports required by many accreditation organizations, such as AACSB and AICPA.

# MCGRAW-HILL CUSTOMER CARE CONTACT INFORMATION

At McGraw-Hill, we understand that getting the most from new technology can be challenging. That's why our services don't stop after you purchase our products. You can e-mail our Product Specialists 24 hours a day to get product-training online. Or you can search our knowledge bank of Frequently Asked Questions on our support website. For Customer Support, call 800-331-5094, e-mail hmsupport@mcgraw-hill.com, or visit www.mhhe.com/support. One of our Technical Support Analysts will be able to assist you in a timely fashion.

# CONTENTS IN BRIEF

*Preface* *vii*

**part 1** INTRODUCTION AND OVERVIEW OF FINANCIAL MARKETS 1

1. Introduction 1
2. Determinants of Interest Rates 26
3. Interest Rates and Security Valuation 58
4. The Federal Reserve System, Monetary Policy, and Interest Rates 93

**part 2** SECURITIES MARKETS 132

5. Money Markets 132
6. Bond Markets 169
7. Mortgage Markets 208
8. Stock Markets 240
9. Foreign Exchange Markets 282
10. Derivative Securities Markets 311

**part 3** COMMERCIAL BANKS 353

11. Commercial Banks: Industry Overview 353
12. Commercial Banks' Financial Statements and Analysis 380
13. Regulation of Commercial Banks 413

**part 4** OTHER FINANCIAL INSTITUTIONS 454

14. Other Lending Institutions: Savings Institutions, Credit Unions, and Finance Companies 454
15. Insurance Companies 480
16. Securities Firms and Investment Banks 506
17. Investment Companies 531
18. Pension Funds 564

**part 5** RISK MANAGEMENT IN FINANCIAL INSTITUTIONS 585

19. Types of Risks Incurred by Financial Institutions 585
20. Managing Credit Risk on the Balance Sheet 604
21. Managing Liquidity Risk on the Balance Sheet 632
22. Managing Interest Rate Risk and Insolvency Risk on the Balance Sheet 655
23. Managing Risk off the Balance Sheet with Derivative Securities 683
24. Managing Risk off the Balance Sheet with Loan Sales and Securitization 712

*References* *739*

*Index* *741*

# CONTENTS

*Preface* vii

**part 1 INTRODUCTION AND OVERVIEW OF FINANCIAL MARKETS** 1

**1 Introduction 1**

Why Study Financial Markets and Institutions? Chapter Overview 1

Overview of Financial Markets 3
- *Primary Markets versus Secondary Markets 4*
- *Money Markets versus Capital Markets 6*
- *Foreign Exchange Markets 9*
- *Derivative Security Markets 9*
- *Financial Market Regulation 10*

Overview of Financial Institutions 11
- *Unique Economic Functions Performed by Financial Institutions 12*
- *Additional Benefits FIs Provide to Suppliers of Funds 14*
- *Economic Functions FIs Provide to the Financial System as a Whole 15*
- *Risks Incurred by Financial Institutions 16*
- *Regulation of Financial Institutions 16*
- *Trends in the United States 17*

Globalization of Financial Markets and Institutions 21

Appendix 1A: The Financial Crisis: The Failure of Financial Institutions' Specialness 25

**2 Determinants of Interest Rates 26**

Interest Rate Fundamentals: Chapter Overview 26

Loanable Funds Theory 27
- *Supply of Loanable Funds 28*
- *Demand for Loanable Funds 29*
- *Equilibrium Interest Rate 30*
- *Factors That Cause the Supply and Demand Curves for Loanable Funds to Shift 31*

Movement Of Interest Rates Over Time 35

Determinants of Interest Rates for Individual Securities 36
- *Inflation 36*
- *Real Risk-Free Rates 36*
- *Default or Credit Risk 38*
- *Liquidity Risk 40*
- *Special Provisions or Covenants 40*
- *Term to Maturity 40*

Term Structure of Interest Rates 42
- *Unbiased Expectations Theory 42*
- *Liquidity Premium Theory 44*
- *Market Segmentation Theory 46*

Forecasting Interest Rates 48

Time Value of Money and Interest Rates 49
- *Time Value of Money 49*
- *Lump Sum Valuation 50*
- *Annuity Valuation 52*

**3 Interest Rates and Security Valuation 58**

Interest Rates as a Determinant of Financial Security Values: Chapter Overview 58

Various Interest Rate Measures 59
- *Coupon Rate 59*
- *Required Rate of Return 59*
- *Expected Rate of Return 60*
- *Required versus Expected Rates of Return: The Role of Efficient Markets 61*
- *Realized Rate of Return 62*

Bond Valuation 63
- *Bond Valuation Formula Used to Calculate Fair Present Values 63*
- *Bond Valuation Formula Used to Calculate Yield to Maturity 65*

Equity Valuation 66
- *Zero Growth in Dividends 68*
- *Constant Growth in Dividends 69*
- *Supernormal (or Nonconstant) Growth in Dividends 70*

Impact of Interest Rate Changes on Security Values 71

Impact of Maturity on Security Values 72
- *Maturity and Security Prices 73*
- *Maturity and Security Price Sensitivity to Changes in Interest Rates 73*

Impact of Coupon Rates on Security Values 74
- *Coupon Rate and Security Price 75*
- *Coupon Rate and Security Price Sensitivity to Changes in Interest Rates 75*

Duration 76
- *A Simple Illustration of Duration 76*
- *A General Formula for Duration 78*
- *Features of Duration 82*
- *Economic Meaning of Duration 83*
- *Large Interest Rate Changes and Duration 85*

Appendix 3A: Duration and Immunization 92

Appendix 3B: More on Convexity 92

## 4 The Federal Reserve System, Monetary Policy, and Interest Rates 93

Major Duties and Responsibilities of the Federal Reserve System: Chapter Overview 93

Structure of the Federal Reserve System 94
- *Organization of the Federal Reserve System 94*
- *Board of Governors of the Federal Reserve System 96*
- *Federal Open Market Committee 97*
- *Functions Performed by Federal Reserve Banks 97*
- *Balance Sheet of the Federal Reserve 102*

Monetary Policy Tools 105
- *Open Market Operations 108*
- *The Discount Rate 110*
- *Reserve Requirements (Reserve Ratios) 113*

The Federal Reserve, the Money Supply, and Interest Rates 116
- *Effects of Monetary Tools on Various Economic Variables 117*
- *Money Supply versus Interest Rate Targeting 118*

International Monetary Policies and Strategies 123
- *Systemwide Rescue Programs Employed during the Financial Crisis 123*
- *Challenges Remain after the Crisis 128*

# part 2 SECURITIES MARKETS 132

## 5 Money Markets 132

Definition of Money Markets: Chapter Overview 132

Money Markets 133

Yields on Money Market Securities 133
- *Bond Equivalent Yields 134*
- *Effective Annual Return 134*
- *Discount Yields 134*
- *Single-Payment Yields 135*

Money Market Securities 136
- *Treasury Bills 138*
- *Federal Funds 144*
- *Repurchase Agreements 145*
- *Commercial Paper 148*
- *Negotiable Certificates of Deposit 153*
- *Banker's Acceptances 154*
- *Comparison of Money Market Securities 155*

Money Market Participants 155
- *The U.S. Treasury 156*
- *The Federal Reserve 156*
- *Commercial Banks 156*
- *Money Market Mutual Funds 157*
- *Brokers and Dealers 157*
- *Corporations 158*
- *Other Financial Institutions 158*
- *Individuals 158*

International Aspects of Money Markets 158
- *Euro Money Markets 160*

Appendix 5A: Single versus Discriminating Price Treasury Auctions 168

Appendix 5B: Creation of a Banker's Acceptance 168

## 6 Bond Markets 169

Definition of Bond Markets: Chapter Overview 169

Bond Market Securities 170
- *Treasury Notes and Bonds 170*
- *Municipal Bonds 181*
- *Corporate Bonds 187*
- *Bond Ratings and Interest Rate Spreads 193*
- *Bond Market Indexes 196*

Bond Market Participants 197

Comparison of Bond Market Securities 198

International Aspects of Bond Markets 198
- *Eurobonds, Foreign Bonds, and Sovereign Bonds 201*

## 7 Mortgage Markets 208

Mortgages and Mortgage-Backed Securities: Chapter Overview 208

Primary Mortgage Market 210
- *Mortgage Characteristics 211*
- *Mortgage Amortization 216*
- *Other Types of Mortgages 221*

Secondary Mortgage Markets 223
- *History and Background of Secondary Mortgage Markets 224*
- *Mortgage Sales 225*
- *Mortgage-Backed Securities 225*

Participants in the Mortgage Markets 233

International Trends in Securitization 234

Appendix 7A: Amortization Schedules for 30-Year Mortgage in Example 7–2 and No-Points versus Points Mortgages in Example 7–4 239

## 8 Stock Markets 240

The Stock Markets: Chapter Overview 240

Stock Market Securities 242
- *Common Stock 242*
- *Preferred Stock 245*

Primary and Secondary Stock Markets 247
- *Primary Stock Markets 247*
- *Secondary Stock Markets 252*
- *Stock Market Indexes 262*

Stock Market Participants 266

Other Issues Pertaining to Stock Markets 268
*Economic Indicators 268*
*Market Efficiency 269*
*Stock Market Regulations 272*

International Aspects of Stock Markets 274

Appendix 8A: The Capital Asset Pricing Model 281

Appendix 8B: Event Study Tests 281

## 9 Foreign Exchange Markets 282

Foreign Exchange Markets and Risk: Chapter Overview 282

Background and History of Foreign Exchange Markets 283

Foreign Exchange Rates and Transactions 288
*Foreign Exchange Rates 288*
*Foreign Exchange Transactions 288*
*Return and Risk of Foreign Exchange Transactions 293*
*Role of Financial Institutions in Foreign Exchange Transactions 299*

Interaction of Interest Rates, Inflation, and Exchange Rates 302
*Purchasing Power Parity 303*
*Interest Rate Parity 305*

Appendix 9A: Balance of Payment Accounts 310

## 10 Derivative Securities Markets 311

Derivative Securities: Chapter Overview 311

Forwards and Futures 313
*Spot Markets 313*
*Forward Markets 314*
*Futures Markets 316*

Options 323
*Call Options 323*
*Put Options 325*
*Option Values 327*
*Option Markets 329*

Regulation of Futures and Options Markets 335

Swaps 336
*Interest Rate Swaps 337*
*Currency Swaps 341*
*Credit Swaps 342*
*Swap Markets 343*

Caps, Floors, and Collars 345

International Aspects of Derivative Securities Markets 347

Appendix 10A: Black–Scholes Option Pricing Model 352

# part 3 COMMERCIAL BANKS 353

## 11 Commercial Banks: Industry Overview 353

Commercial Banks as a Sector of the Financial Institutions Industry: Chapter Overview 353

Definition of a Commercial Bank 355

Balance Sheets and Recent Trends 355
*Assets 355*
*Liabilities 358*
*Equity 359*
*Off-Balance-Sheet Activities 359*
*Other Fee-Generating Activities 363*

Size, Structure, and Composition of the Industry 364
*Bank Size and Concentration 365*
*Bank Size and Activities 367*

Industry Performance 368

Regulators 371
*Federal Deposit Insurance Corporation 371*
*Office of the Comptroller of the Currency 372*
*Federal Reserve System 373*
*State Authorities 373*

Global Issues 373
*Advantages and Disadvantages of International Expansion 373*
*Global Banking Performance 375*

## 12 Commercial Banks' Financial Statements and Analysis 380

Why Evaluate the Performance of Commercial Banks? Chapter Overview 380

Financial Statements of Commercial Banks 382
*Balance Sheet Structure 383*
*Off-Balance-Sheet Assets and Liabilities 389*
*Other Fee-Generating Activities 392*
*Income Statement 393*
*Direct Relationship between the Income Statement and the Balance Sheet 397*

Financial Statement Analysis Using a Return on Equity Framework 398
*Return on Equity and Its Components 399*
*Return on Assets and Its Components 401*
*Other Ratios 406*

Impact of Market Niche and Bank Size on Financial Statement Analysis 407
*Impact of a Bank's Market Niche 407*
*Impact of Size on Financial Statement Analysis 407*

## 13 Regulation of Commercial Banks 413

Specialness and Regulation: Chapter Overview 413

Types of Regulations and the Regulators 414
- *Safety and Soundness Regulation 414*
- *Monetary Policy Regulation 417*
- *Credit Allocation Regulation 417*
- *Consumer Protection Regulation 417*
- *Investor Protection Regulation 418*
- *Entry and Chartering Regulation 418*
- *Regulators 419*

Regulation of Product and Geographic Expansion 419
- *Product Segmentation in the U.S. Commercial Banking Industry 419*
- *Geographic Expansion in the U.S. Commercial Banking Industry 426*

Bank and Savings Institution Guarantee Funds 427
- *The Federal Deposit Insurance Corporation (FDIC) 428*
- *The Demise of the Federal Savings and Loan Insurance Corporation (FSLIC) 429*
- *Reform of Deposit Insurance 430*
- *Non–U.S. Deposit Insurance Systems 431*

Balance Sheet Regulations 431
- *Regulations on Commercial Bank Liquidity 431*
- *Regulations on Capital Adequacy (Leverage) 432*

Foreign versus Domestic Regulation of Commercial Banks 437
- *Product Diversification Activities 437*
- *Global or International Expansion Activities 438*

Appendix 13A: Calculating Deposit Insurance Premium Assessments 445

Appendix 13B: Calculating Minimum Required Reserves at U.s. Depository Institutions 450

Appendix 13C: Primary Regulators of Depository Institutions 453

Appendix 13D: Deposit Insurance Coverage for Commercial Banks in Various Countries 453

Appendix 13E: Calculating Risk-Based Capital Ratios 453

# part 4 OTHER FINANCIAL INSTITUTIONS 454

## 14 Other Lending Institutions 454

Other Lending Institutions: Chapter Overview 454

Savings Institutions 455
- *Size, Structure, and Composition of the Industry 455*
- *Balance Sheets and Recent Trends 457*
- *Regulators 459*
- *Savings Institution Recent Performance 460*

Credit Unions 461
- *Size, Structure, and Composition of the Industry 462*
- *Balance Sheets and Recent Trends 464*
- *Regulators 466*
- *Industry Performance 466*

Finance Companies 468
- *Size, Structure, and Composition of the Industry 468*
- *Balance Sheets and Recent Trends 469*
- *Industry Performance 474*
- *Regulation 475*

Global Issues 476

## 15 Insurance Companies 480

Two Categories of Insurance Companies: Chapter Overview 480

Life Insurance Companies 481
- *Size, Structure, and Composition of the Industry 481*
- *Balance Sheets and Recent Trends 486*
- *Regulation 489*

Property–Casualty Insurance Companies 490
- *Size, Structure, and Composition of the Industry 490*
- *Balance Sheets and Recent Trends 492*
- *Regulation 500*

Global Issues 501

## 16 Securities Firms and Investment Banks 506

Services Offered by Securities Firms versus Investment Banks: Chapter Overview 506

Size, Structure, and Composition of the Industry 508

Securities Firm and Investment Bank Activity Areas 510
- *Investment Banking 510*
- *Venture Capital 512*
- *Market Making 514*
- *Trading 514*
- *Investing 515*
- *Cash Management 516*
- *Mergers and Acquisitions 516*
- *Other Service Functions 516*

Recent Trends and Balance Sheets 517
- *Recent Trends 517*
- *Balance Sheets 520*

Regulation 522

Global Issues 525

## 17 Investment Companies 531

Investment Companies: Chapter Overview 531

Size, Structure, and Composition of the Mutual Fund Industry 532
- *Historical Trends 532*
- *Different Types of Mutual Funds 533*
- *Other Types of Investment Company Funds 538*

Mutual Fund Returns and Costs 539
- *Mutual Fund Prospectuses and Objectives 539*
- *Investor Returns from Mutual Fund Ownership 542*
- *Mutual Fund Costs 544*

Mutual Fund Balance Sheets and Recent Trends 547
- *Long-Term Funds 547*
- *Money Market Funds 548*

Mutual Fund Regulation 549

Mutual Fund Global Issues 552

Hedge Funds 552
- *Types of Hedge Funds 555*
- *Fees on Hedge Funds 558*
- *Offshore Hedge Funds 559*
- *Regulation of Hedge Funds 560*

## 18 Pension Funds 564

Pension Funds Defined: Chapter Overview 564

Size, Structure, and Composition of the Industry 565
- *Defined Benefit versus Defined Contribution Pension Funds 565*
- *Insured versus Noninsured Pension Funds 567*
- *Private Pension Funds 568*
- *Public Pension Funds 575*

Financial Asset Investments and Recent Trends 576
- *Private Pension Funds 576*
- *Public Pension Funds 577*

Regulation 579

Global Issues 581

Appendix 18A: Calculation of Growth in IRA Value during an Individual's Working Years 584

# part 5 RISK MANAGEMENT IN FINANCIAL INSTITUTIONS 585

## 19 Types of Risks Incurred by Financial Institutions 585

Why Financial Institutions Need to Manage Risk: Chapter Overview 585

Credit Risk 586

Liquidity Risk 589

Interest Rate Risk 590

Market Risk 592

Off-Balance-Sheet Risk 594

Foreign Exchange Risk 596

Country or Sovereign Risk 598

Technology and Operational Risk 598

Insolvency Risk 600

Other Risks and Interaction among Risks 600

## 20 Managing Credit Risk on the Balance Sheet 604

Credit Risk Management: Chapter Overview 604

Credit Quality Problems 606

Credit Analysis 607
- *Real Estate Lending 608*
- *Consumer (Individual) and Small-Business Lending 611*
- *Mid-Market Commercial and Industrial Lending 612*
- *Large Commercial and Industrial Lending 620*

Calculating the Return on a Loan 624
- *Return on Assets (ROA) 624*
- *RAROC Models 626*

Appendix 20A: Loan Portfolio Risk and Management 631

## 21 Managing Liquidity Risk on the Balance Sheet 632

Liquidity Risk Management: Chapter Overview 632

Causes of Liquidity Risk 633

Liquidity Risk and Depository Institutions 634
- *Liability-Side Liquidity Risk 634*
- *Asset-Side Liquidity Risk 637*
- *Measuring a DI's Liquidity Exposure 638*
- *Liquidity Risk, Unexpected Deposit Drains, and Bank Runs 643*
- *Bank Runs, the Discount Window, and Deposit Insurance 644*

Liquidity Risk and Insurance Companies 647
- *Life Insurance Companies 647*
- *Property–Casualty Insurance Companies 648*
- *Guarantee Programs for Life and Property–Casualty Insurance Companies 649*

Liquidity Risk and Investment Funds 649

Appendix 21A: Sources and Uses of Funds Statement: J.P. Morgan Chase, September 2016 654

Appendix 21B: New Liquidity Risk Measures Implemented by the Bank for International Settlements 654

## 22 Managing Interest Rate Risk and Insolvency Risk on the Balance Sheet 655

Interest Rate and Insolvency Risk Management: Chapter Overview 655

Interest Rate Risk Measurement and Management 656
*Repricing Gap Model 656*
*Duration Gap Model 665*

Insolvency Risk Management 673
*Capital and Insolvency Risk 673*

## 23 Managing Risk off the Balance Sheet with Derivative Securities 683

Derivative Securities used to Manage Risk: Chapter Overview 683

Forward and Futures Contracts 684
*Hedging with Forward Contracts 685*
*Hedging with Futures Contracts 686*

Options 689
*Basic Features of Options 689*
*Actual Interest Rate Options 692*
*Hedging with Options 692*
*Caps, Floors, and Collars 693*

Risks Associated with Futures, Forwards, and Options 694

Swaps 695
*Hedging with Interest Rate Swaps 695*
*Hedging with Currency Swaps 698*
*Credit Swaps 699*
*Credit Risk Concerns with Swaps 702*

Comparison of Hedging Methods 703
*Writing versus Buying Options 703*
*Futures versus Options Hedging 705*
*Swaps versus Forwards, Futures, and Options 706*

Appendix 23A: Hedging with Futures Contracts 711

Appendix 23B: Hedging with Options 711

Appendix 23C: Hedging with Caps, Floors, and Collars 711

## 24 Managing Risk off the Balance Sheet with Loan Sales and Securitization 712

Why Financial Institutions Sell and Securitize Loans: Chapter Overview 712

Loan Sales 713
*Types of Loan Sales Contracts 715*
*The Loan Sales Market 715*
*Secondary Market for Less Developed Country Debt 718*
*Factors Encouraging Future Loan Sales Growth 719*
*Factors Deterring Future Loan Sales Growth 720*

Loan Securitization 721
*Pass-Through Security 721*
*Collateralized Mortgage Obligation 728*
*Mortgage-Backed Bond 732*

Securitization of Other Assets 734

Can All Assets Be Securitized? 734

*References 739*

*Index 741*

# Introduction

chapter

1

## Learning Goals

- **LG 1-1** *Differentiate between primary and secondary markets.*
- **LG 1-2** *Differentiate between money and capital markets.*
- **LG 1-3** *Understand what foreign exchange markets are.*
- **LG 1-4** *Understand what derivative security markets are.*
- **LG 1-5** *Distinguish between the different types of financial institutions.*
- **LG 1-6** *Know the services financial institutions perform.*
- **LG 1-7** *Know the risks financial institutions face.*
- **LG 1-8** *Appreciate why financial institutions are regulated.*
- **LG 1-9** *Recognize that financial markets are becoming increasingly global.*

OUTLINE

Why Study Financial Markets and Institutions? Chapter Overview
Overview of Financial Markets
- Primary Markets versus Secondary Markets
- Money Markets versus Capital Markets
- Foreign Exchange Markets
- Derivative Security Markets
- Financial Market Regulation

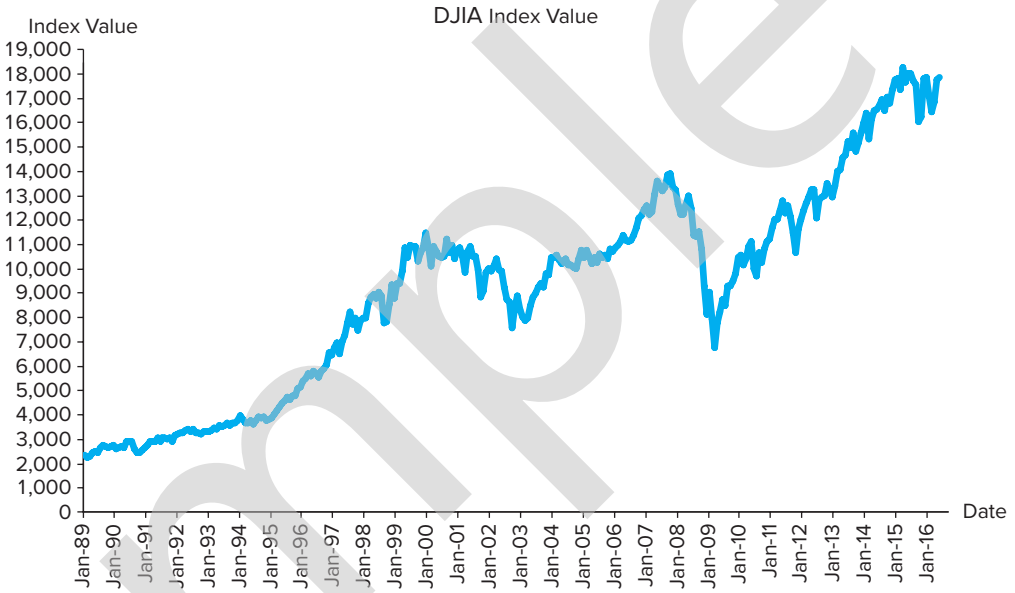
Overview of Financial Institutions
- Unique Economic Functions Performed by Financial Institutions
- Additional Benefits FIs Provide to Suppliers of Funds
- Economic Functions FIs Provide to the Financial System as a Whole
- Risks Incurred by Financial Institutions
- Regulation of Financial Institutions
- Trends in the United States

Globalization of Financial Markets and Institutions
Appendix 1A: The Financial Crisis: The Failure of Financial Institutions' Specialness (available through Connect or your course instructor)

## WHY STUDY FINANCIAL MARKETS AND INSTITUTIONS? CHAPTER OVERVIEW

In the 1990s, financial markets in the United States boomed. As seen in Figure 1–1, the Dow Jones Industrial Index—a widely quoted index of the values of 30 large corporations (see Chapter 8)—rose from a level of 2,800 in January 1990 to more than 11,000 by the end of the decade; this compares to a move from 100 at its inception in 1906 to 2,800 eighty-four years later. In the early 2000s, as a result of an economic downturn in the United States and elsewhere, this index fell back below 10,000. The index rose to over 14,000 in July 2007, but (because of an increasing mortgage market credit crunch, particularly the subprime mortgage market) fell back to below 13,000 within a month of hitting the all-time high. By 2008, problems in the subprime mortgage market escalated to a full-blown financial crisis and the worst recession in the United States since the Great Depression. The Dow Jones Industrial Average (DJIA) fell to 6,547 in March 2009 before recovering, along with the economy, to over 11,000 in April 2010. However, it took until March 5, 2013, for the DJIA to surpass its pre-crisis high of 14,164.53, closing at 14,253.77 for the day, and the DJIA rose to over 21,000 in mid-2017.

**Figure 1–1** **The Dow Jones Industrial Average, 1989–2016**




During the financial crisis of 2008–2009, market swings seen in the United States quickly spread worldwide. Stock markets saw huge swings in value as investors tried to sort out who might survive and who would not (and markets from Russia to Europe were forced to suspend trading as stock prices plunged). As U.S. markets recovered in 2010–2013 and, as mentioned earlier, surpassed their pre-crisis highs, European stock markets struggled as Greece battled with a severe debt crisis that eventually spread to other European nations with fiscal problems, such as Portugal, Spain, and Italy. Even the growth in the robust Chinese economy slowed to 6.7 percent in 2016, the lowest level in seven years.

World markets were rocked again in June 2016 when the people of the United Kingdom voted to leave the European Union (EU) after 43 years (dubbed "Brexit"). The shock from the UK's surprise vote to leave the EU swept across global markets, triggering steep drops in stock markets and the British pound and a flight into safe assets such as U.S. bonds and gold. The pound fell more than 11 percent to its lowest point since 1985. The DJIA dropped 610.32 points, or 3.4 percent. The Stoxx Europe 600 index fell 7 percent, its steepest drop since 2008, while Japan's Nikkei Stock Average declined 7.9 percent. Bonds also sold off sharply, pushing UK government borrowing costs sharply higher, as traders and investors grappled with the market implications of Brexit. The UK had its credit rating outlook cut to "negative" by the ratings agency Moody's.

The UK's vote to leave the European Union shook the region, precipitating an immediate political crisis in Britain and shifting the path of a European project created to bind a continent torn by World War II. Prime Minister David Cameron, who had led the campaign to stay inside the 28-nation bloc, announced he would step down, setting off a leadership contest among Conservatives. Britain's decision, one of the most momentous by a Western country in the past 50 years, reverses the course of expansion for the EU. It had grown over decades to include most of Europe, absorbing former dictatorships in Greece, Spain, and Portugal, and the countries of the east, formerly under Soviet domination. The UK would be the first member nation to leave, a step some leaders warned beforehand would diminish the global influence of the UK and the EU and risk setting in motion the European bloc's eventual disintegration. The vote also raised questions about whether the UK itself would split. After a large majority of Scottish citizens voted to remain a part of the EU, Scotland's First Minister said the Scottish National Party would seek to hold a new referendum on the country's exit from the EU.

Originally the banking industry operated as a full-service industry, performing directly or indirectly all financial services (commercial banking, investment banking, stock investing, insurance provision, etc.). In the early 1930s, the economic and industrial collapse resulted in the separation of some of these activities. In the 1970s and 1980s new, relatively unregulated financial services industries sprang up (e.g., mutual funds, brokerage funds) that separated the financial service functions even further.

The last 30 years, however, have seen a reversal of these trends. In the 1990s and 2000s, regulatory barriers, technology, and financial innovation changes were such that a full set of financial services could again be offered by a single financial services firm under the umbrella of a financial services holding company. For example, J.P. Morgan Chase & Co. operates a commercial bank (J.P. Morgan Chase Bank), an investment bank (J. P. Morgan Securities, which also sells mutual funds), and an insurance company (J. P. Morgan Insurance Agency). Not only did the boundaries between traditional industry sectors change, but competition became global in nature as well. For example, J.P. Morgan Chase is the world's seventh-largest bank holding company, operating in 60 countries.

The financial crisis produced another reshaping of all financial institution (FI) sectors and the end of many major FIs (e.g., Bear Stearns and Lehman Brothers), with the two most prominent investment banks in the world, Goldman Sachs and Morgan Stanley, converting to bank holding company status. Indeed, as of 2010, all the major U.S. investment banks had either failed, been acquired by a commercial bank, or become bank holding companies. Further, legislation enacted as a result of the financial crisis represents an attempt to again separate FI activities. For example, the "Volcker Rule" provision of the Wall Street Reform and Consumer Protection Act prohibits bank holding companies from engaging in proprietary trading and limits their investments in hedge funds, private equity, and related vehicles. Despite these most recent changes, many FIs operate in more than one FI sector.

As economic and competitive environments change, attention to profit and, more than ever, risk becomes increasingly important. This book provides a detailed overview and analysis of the financial system in which financial managers and individual investors operate. Making investment and financing decisions requires managers and individuals to understand the flow of funds throughout the economy as well as the operation and structure of domestic and international financial markets. In particular, this book offers a unique analysis of the risks faced by investors and savers, as well as strategies that can be adopted for controlling and managing these risks. Newer areas of operations such as asset securitization, derivative securities, and internationalization of financial services also receive special emphasis. Further, as the United States and the world continue to recover from the collapse of the financial markets, this book highlights and discusses the impact of this crisis on the various financial markets and the financial institutions that operate in them.

This introductory chapter provides an overview of the structure and operations of various financial markets and financial institutions. Financial markets are differentiated by the characteristics (such as maturity) of the financial instruments or securities that are exchanged. Moreover, each financial market, in turn, depends in part or in whole on financial institutions. Indeed, FIs play a special role in the functioning of financial markets. In particular, FIs often provide the least costly and most efficient way to channel funds to and from financial markets. As part of this discussion, we briefly examine how changes in the way FIs deliver services played a major part in the events leading up to the severe financial crisis of the late 2000s. A more detailed discussion of the causes of, the major events during, and the regulatory and industry changes resulting from the financial crisis is provided in Appendix 1A to the chapter (available through Connect or your course instructor).

## OVERVIEW OF FINANCIAL MARKETS

### financial markets

*The arenas through which funds flow.*

**Financial markets** are structures through which funds flow. Table 1–1 summarizes the financial markets discussed in this section. Financial markets can be distinguished along two major dimensions: (1) primary versus secondary markets and (2) money versus capital markets. The next sections discuss each of these dimensions.

**TABLE 1–1 Types of Financial Markets**

**Primary markets**—markets in which corporations raise funds through new issues of securities.
**Secondary markets**—markets that trade financial instruments once they are issued.
**Money markets**—markets that trade debt securities or instruments with maturities of less than one year.
**Capital markets**—markets that trade debt and equity instruments with maturities of more than one year.
**Foreign exchange markets**—markets in which cash flows from the sale of products or assets denominated in a foreign currency are transacted.
**Derivative markets**—markets in which derivative securities trade.

LG 1-1

## Primary Markets versus Secondary Markets

**primary markets**

*Markets in which corporations raise funds through new issues of securities.*

**Primary Markets.** **Primary markets** are markets in which users of funds (e.g., corporations) raise funds through new issues of financial instruments, such as stocks and bonds. Table 1–2 lists data on primary market sales of securities from 2000 through 2016. Note the impact the financial crisis had on primary market sales by firms. New issues fell to $1,068.0 billion in 2008, during the worst of the crisis, from $2,389.1 billion in 2007, pre-crisis. As of 2015, primary market sales had still not recovered as only $1,843.2 billion new securities were issued for the year.

Fund users have new projects or expanded production needs, but do not have sufficient internally generated funds (such as retained earnings) to support these needs. Thus, the fund users issue securities in the external primary markets to raise additional funds. New issues of financial instruments are sold to the initial suppliers of funds (e.g., households) in exchange for funds (money) that the issuer or user of funds needs.[1] Most primary market transactions in the United States are arranged through financial institutions called investment banks—for example, Morgan Stanley or Bank of America Merrill Lynch—that serve as intermediaries between the issuing corporations (fund users) and investors (fund suppliers). For these public offerings, the investment bank provides the securities issuer (the funds user) with advice on the securities issue (such as the offer price and number of securities to issue) and attracts the initial public purchasers of the securities for the funds user. By issuing primary market securities with the help of an investment bank, the funds user saves the risk and cost of creating a market for its securities on its own (see the following discussion). Figure 1–2 illustrates a time line for the primary market exchange of funds for a new issue of corporate bonds or equity. We discuss this process in detail in Chapters 6 and 8.

**initial public offering (IPO)**

*The first public issue of a financial instrument by a firm.*

Primary market financial instruments include issues of equity by firms initially going public (e.g., allowing their equity—shares—to be publicly traded on stock markets for the first time). These first-time issues are usually referred to as **initial public offerings (IPOs).** For example, on June 16, 2015, Fitbit announced a $732 million IPO of its common stock.

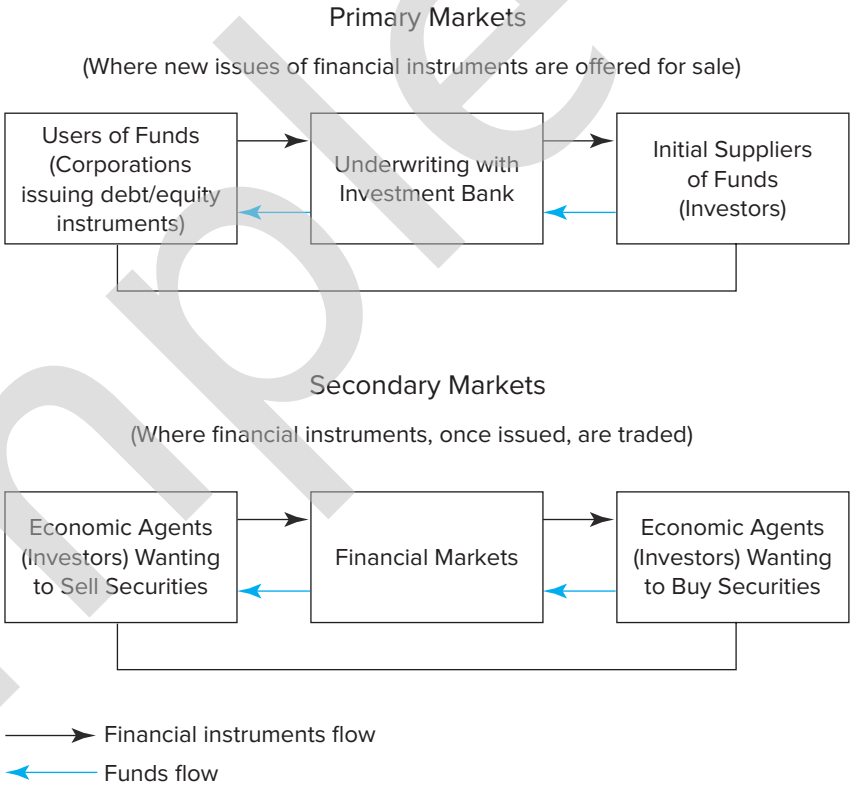
**TABLE 1–2 Primary Market Sales of Securities** *(in billions of dollars)*

| Security Type | 2000 | 2005 | 2007 | 2008 | 2010 | 2012 | 2015 | 2016* |
|---|---|---|---|---|---|---|---|---|
| All issues | $1,256.7 | $2,439.0 | $2,389.1 | $1,068.0 | $1,024.7 | $1,401.0 | $1,843.2 | $318.9 |
| Bonds | 944.8 | 2,323.7 | 2,220.3 | 861.2 | 893.7 | 1,242.5 | 1,611.3 | 285.3 |
| Stocks | 311.9 | 115.3 | 168.8 | 206.8 | 131.0 | 129.5 | 174.0 | 33.2 |
| Private placements | 196.5 | 24.6 | 20.1 | 16.2 | 22.2 | 21.4 | 28.8 | n.a.† |
| IPOs | 97.0 | 36.7 | 46.3 | 26.4 | 37.0 | 40.9 | 29.1 | 0.4 |

*Through first quarter.
†n.a. = not applicable.

1. We discuss the users and suppliers of funds in more detail in Chapter 2.

**Figure 1–2** Primary and Secondary Market Transfer of Funds Time Line




The company's stock was underwritten by several investment banks, including Morgan Stanley, Deutsche Bank, and Bank of America Merrill Lynch. Primary market securities also include the issue of additional equity or debt instruments of an already publicly traded firm. For example, on January 28, 2016, Molson Coors Brewing Company announced the sale of an additional 29.88 million shares of common stock underwritten by investment banks such as UBS, Bank of America Merrill Lynch, and Citigroup.

**secondary market**

*A market that trades financial instruments once they are issued.*

**Secondary Markets.** Once financial instruments such as stocks are issued in primary markets, they are then traded—that is, rebought and resold—in **secondary markets.** For example, on April 12, 2016, 9.7 million shares of ExxonMobil were traded in the secondary stock market. Buyers of secondary market securities are economic agents (consumers, businesses, and governments) with excess funds. Sellers of secondary market financial instruments are economic agents in need of funds. Secondary markets provide a centralized marketplace where economic agents know they can transact quickly and efficiently.

These markets therefore save economic agents the search and other costs of seeking buyers or sellers on their own. Figure 1–2 illustrates a secondary market transfer of funds. When an economic agent buys a financial instrument in a secondary market, funds are exchanged, usually with the help of a securities broker such as Charles Schwab acting as an intermediary between the buyer and the seller of the instrument (see Chapter 8). The original issuer of the instrument (user of funds) is not involved in this transfer. The New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotation (NASDAQ) system are two well-known examples of secondary markets for trading stocks. We discuss the details of each of these markets in Chapter 8.

**derivative security**

*A financial security whose payoffs are linked to other, previously issued securities or indices.*

In addition to stocks and bonds, secondary markets also exist for financial instruments backed by mortgages and other assets (see Chapter 7), foreign exchange (see Chapter 9), and futures and options (i.e., **derivative securities**—financial securities whose payoffs

are linked to other, previously issued [or underlying] primary securities or indexes of primary securities) (see Chapter 10). As we will see in Chapter 10, derivative securities have existed for centuries, but the growth in derivative securities markets occurred mainly in the 1980s through 2000s. As major markets, therefore, derivative securities markets are among the newest of the financial security markets.

Secondary markets offer benefits to both investors (suppliers of funds) and issuing corporations (users of funds). For investors, secondary markets provide the opportunity to trade securities at their market values quickly as well as to purchase securities with varying risk-return characteristics (see Chapter 2). Corporate security issuers are not directly involved in the transfer of funds or instruments in the secondary market. However, the issuer does obtain information about the current market value of its financial instruments, and thus the value of the corporation as perceived by investors such as its stockholders, through tracking the prices at which its financial instruments are being traded on secondary markets. This price information allows issuers to evaluate how well they are using the funds generated from the financial instruments they have already issued and provides information on how well any subsequent offerings of debt or equity might do in terms of raising additional money (and at what cost).

**liquidity**

*The ease with which an asset can be converted into cash quickly and at fair market value.*

Secondary markets offer buyers and sellers **liquidity**—the ability to turn an asset into cash quickly at its fair market value—as well as information about the prices or the value of their investments. Increased liquidity makes it more desirable and easier for the issuing firm to sell a security initially in the primary market. Further, the existence of centralized markets for buying and selling financial instruments allows investors to trade these instruments at low transaction costs.

LG 1-2

## *Money Markets versus Capital Markets*

**money markets**

*Markets that trade debt securities or instruments with maturities of one year or less.*

**Money Markets.** **Money markets** are markets that trade debt securities or instruments with maturities of one year or less (see Figure 1–3). In the money markets, economic agents with short-term excess supplies of funds can lend funds (i.e., buy money market instruments) to economic agents who have short-term needs or shortages of funds (i.e., they sell money market instruments). The short-term nature of these instruments means that fluctuations in their prices in the secondary markets in which they trade are usually quite small (see Chapters 3 and 22 on interest rate risk). In the United States, money markets do not operate in a specific location—rather, transactions occur via telephones, wire transfers, and computer trading. Thus, most U.S. money markets are said to be **over-the-counter (OTC) markets.**

**over-the-counter (OTC) markets**

*Markets that do not operate in a specific fixed location—rather, transactions occur via telephones, wire transfers, and computer trading.*

**Money Market Instruments.** A variety of money market securities are issued by corporations and government units to obtain short-term funds. These securities include Treasury bills, federal funds, repurchase agreements, commercial paper, negotiable certificates of deposit, and banker's acceptances. Table 1–3 lists and defines the major money market securities. Figure 1–4 shows outstanding amounts of money market instruments in the United States in 1990, 2000, 2010, and 2016. Notice that in 2016 federal funds and repurchase agreements, followed by negotiable CDs, Treasury bills, and commercial paper, had the largest amounts outstanding. Money market instruments and the operation of the money markets are described and discussed in detail in Chapter 5.

**Figure 1–3** Money versus Capital Market Maturities

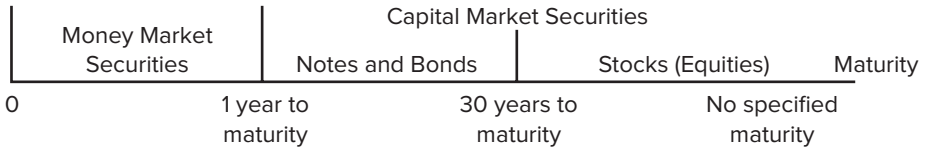
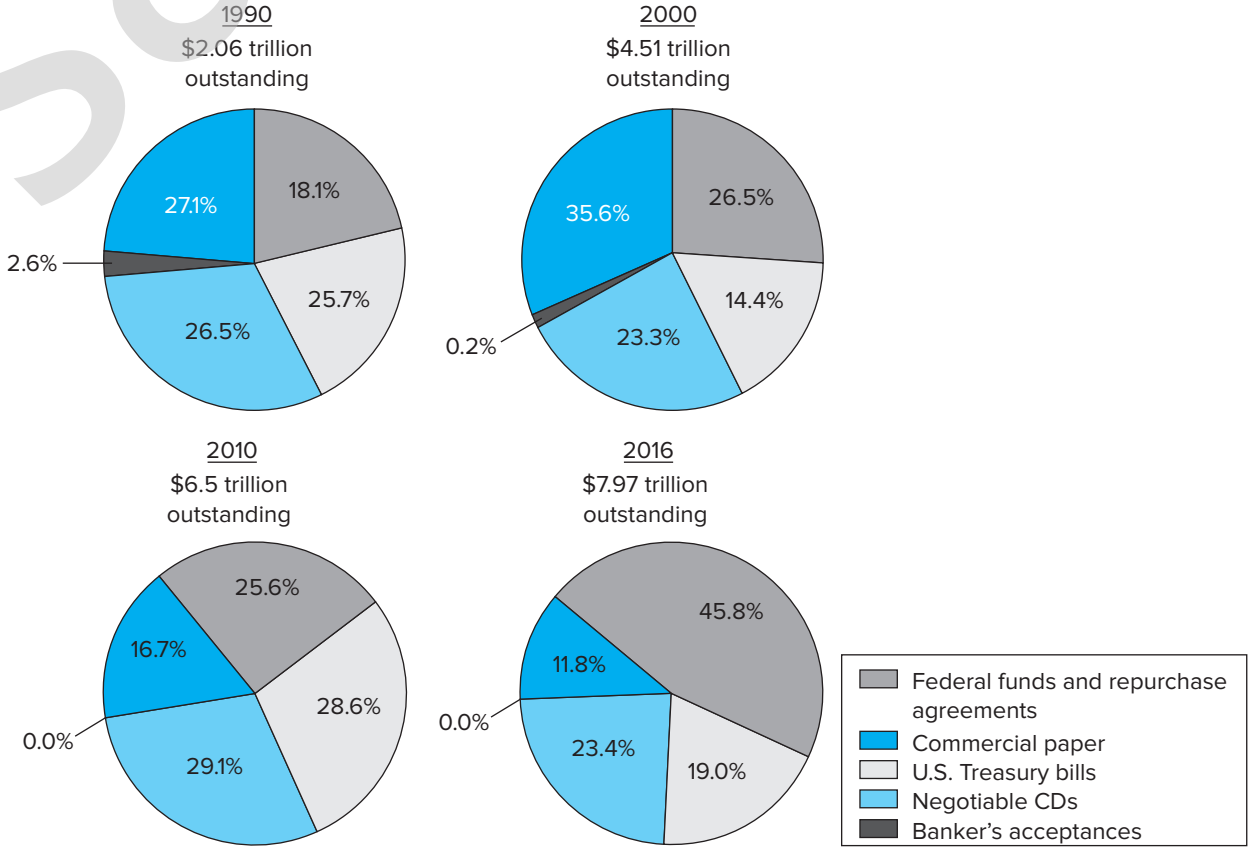


**TABLE 1–3** Money and Capital Market Instruments

| MONEY MARKET INSTRUMENTS |
|---|
| **Treasury bills**—short-term obligations issued by the U.S. government. |
| **Federal funds**—short-term funds transferred between financial institutions usually for no more than one day. |
| **Repurchase agreements**—agreements involving the sale of securities by one party to another with a promise by the seller to repurchase the same securities from the buyer at a specified date and price. |
| **Commercial paper**—short-term unsecured promissory notes issued by a company to raise short-term cash. |
| **Negotiable certificates of deposit**—bank-issued time deposits that specify an interest rate and maturity date and are negotiable (i.e., can be sold by the holder to another party). |
| **Banker's acceptances**—time drafts payable to a seller of goods, with payment guaranteed by a bank. |
| **CAPITAL MARKET INSTRUMENTS** |
| **Corporate stock**—the fundamental ownership claim in a public corporation. |
| **Mortgages**—loans to individuals or businesses to purchase a home, land, or other real property. |
| **Corporate bonds**—long-term bonds issued by corporations. |
| **Treasury bonds**—long-term bonds issued by the U.S. government. |
| **State and local government bonds**—long-term bonds issued by state and local governments. |
| **U.S. government agency bonds**—long-term bonds collateralized by a pool of assets and issued by agencies of the U.S. government. |
| **Bank and consumer loans**—loans to commercial banks and individuals. |

**Figure 1–4** Money Market Instruments Outstanding




**Sources:** Federal Reserve Board, "Financial Accounts of the United States," *Statistical Releases,* Washington, DC, various issues. www.federalreserve.gov

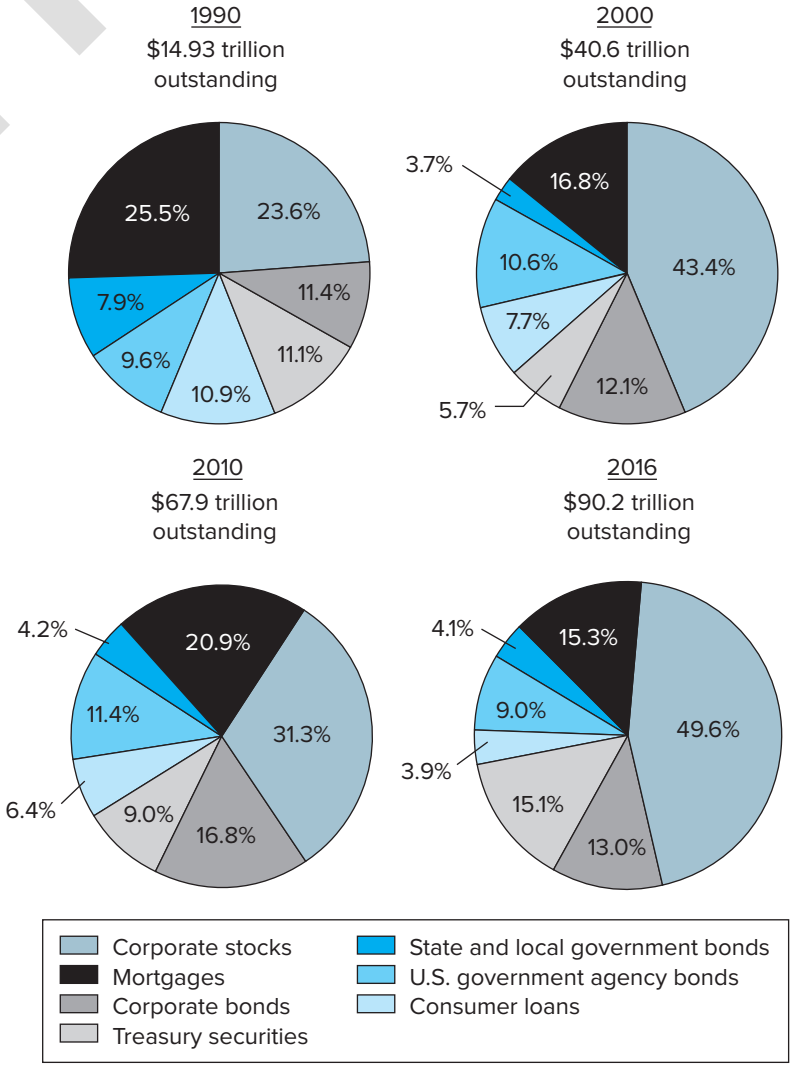
**capital markets**

*Markets that trade debt (bonds) and equity (stocks) instruments with maturities of more than one year.*

**Capital Markets.** **Capital markets** are markets that trade equity (stocks) and debt (bonds) instruments with maturities of more than one year (see Figure 1–3). The major suppliers of capital market securities (or users of funds) are corporations and governments. Households are the major suppliers of funds for these securities. Given their longer maturity, these instruments experience wider price fluctuations in the secondary markets in which they trade than do money market instruments. For example, all else constant, long-term maturity debt instruments experience wider price fluctuations for a given change in interest rates than short-term maturity debt instruments (see Chapter 3).

**Capital Market Instruments.** Table 1–3 lists and defines the major capital market securities. Figure 1–5 shows their outstanding amounts by dollar market value. Notice that in 2000, 2010, and 2016, corporate stocks or equities represent the largest capital market instrument, followed by mortgages and corporate bonds. The relative size of the market value of capital market instruments outstanding depends on two factors: the number of

**Figure 1–5** Capital Market Instruments Outstanding




**Sources:** Federal Reserve Board, "Financial Accounts of the United States," *Statistical Releases*, Washington, DC, various issues. www.federalreserve.gov

securities issued and their market prices.[2] One reason for the sharp increase in the value of equities outstanding is the bull market in stock prices in the 1990s. Stock values fell in the early 2000s as the U.S. economy experienced a downturn—partly because of 9/11 and partly because interest rates began to rise—and stock prices fell. Stock prices in most sectors subsequently recovered and, by 2007, even surpassed their 1999 levels. Stock prices fell precipitously during the financial crisis of 2008–2009. As of mid-March 2009, the Dow Jones Industrial Average (DJIA) had fallen 53.8 percent in value in less than 1½ years, larger than the decline during the market crash of 1929 when it fell 49 percent. However, stock prices recovered, along with the economy, in the last half of 2009, rising 71.1 percent between March 2009 and April 2010. Capital market instruments and their operations are discussed in detail in Chapters 6, 7, and 8.

LG 1-3

## *Foreign Exchange Markets*

In addition to understanding the operations of domestic financial markets, a financial manager must also understand the operations of foreign exchange markets and foreign capital markets. Today's U.S.-based companies operate globally. It is therefore essential that financial managers understand how events and movements in financial markets in other countries affect the profitability and performance of their own companies. For example, in 2015 a strengthening dollar reduced profits for internationally active firms. IBM experienced a drop in its 2015 earnings per share of $1.10 due to foreign exchange trends. Coca-Cola, which gets the majority of its sales from outside the United States, saw 2015 revenues decrease by 5.1 percent as the U.S. dollar strengthened relative to foreign currencies.

**DO YOU UNDERSTAND:**

1. *The difference between primary and secondary markets?*
2. *The major distinction between money markets and capital markets?*
3. *What the major instruments traded in the capital markets are?*
4. *What happens to the dollar value of a U.S. investor's holding of British pounds if the pound appreciates (rises) in value against the dollar?*
5. *What derivative security markets are?*

Cash flows from the sale of securities (or other assets) denominated in a foreign currency expose U.S. corporations and investors to risk regarding the value at which foreign currency cash flows can be converted into U.S. dollars. For example, the actual amount of U.S. dollars received on a foreign investment depends on the exchange rate between the U.S. dollar and the foreign currency when the nondollar cash flow is converted into U.S. dollars. If a foreign currency depreciates (declines in value) relative to the U.S. dollar over the investment period (i.e., the period between the time a foreign investment is made and the time it is terminated), the dollar value of cash flows received will fall. If the foreign currency appreciates, or rises in value, relative to the U.S. dollar, the dollar value of cash flows received on the foreign investment will increase.

While foreign currency exchange rates are often flexible—they vary day to day with demand for and supply of a foreign currency for dollars—central governments sometimes intervene in foreign exchange markets directly or affect foreign exchange rates indirectly by altering interest rates. We discuss the motivation and effects of these interventions in Chapters 4 and 9. The sensitivity of the value of cash flows on foreign investments to changes in the foreign currency's price in terms of dollars is referred to as *foreign exchange risk* and is discussed in more detail in Chapter 9. Techniques for managing, or "hedging," foreign exchange risk, such as using derivative securities like foreign exchange (FX) futures, options, and swaps, are discussed in Chapter 23.

LG 1-4

## *Derivative Security Markets*

**derivative security markets**

*The markets in which derivative securities trade.*

**Derivative security markets** are markets in which derivative securities trade. A **derivative security** is a financial security (such as a futures contract, option contract, swap contract, or mortgage-backed security) whose payoff is linked to another, previously issued security such as a security traded in capital or foreign exchange markets. Derivative securities generally involve an agreement between two parties to exchange a standard quantity of an asset or cash flow at a predetermined price and at a specified date in the future. As the

2. For example, the market value of equity is the product of the price of the equity times the number of shares that are issued.

**derivative security**

*An agreement between two parties to exchange a standard quantity of an asset at a predetermined price at a specified date in the future.*

value of the underlying security to be exchanged changes, the value of the derivative security changes. While derivative securities have been in existence for centuries, the growth in derivative security markets occurred mainly in the 1990s and 2000s. Table 1–4 shows the dollar (or notional) value of derivatives held by commercial banks from 1992 through 2016. Note the tremendous growth in these securities between 1992 and 2013, and the large drop from 2013 to 2016. As we discuss in Chapter 10, part of the Wall Street Reform and Consumer Protection Act, passed in 2010 in response to the financial crisis, is the Volcker Rule which prohibits U.S. depository institutions (DIs) from engaging in proprietary trading (i.e., trading as a principal for the trading account of the bank). This includes any transaction to purchase or sell derivatives. Thus, only the investment banking arm of the business is allowed to conduct such trading. The Volcker Rule was implemented in April 2014 and banks had until July 21, 2015, to be in compliance. The result has been a reduction in derivative securities held off-balance-sheet by these financial institutions.

As major markets, derivative security markets are the newest of the financial security markets. Derivative securities, however, are also potentially the riskiest of the financial securities. Indeed, at the center of the recent financial crisis were losses associated with off-balance-sheet mortgage-backed (derivative) securities created and held by FIs. Losses from the falling value of subprime mortgages and the derivative securities backed by these mortgages reached $700 billion worldwide by early 2009 and resulted in the failure, acquisition, or bailout of some of the largest FIs and the near collapse of the world's financial and economic systems.

We discuss derivative security activity in Chapter 10. Derivative security traders can be either users of derivative contracts for hedging (see Chapters 10 and 23) and other purposes or dealers (such as banks) that act as counterparties in trades with customers for a fee.

www.sec.gov

## *Financial Market Regulation*

Financial instruments are subject to regulations imposed by regulatory agencies such as the Securities and Exchange Commission (SEC)—the main regulator of securities markets since the passage of the Securities Act of 1934—as well as the exchanges (if any) on which the instruments are traded. The main emphasis of SEC regulations (as stated in the Securities Act of 1933) is on full and fair disclosure of information on securities issues to actual and potential investors. Those firms planning to issue new stocks or bonds to be sold to the public at large (public issues) are required by the SEC to register their securities with the SEC and to fully describe the issue, and any risks associated with the issue, in a legal document called a prospectus.

The SEC also monitors trading on the major exchanges (along with the exchanges themselves) to ensure that stockholders and managers do not trade on the basis of inside information about their own firms (i.e., information prior to its public release). SEC regulations are not intended to protect investors against poor investment choices, but rather to ensure that investors have full and accurate information available about corporate issuers when making their investment decisions.

**TABLE 1–4 Derivative Contracts Held by Commercial Banks, by Contract Product**
*(in billions of dollars)*

| | 1992 | 2000 | 2008 | 2013 | 2016 |
|---|---|---|---|---|---|
| Futures and forwards | $4,780 | $ 9,877 | $ 22,512 | $ 45,599 | $ 35,685 |
| Swaps | 2,417 | 21,949 | 131,706 | 138,361 | 107,393 |
| Options | 1,568 | 8,292 | 30,267 | 33,760 | 30,909 |
| Credit derivatives | — | 426 | 15,897 | 13,901 | 6,986 |
| Total | $8,765 | $40,544 | $ 200,382 | $231,621 | $180,973 |

**Note:** Em dashes represent values that are too small to register.
**Sources:** Office of the Comptroller of the Currency website, various dates. www.occ.treas.gov

## OVERVIEW OF FINANCIAL INSTITUTIONS

LG 1-5

### financial institutions

*Institutions that perform the essential function of channeling funds from those with surplus funds to those with shortages of funds.*

### direct transfer

*A corporation sells its stock or debt directly to investors without going through a financial institution.*

**Financial institutions** (e.g., commercial and savings banks, credit unions, insurance companies, mutual funds) perform the essential function of channeling funds from those with surplus funds (suppliers of funds) to those with shortages of funds (users of funds). Chapters 11 through 18 discuss the various types of FIs in today's economy, including (1) the size, structure, and composition of each type; (2) their balance sheets and recent trends; (3) FI performance; and (4) the regulators who oversee each type. Table 1–5 lists and summarizes the FIs discussed in detail in later chapters.

To understand the important economic function financial institutions play in the operation of financial markets, imagine a simple world in which FIs do not exist. In such a world, suppliers of funds (e.g., households), generating excess savings by consuming less than they earn, would have a basic choice: they could either hold cash as an asset or directly invest that cash in the securities issued by users of funds (e.g., corporations or households). In general, users of funds issue financial claims (e.g., equity and debt securities or mortgages) to finance the gap between their investment expenditures and their internally generated savings such as retained earnings. As shown in Figure 1–6, in such a world we have a **direct transfer** of funds (money) from suppliers of funds to users of funds. In return, financial claims would flow directly from users of funds to suppliers of funds.

**TABLE 1–5** Types of Financial Institutions

**Commercial banks**—depository institutions whose major assets are loans and whose major liabilities are deposits. Commercial banks' loans are broader in range, including consumer, commercial, and real estate loans, than are those of other depository institutions. Commercial banks' liabilities include more nondeposit sources of funds, such as subordinate notes and debentures, than do those of other depository institutions.

**Thrifts**—depository institutions in the form of savings associations, savings banks, and credit unions. Thrifts generally perform services similar to commercial banks, but they tend to concentrate their loans in one segment, such as real estate loans or consumer loans.

**Insurance companies**—financial institutions that protect individuals and corporations (policyholders) from adverse events. Life insurance companies provide protection in the event of untimely death, illness, and retirement. Property casualty insurance protects against personal injury and liability due to accidents, theft, fire, and so on.

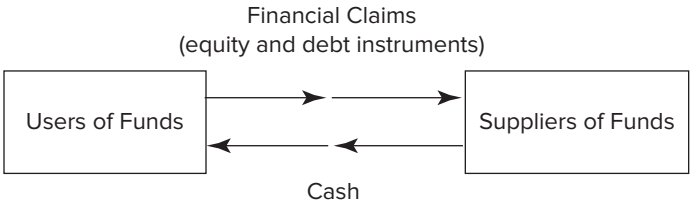
**Securities firms and investment banks**—financial institutions that help firms issue securities and engage in related activities such as securities brokerage and securities trading.

**Finance companies**—financial intermediaries that make loans to both individuals and businesses. Unlike depository institutions, finance companies do not accept deposits but instead rely on short- and long-term debt for funding.

**Investment funds**—financial institutions that pool financial resources of individuals and companies and invest those resources in diversified portfolios of assets.

**Pension funds**—financial institutions that offer savings plans through which fund participants accumulate savings during their working years before withdrawing them during their retirement years. Funds originally invested in and accumulated in pension funds are exempt from current taxation.

**Figure 1–6** Flow of Funds in a World without FIs



In this economy without financial institutions, the level of funds flowing between suppliers of funds (who want to maximize the return on their funds subject to risk) and users of funds (who want to minimize their cost of borrowing subject to risk) is likely to be quite low. There are several reasons for this. First, once they have lent money in exchange for financial claims, suppliers of funds need to monitor continuously the use of their funds. They must be sure that the user of funds neither steals the funds outright nor wastes the funds on projects that have low or negative returns. Such monitoring is often extremely costly for any given fund supplier because it requires considerable time, expense, and effort to collect this information relative to the size of the average fund supplier's investment. Given this, fund suppliers would likely prefer to leave, or delegate, the monitoring of fund borrowers to others. The resulting lack of monitoring increases the risk of directly investing in financial claims.

Second, the relatively long-term nature of many financial claims (e.g., mortgages, corporate stock, and bonds) creates another disincentive for suppliers of funds to hold the direct financial claims issued by users of funds. Specifically, given the choice between holding cash and long-term securities, fund suppliers may well choose to hold cash for liquidity reasons, especially if they plan to use their savings to finance consumption expenditures in the near future and financial markets are not very developed, or deep, in terms of the number of active buyers and sellers in the market.

**price risk**

*The risk that an asset's sale price will be lower than its purchase price.*

Third, even though real-world financial markets provide some liquidity services, by allowing fund suppliers to trade financial securities among themselves, fund suppliers face a **price risk** upon the sale of securities. That is, the price at which investors can sell a security on secondary markets such as the New York Stock Exchange (NYSE) may well differ from the price they initially paid for the security either because investors change their valuation of the security between the time it was bought and when it was sold and/or because dealers, acting as intermediaries between buyers and sellers, charge transaction costs for completing a trade.

## *Unique Economic Functions Performed by Financial Institutions*

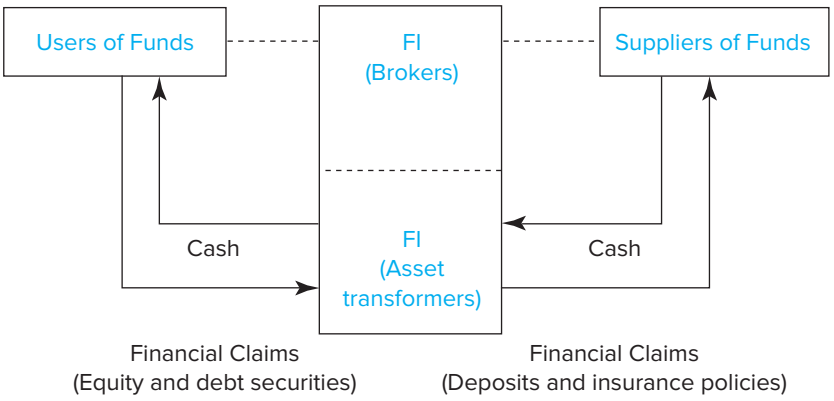
Because of (1) monitoring costs, (2) liquidity costs, and (3) price risk, the average investor in a world without FIs would likely view direct investment in financial claims and markets as an unattractive proposition and prefer to hold cash. As a result, financial market activity (and therefore savings and investment) would likely remain quite low.

**indirect transfer**

*A transfer of funds between suppliers and users of funds through a financial intermediary.*

However, the financial system has developed an alternative and indirect way for investors (or fund suppliers) to channel funds to users of funds.[3] This is the **indirect transfer** of funds to the ultimate user of funds via FIs. Due to the costs of monitoring, liquidity risk, and price risk, as well as for other reasons explained later, fund suppliers often prefer to

**Figure 1–7** Flow of Funds in a World with FIs




3. We describe and illustrate this flow of funds in Chapter 2.

hold the financial claims issued by FIs rather than those directly issued by the ultimate users of funds. Consider Figure 1–7, which is a closer representation than Figure 1–6 of the world in which we live and the way funds flow in the U.S. financial system. Notice how financial intermediaries or institutions are standing, or intermediating between, the suppliers and users of funds—that is, channeling funds from ultimate suppliers to ultimate users of funds.

How can a financial institution reduce the monitoring costs, liquidity risks, and price risks facing the suppliers of funds compared to when they directly invest in financial claims? We look at how FIs resolve these cost and risk issues next and summarize them in Table 1–6.

LG 1-6

**Monitoring Costs.** As mentioned previously, a supplier of funds who directly invests in a fund user's financial claims faces a high cost of monitoring the fund user's actions in a timely and complete fashion. One solution to this problem is for a large number of small investors to group their funds together by holding the claims issued by a financial institution. The FI groups the fund suppliers' funds together and invests them in the direct financial claims issued by fund users. This aggregation of funds by fund suppliers in a financial institution resolves a number of problems. First, the "large" FI now has a much greater incentive to hire employees with superior skills and training in monitoring. This expertise can be used to collect information and monitor the ultimate fund user's actions because the FI has far more at stake than any small individual fund supplier. Second, the monitoring function performed by the FI alleviates the "free-rider" problem that exists when small fund suppliers leave it to each other to collect information and monitor a fund user. In an economic sense, fund suppliers have appointed the financial institution as a **delegated monitor** to act on their behalf. For example, full-service securities firms such as Morgan Stanley carry out investment research on new issues and make investment recommendations for their retail clients (or investors), while commercial banks collect deposits from fund suppliers and lend these funds to ultimate users such as corporations. An important part of these FIs' functions is their ability and incentive to monitor ultimate fund users.

**delegated monitor**

*An economic agent appointed to act on behalf of smaller investors in collecting information and/or investing funds on their behalf.*

**TABLE 1–6 Services Performed by Financial Institutions**

**Services Benefiting Suppliers of Funds:**

**Monitoring costs**—aggregation of funds in an FI provides greater incentive to collect a firm's information and monitor actions. The relatively large size of the FI allows this collection of information to be accomplished at a lower average cost (economies of scale).

**Liquidity and price risk**—FIs provide financial claims to household savers with superior liquidity attributes and with lower price risk.

**Transaction cost services**—similar to economies of scale in information production costs, an FI's size can result in economies of scale in transaction costs.

**Maturity intermediation**—FIs can better bear the risk of mismatching the maturities of their assets and liabilities.

**Denomination intermediation**—FIs such as mutual funds allow small investors to overcome constraints to buying assets imposed by large minimum denomination size.

**Services Benefiting the Overall Economy:**

**Money supply transmission**—depository institutions are the conduit through which monetary policy actions impact the rest of the financial system and the economy in general.

**Credit allocation**—FIs are often viewed as the major, and sometimes only, source of financing for a particular sector of the economy, such as farming and residential real estate.

**Intergenerational wealth transfers**—FIs, especially life insurance companies and pension funds, provide savers with the ability to transfer wealth from one generation to the next.

**Payment services**—the efficiency with which depository institutions provide payment services directly benefits the economy.

**asset transformers**

*Financial claims issued by an FI that are more attractive to investors than are the claims directly issued by corporations.*

**Liquidity and Price Risk.** In addition to improving the quality and quantity of information, FIs provide further claims to fund suppliers, thus acting as **asset transformers.** Financial institutions purchase the financial claims issued by users of funds—primary securities such as mortgages, bonds, and stocks—and finance these purchases by selling financial claims to household investors and other fund suppliers in the form of deposits, insurance policies, or other *secondary securities.* Thus, in contrast to a world without FIs, while funds are being transferred from suppliers of funds through FIs to users of funds, ownership of the financial claims is not directly transferred from users of funds to the suppliers of funds. For example, an individual investor in a mutual fund that purchases Apple stock is not a shareholder of Apple Inc. The mutual fund owns Apple shares and the individual investor owns shares of this mutual fund.

Often claims issued by financial institutions have liquidity attributes that are superior to those of primary securities. For example, banks and thrift institutions (e.g., savings associations) issue transaction account deposit contracts with a fixed principal value and often a guaranteed interest rate that can be withdrawn immediately, on demand, by investors. Money market mutual funds issue shares to household savers that allow them to enjoy almost fixed principal (depositlike) contracts while earning higher interest rates than on bank deposits, and that can be withdrawn immediately. Even life insurance companies allow policyholders to borrow against their policies held with the company at very short notice. Notice that in reducing the liquidity risk of investing funds for fund suppliers, the FI transfers this risk to its own balance sheet. That is, FIs such as depository institutions offer highly liquid, low price-risk securities to fund suppliers on the liability side of their balance sheets, while investing in relatively less liquid and higher price-risk securities—such as the debt and equity—issued by fund users on the asset side. Three questions arise here. First, how can FIs provide these liquidity services? Furthermore, how can FIs be confident enough to guarantee that they can provide liquidity services to fund suppliers when they themselves invest in risky assets? Finally, why should fund suppliers believe FIs' promises regarding the liquidity and safety of their investments?

**diversify**

*The ability of an economic agent to reduce risk by holding a number of different securities in a portfolio.*

The answers to these three questions lie in financial institutions' ability to **diversify** away some, but not all, of their investment risk. The concept of diversification is familiar to all students of finance. Basically, as long as the returns on different investments are not perfectly positively correlated, by spreading their investments across a number of assets, FIs can diversify away significant amounts of their portfolio risk. (We discuss the mechanics of diversification in the loan portfolio in Chapter 20.) Thus, FIs can exploit the law of large numbers in making their investment decisions, whereas because of their smaller wealth size, individual fund suppliers are constrained to holding relatively undiversified portfolios. As a result, diversification allows an FI to predict more accurately its expected return and risk on its investment portfolio so that it can credibly fulfill its promises to the suppliers of funds to provide highly liquid claims with little price risk. As long as an FI is large enough to gain from diversification and monitoring on the asset side of its balance sheet, its financial claims (its liabilities) are likely to be viewed as liquid and attractive to small savers—especially when compared to direct investments in the capital market.

### *Additional Benefits FIs Provide to Suppliers of Funds*

The indirect investing of funds through financial institutions is attractive to fund suppliers for other reasons as well. We discuss these below and summarize them in Table 1–6.

**economies of scale**

*The concept that cost reduction in trading and other transaction services results in increased efficiency when FIs perform these services.*

**Reduced Transaction Cost.** Not only do financial institutions have a greater incentive to collect information, but also their average cost of collecting relevant information is lower than for the individual investor (i.e., information collection enjoys **economies of scale**). For example, the cost to a small investor of buying a $100 broker's report may seem inordinately high for a $10,000 investment. For an FI with $10 billion of assets under management, however, the cost seems trivial. Such economies of scale of information production and collection tend to enhance the advantages to investors of investing via FIs rather than

directly investing themselves. Nevertheless, as a result of technological advances, the costs of direct access to financial markets by savers are ever falling and the relative benefits to the individual savers of investing through FIs are narrowing.

**Maturity Intermediation.** An additional dimension of financial institutions' ability to reduce risk by diversification is their greater ability, compared to a small saver, to bear the risk of mismatching the maturities of their assets and liabilities. Thus, FIs offer maturity intermediation services to the rest of the economy. Specifically, by maturity mismatching, FIs can produce long-term contracts such as long-term, fixed-rate mortgage loans to households, while still raising funds with short-term liability contracts such as deposits. In addition, although such mismatches can subject an FI to interest rate risk (see Chapters 3 and 22), a large FI is better able than a small investor to manage this risk through its superior access to markets and instruments for hedging the risks of such loans (see Chapters 7, 10, 20, and 24).

**Denomination Intermediation.** Some FIs, especially mutual funds, perform a unique service relating to denomination intermediation. Because many assets are sold in very large denominations, they are either out of reach of individual savers or would result in savers holding very undiversified asset portfolios. For example, the minimum size of a negotiable CD is $100,000, while commercial paper (short-term corporate debt) is often sold in minimum packages of $250,000 or more. Individual small savers may be unable to purchase such instruments directly. However, by pooling the funds of many small savers (such as by buying shares in a mutual fund with other small investors), small savers overcome constraints to buying assets imposed by large minimum denomination size. Such indirect access to these markets may allow small savers to generate higher returns (and lower risks) on their portfolios as well.

### *Economic Functions FIs Provide to the Financial System as a Whole*

In addition to the services financial institutions provide to suppliers and users of funds in the financial markets, FIs perform services that improve the operation of the financial system as a whole. We discuss these next and summarize them in Table 1–6.

**The Transmission of Monetary Policy.** The highly liquid nature of bank and thrift deposits has resulted in their acceptance by the public as the most widely used medium of exchange in the economy. Indeed, at the core of the most commonly used definitions of the money supply (see Chapter 4) are bank and/or thrift deposit contracts. Because deposits are a significant component of the money supply, which in turn directly impacts the rate of economic growth, depository institutions—particularly commercial banks—play a key role in the *transmission of monetary policy* from the central bank (the Federal Reserve) to the rest of the economy (see Chapter 4 for a detailed discussion of how the Federal Reserve implements monetary policy through depository institutions).[4] Because depository institutions are instrumental in determining the size and growth of the money supply, they have been designated as the primary conduit through which monetary policy actions by the Federal Reserve impact the rest of the financial sector and the economy in general.

www.federalreserve.gov

**Credit Allocation.** FIs provide a unique service to the economy in that they are the major source of financing for particular sectors of the economy preidentified by society as being in special need of financing. For example, policymakers in the United States and a number of other countries such as the United Kingdom have identified *residential real estate* as

4. The Federal Reserve is the U.S. central bank charged with promoting economic growth in line with the economy's potential to expand.

**DO YOU UNDERSTAND:**

6. *The three major reasons that suppliers of funds would not want to directly purchase securities?*
7. *What the asset transformation function of FIs is?*
8. *What delegated monitoring function FIs perform?*
9. *What the link is between asset diversification and the liquidity of deposit contracts?*
10. *What maturity intermediation is?*
11. *Why the need for denomination intermediation arises?*
12. *The two major sectors that society has identified as deserving special attention in credit allocation?*
13. *Why monetary policy is transmitted through the banking system?*
14. *The payment services that FIs perform?*

needing special attention. This has enhanced the specialness of those FIs that most commonly service the needs of that sector. In the United States, savings associations and savings banks must emphasize mortgage lending. Sixty-five percent of their assets must be mortgage related for these thrifts to maintain their charter status (see Chapter 14). In a similar fashion, farming is an especially important area of the economy in terms of the overall social welfare of the population. Thus, the U.S. government has directly encouraged financial institutions to specialize in financing this area of activity through the creation of Federal Farm Credit Banks.[5]

**Intergenerational Wealth Transfers or Time Intermediation.** The ability of savers to transfer wealth from their youth to old age as well as across generations is also of great importance to a country's social well-being. Because of this, special taxation relief and other subsidy mechanisms encourage investments by savers in life insurance, annuities, and pension funds. For example, pension funds offer savings plans through which fund participants accumulate tax-exempt savings during their working years before withdrawing them during their retirement years.

**Payment Services.** Depository institutions such as banks and thrifts are also special in that the efficiency with which they provide payment services directly benefits the economy. Two important payment services are check-clearing and wire transfer services. For example, on any given day, over $4.5 trillion of payments are directed through Fedwire and CHIPS, the two largest wholesale payment wire network systems in the United States. Any breakdowns in these systems would likely produce gridlock to the payment system, with resulting harmful effects to the economy.

## LG 1-7 Risks Incurred by Financial Institutions

As financial institutions perform the various services described previously, they face many types of risk. Specifically, all FIs hold some assets that are potentially subject to default or credit risk (such as loans, stocks, and bonds). As FIs expand their services to non-U.S. customers or even domestic customers with business outside the United States, they are exposed to both foreign exchange risk and country or sovereign risk as well. Further, FIs tend to mismatch the maturities of their balance sheet assets and liabilities to a greater or lesser extent and are thus exposed to interest rate risk. If FIs actively trade these assets and liabilities rather than hold them for longer-term investments, they are further exposed to market risk or asset price risk. Increasingly, FIs hold contingent assets and liabilities off the balance sheet, which presents an additional risk called off-balance-sheet risk. Moreover, all FIs are exposed to some degree of liability withdrawal or liquidity risk, depending on the type of claims they have sold to liability holders. All FIs are exposed to technology risk and operational risk because the production of financial services requires the use of real resources and back-office support systems (labor and technology combined to provide services). Finally, the risk that an FI may not have enough capital reserves to offset a sudden loss incurred as a result of one or more of the risks it faces creates insolvency risk for the FI. Chapters 19 through 24 provide an analysis of how FIs measure and manage these risks.

## LG 1-8 Regulation of Financial Institutions

The preceding section showed that financial institutions provide various services to sectors of the economy. Failure to provide these services, or a breakdown in their efficient provision, can be costly to both the ultimate suppliers of funds and users of funds as well as to the economy overall. The financial crisis of the late 2000s is a prime example of how such a breakdown in the provision of financial services can cripple financial markets

5. The Farm Credit System was created by Congress in 1916 to provide American agriculture with a source of sound, dependable credit at low rates of interest.

worldwide and bring the world economy into a deep recession. For example, bank failures may destroy household savings and at the same time restrict a firm's access to credit. Insurance company failures may leave household members totally exposed in old age to the cost of catastrophic illnesses and to sudden drops in income upon retirement. In addition, individual FI failures may create doubts in savers' minds regarding the stability and solvency of FIs and the financial system in general and cause panics and even withdrawal runs on sound institutions. Indeed, this possibility provided the reasoning in 2008 for an increase in the deposit insurance cap to $250,000 per person per bank. At this time, the Federal Deposit Insurance Corporation (FDIC) was concerned about the possibility of contagious runs as a few major FIs (e.g., IndyMac and Washington Mutual) failed or nearly failed. The FDIC wanted to instill confidence in the banking system and made the change to avoid massive depositor runs from many of the troubled (and even safer) FIs, more FI failures, and an even larger collapse of the financial system.

FIs are regulated in an attempt to prevent these types of market failures and the costs they would impose on the economy and society at large. Although regulation may be socially beneficial, it also imposes private costs, or a regulatory burden, on individual FI owners and managers. Consequently, regulation is an attempt to enhance the social welfare benefits and mitigate the costs of the provision of FI services. Chapter 13 describes regulations (past and present) that have been imposed on U.S. financial institutions.

## *Trends in the United States*

In Table 1–7, we show the changing shares of total assets of financial institutions in the United States from 1948 to 2016. A number of important trends are clearly evident; most apparent is the decline in the total share of depository institutions—commercial banks and thrifts—since World War II. Specifically, while still the dominant sector of the financial institutions industry, the share of commercial banks declined from 54.5 percent in 1948 to 26.1 percent in 2016. Note the particularly large decrease in the share of commercial banks from 2010 (32.8 percent) to 2016 (26.1 percent). The effects of regulation imposed during the financial crisis (e.g., the Financial Institutions Reform and Recovery Act of 2010 and Basel 3 capital regulations discussed in Chapter 13) and historically low interest rates on bank deposits (discussed in Chapter 2) reflect this relatively large decline. Further, the share of thrifts (savings banks, savings associations, and credit unions) fell from 12.0 to 3.0 percent over the same period.[6] Similarly, insurance companies also witnessed a decline

**TABLE 1–7** **Percentage Shares of Assets of Financial Institutions in the United States, 1948–2016**

| | 1948 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2016 |
|---|---|---|---|---|---|---|---|---|
| Commercial banks | 54.5% | 40.8% | 42.6% | 40.7% | 32.4% | 30.5% | 32.8% | 26.1% |
| Thrift institutions | 12.0 | 21.0 | 23.0 | 25.0 | 17.1 | 10.1 | 7.3 | 3.0 |
| Insurance companies | 26.0 | 24.2 | 19.0 | 16.2 | 18.0 | 15.6 | 14.8 | 10.9 |
| Investment companies | 0.3 | 0.7 | 0.7 | 2.0 | 9.2 | 15.8 | 18.0 | 24.5 |
| Pension funds | 3.8 | 7.7 | 8.0 | 9.5 | 10.5 | 8.8 | 7.6 | 24.5 |
| Finance companies and mortgage companies | 2.7 | 5.2 | 5.7 | 6.2 | 6.8 | 6.9 | 5.3 | 2.0 |
| Securities brokers and dealers | 0.7 | 0.4 | 0.7 | 0.3 | 5.7 | 12.1 | 13.4 | 8.0 |
| Real estate investment trusts | — | 0.0 | 0.3 | 0.1 | 0.3 | 0.2 | 0.8 | 1.0 |
| Total (percentage) | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Total (trillions of dollars) | $0.324 | $0.810 | $1.375 | $4.066 | $11.557 | $29.105 | $51.385 | $73.124 |

**Sources:** Federal Reserve Board, "Financial Accounts of the United States," *Statistical Releases,* various issues. www.federalreserve.gov

6. Although commercial bank assets as a percentage of total assets in the financial sector may have declined in recent years, this does not necessarily mean that banking activity has decreased. Indeed, off-balance-sheet activities have replaced some of the more traditional on-balance-sheet activities of commercial banks (see Chapter 11). Further, as is discussed in Part Three of the text, banks are increasingly providing services (such as securities underwriting, insurance underwriting and sales, and mutual fund services) previously performed exclusively by other FIs.

in their share, from 26.0 to 10.9 percent. The most dramatic trend involves the increasing share of pension funds and investment companies and securities brokers and dealers. Investment companies (mutual funds and money market mutual funds) increased their share from 0.3 to 24.5 percent, while pension funds increased from 3.8 to 24.5 percent over the 1948 to 2016 period.

**The Rise of Financial Services Holding Companies.** To the extent that the financial services market is efficient and the data seen in Table 1–7 reflect the forces of demand and supply, these data indicate a current trend: savers increasingly prefer investments that closely mimic diversified investments in the *direct* securities markets over the transformed financial claims offered by traditional FIs. This trend may also indicate that the regulatory burden on traditional FIs—such as banks and insurance companies—is higher than that on pension funds, mutual funds, and investment companies. Indeed, traditional FIs are unable to produce their services as cost-efficiently as they previously could.

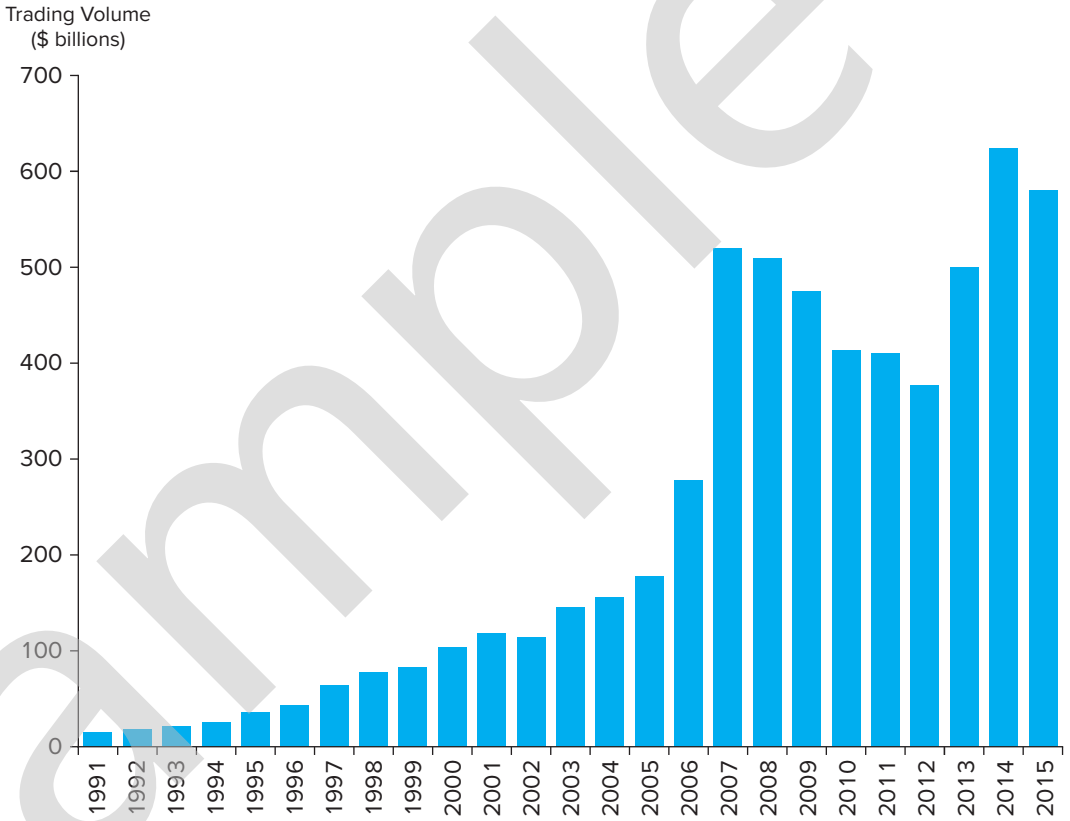
Recognizing this changing trend, in 1999 the U.S. Congress passed the Financial Services Modernization (FSM) Act, which repealed the 1933 Glass-Steagall barriers between commercial banking, insurance, and investment banking. The bill, promoted as the biggest change in the regulation of financial institutions in 70 years, allowed for the creation of "financial services holding companies" that could engage in banking activities, insurance activities, and securities activities. After 70 years of partial or complete separation between insurance, investment banking, and commercial banking, the FSM opened the door for the creation of full-service financial institutions in the United States similar to those that existed before 1933 and that exist in many other countries. Thus, while Table 1–7 lists assets of financial institutions by functional area, the financial services holding company (which combines these activities in a single financial institution) has become the dominant form of financial institution in terms of total assets.

**The Shift Away from Risk Measurement and Management and the Financial Crisis.** Certainly, the financial crisis of the late 2000s changed and reshaped today's financial markets and institutions. As FIs adjusted to regulatory changes brought about by the likes of the FSM Act, one result was a dramatic increase in the systemic risk of the financial system, caused in large part by a shift in the banking model from that of "originate and hold" to "originate and distribute." In the traditional model, banks take short-term deposits and other sources of funds and use them to fund longer term loans to businesses and consumers. Banks typically hold these loans to maturity and thus have an incentive to screen and monitor borrower activities even after a loan is made.

However, the traditional banking model exposes the institution to potential liquidity, interest rate, and credit risk. In attempts to avoid these risk exposures and generate improved return-risk tradeoffs, banks have shifted to an underwriting model in which they originate or warehouse loans and then quickly sell them. Figure 1–8 shows the growth in bank loan secondary market trading from 1991 through 2015. Note the huge growth in bank loan trading even during the financial crisis of 2008–2009. When loans trade, the secondary market produces information that can substitute for the information and monitoring of banks. Further, banks may have lower incentives to collect information and monitor borrowers if they sell loans rather than keep them as part of the bank's portfolio of assets. Indeed, most large banks are organized as financial services holding companies to facilitate these new activities.

More recently, activities of shadow banks, nonbank financial services firms (such as structured investment vehicles [SIVs] discussed in Chapter 24) that perform banking services, have facilitated the change from the originate-and-hold model of commercial banking to the originate-and-distribute banking model. In the shadow banking system, savers place their funds with money market mutual and similar funds, which invest these funds in the liabilities of shadow banks. Borrowers get loans and leases from shadow banks rather than from banks. Like the traditional banking system, the shadow banking system intermediates the flow of funds between net savers and net borrowers. However, instead of

**Figure 1–8** **Bank Loan Secondary Market Trading 1991–2015**




**Source:** Thomson Reuters LPC website, 2016. www.loanpricing.com



the bank serving as the intermediary, it is the nonbank financial services firm, or shadow bank, that intermediates. These innovations remove risk from the balance sheet of financial institutions and shift risk off the balance sheet and to other parts of the financial system. Since the FIs, acting as underwriters, are not exposed to the credit, liquidity, and interest rate risks of traditional banking, they have little incentive to screen and monitor the activities of borrowers to whom they originated loans. Thus, FIs' role as specialists in risk measurement and management has been reduced.

Adding to FIs' move away from risk measurement and management was the boom ("bubble") in the housing markets, which began building in 2001, particularly after the terrorist attacks of 9/11. The immediate response by regulators to the terrorist attacks was to create stability in the financial markets by providing liquidity to FIs. For example, the Federal Reserve lowered the short-term interest rate that banks and other financial institutions pay in the federal funds market. Perhaps not surprisingly, low interest rates and the increased liquidity provided by the central bank resulted in a rapid expansion in consumer, mortgage, and corporate debt financing. Demand for residential mortgages and credit card debt rose dramatically. As the demand for mortgage debt grew, especially among those who had previously been excluded from participating in the market because of their poor credit ratings, FIs began lowering their credit quality cut-off points. Moreover, to boost their earnings, in the market now popularly known as the "subprime market," banks and other mortgage-supplying institutions often offered relatively low "teaser" rates on adjustable rate mortgages (ARMs). These teaser rates provided exceptionally low initial interest rates. But after the expiration of the initial rate period two or three years later, if market rates rose, the loan rates increased substantially.

Under the traditional, originate-and-hold banking model, banks might have been reluctant to so aggressively pursue low-credit-quality borrowers for fear that the loans would default. However, under the originate-and-distribute model of banking, asset securitization and loan syndication allowed banks to retain little or no part of the loans, and hence little or no part of the default risk on loans that they originated. Thus, as long as the borrower did not default within the first months after a loan's issuance and the loans were sold or securitized without recourse back to the bank, the issuing bank could ignore longer-term credit risk concerns. The result was a deterioration in credit quality at the same time as there was a dramatic increase in consumer and corporate leverage.

Eventually, in 2006, housing prices started to fall. At the same time, the Federal Reserve started to raise interest rates as it began to fear inflation. Since many of the subprime mortgages that originated in the 2001–2005 period had adjustable rates, the cost of meeting mortgage commitments rose to unsustainable levels for many low-income households. The confluence of falling house prices, rising interest rates, and rising mortgage costs led to a wave of mortgage defaults in the subprime market and foreclosures that only reinforced the downward trend in housing prices. In 2007, the percentage of subprime mortgage-backed securities delinquent by 90 days or more was 10.09 percent, substantially higher than the 5.37 percent rate in May 2005. The financial crisis began. As previously mentioned, Appendix 1A (available through Connect or your course instructor) provides a detailed discussion of the causes of, the major events during, and the regulatory and industry changes resulting from the financial crisis.

The economy relies on financial institutions to act as specialists in risk measurement and management. The importance of this was demonstrated in the aftermath of the FIs' failure to perform this critical function during the global financial crisis. The result was a worldwide breakdown in credit markets, as well as an enhanced level of equity market volatility. When FIs failed to perform their critical risk measurement and management functions, the result was a crisis of confidence that disrupted financial markets.

**Enterprise Risk Management.** A major theme of this book is the measurement and management of FI risks. While FIs have traditionally examined risk measurement and management by functional area (e.g., credit risk or liquidity risk), more recently they have recognized the value of enterprise risk management. **Enterprise risk management (ERM)** recognizes the importance of prioritizing and managing the combined impact of the full spectrum of risks as an interrelated risk portfolio. The process also seeks to embed risk management as a component in all critical decisions throughout the FI.

**enterprise risk management (ERM)**

*Recognizes the importance of managing the combined impact of the full spectrum of risks as an interrelated risk portfolio.*

ERM came to the forefront for many FIs during and after the financial crisis, when their risk management practices came under intense scrutiny. Many FIs had invested heavily in advanced risk measurement and management systems only to have them fail to detect or control risk exposures that led up to the crisis. These failures resulted in significant examinations of what went wrong with risk management systems and practices. For example, since the financial crisis, global FI regulators, such as the Basel Committee on Banking Supervision, have moved to address risk culture, risk appetite setting, and risk governance more explicitly in regulatory standards. This was not the case prior to the crisis, when emphasis was predominantly placed on risk management processes and systems, believing that this ought to be sufficient. Prior to the financial crisis, FIs largely failed to take into account behavioral biases that play a critical role in senior management decisions which ultimately affect the risks that a company was willing to take or tolerate. Rather, the advancements in risk management had resulted in a highly analytical-focused discipline that largely ignored fundamental drivers of risk taking that are rooted in subtler behavioral characteristics. Using an ERM framework, decisions include how performance targets are set for staff, how incentive structures are designed, and the stature and resources that are provided to risk management functions within the FI. ERM stresses the importance of building a strong risk culture supported by governance arrangements that are explicitly aligned to a firm's risk appetite.

## GLOBALIZATION OF FINANCIAL MARKETS AND INSTITUTIONS

LG 1-9

Financial markets and institutions in the United States have their counterparts in many foreign countries. International debt and equity markets are those markets that trade debt and equity securities issued by domestic and foreign firms. While U.S. markets are the world's largest, international markets have seen rapid growth in recent years. Table 1–8 lists U.S. dollar equivalent values of money market and debt securities outstanding in countries throughout the world from 1996 through 2015. Notice that U.S. markets dominate the world debt markets. In 2015, for example, 14.9 percent of the world's debt securities were issued in the United States. The next two most active issuers (the United Kingdom and Germany) had fewer debt securities outstanding than the U.S. market. Table 1–9 reports U.S. dollar equivalent market capitalization on major worldwide stock exchanges. U.S. stock exchanges are again the largest equity markets, followed by Japan and the United Kingdom.

While U.S. financial markets have historically been much larger in value, size, and trading volume than any foreign market, financial markets became truly global in the 1990s as technological improvements resulted in more immediate and cheaper access to real-time data worldwide by domestic and international investors. Added to this was investors' demand for international securities and international portfolio diversification (such as through the growth of U.S. mutual funds that invest in offshore bonds and stocks). As a result, the volume and values of stocks and other securities traded in foreign markets soared.

The significant growth in foreign financial markets is the result of several other factors as well. First is the increase in the pool of savings in foreign countries (e.g., the European

**TABLE 1–8** **World Financial Markets, International Debt Outstanding, by Issuer** *(in billions of dollars)*

| | Long-Term Debt | | | | Money Market Securities | | |
|---|---|---|---|---|---|---|---|
| Country | 1996 | 2000 | 2010 | 2015* | 2000 | 2010 | 2015* |
| Argentina | $ 29.0 | $ 68.1 | $ 53.8 | $ 50.9 | $ 0.4 | $ 0.1 | $ 0.1 |
| Australia | 77.4 | 94.1 | 571.5 | 599.1 | 17.9 | 31.1 | 22.8 |
| Austria | 62.5 | 82.2 | 335.6 | 240.4 | 9.3 | 12.4 | 13.9 |
| Belgium | 42.1 | 65.3 | 573.9 | 287.7 | 12.4 | 18.3 | 10.9 |
| Brazil | 23.1 | 48.9 | 172.6 | 304.5 | 3.5 | 2.8 | 7.5 |
| Canada | 177.8 | 202.8 | 649.8 | 746.8 | 5.8 | 18.3 | 14.2 |
| China | n.a. | 17.6 | 71.8 | 413.5 | 0.2 | 2.8 | 76.1 |
| France | 204.4 | 346.5 | 75.8 | 1,489.3 | 12.7 | 117.5 | 78.2 |
| Germany | 319.8 | 769.8 | 23.9 | 1,648.9 | 104.4 | 121.9 | 163.6 |
| Hong Kong | 15.9 | 28.4 | 85.1 | 126.4 | 2.5 | 1.2 | 5.5 |
| Ireland | 20.0 | 32.0 | 491.0 | 286.7 | 4.1 | 43.4 | 6.7 |
| Italy | 88.6 | 198.1 | 316.2 | 921.8 | 12.6 | 40.5 | 8.7 |
| Japan | 325.6 | 274.2 | 399.7 | 369.3 | 7.4 | 19.6 | 46.2 |
| Luxembourg | 8.4 | 16.4 | 88.5 | 124.4 | 5.4 | 4.2 | 10.2 |
| Mexico | 41.5 | 63.7 | 105.1 | 207.7 | 2.9 | 0.8 | 2.1 |
| Netherlands | 112.2 | 267.2 | 257.7 | 1,192.8 | 26.2 | 91.6 | 63.7 |
| Norway | 19.5 | 39.1 | 204.2 | 241.5 | 1.8 | 4.8 | 3.9 |
| South Korea | 38.9 | 48.7 | 138.1 | 175.6 | 0.8 | 5.0 | 10.7 |
| Spain | 44.2 | 137.0 | 720.4 | 933.6 | 11.3 | 60.0 | 20.4 |
| Sweden | 99.6 | 90.6 | 9.3 | 435.7 | 7.5 | 47.8 | 36.2 |
| Switzerland | 39.5 | 89.3 | 451.9 | 366.7 | 8.1 | 10.5 | 30.3 |
| United Kingdom | 258.7 | 519.2 | 3,020.5 | 2,555.5 | 48.1 | 98.2 | 58.6 |
| United States | 372.4 | 1,662.7 | 7,074.7 | 3,083.7 | 40.9 | 108.3 | 51.4 |
| Total debt | $2,982.5 | $5,907.7 | $26,750.8 | $20,666.7 | $370.1 | $913.5 | $884.4 |

*As of the end of the first quarter.

**Source:** Bank for International Settlements, "International Banking and Financial Market Developments," BIS Statistics Explorer. www.bis.org

**TABLE 1–9 World Financial Markets, Market Capitalization** *(in billions of dollars)*

| Country | 2003 | 2010 | 2013 | 2016 |
|---|---|---|---|---|
| Buenos Aires SE (Argentina) | $ 35.0 | $ 63.9 | $ 43.2 | $ 52.3 |
| Australian SE | 585.5 | 1,454.5 | 1,513.3 | 1,095.7 |
| TMX Group (Canada) | 910.2 | 2,170.4 | 2,032.2 | 1,551.2 |
| Deutsche Börse (Germany) | 1,079.0 | 1,429.7 | 1,566.4 | 1,563.4 |
| NYSE Euronext (Europe) | 2,076.4 | 2,930.1 | 3,016.2 | 3,190.9 |
| Hong Kong Exchanges | 714.6 | 2,711.3 | 2,883.1 | 2,808.0 |
| Irish SE | 85.1 | 60.4 | 128.7 | 114.6 |
| Japan Exchange Group—Tokyo | 2,953.1 | 3,827.8 | 4,223.3 | 4,522.8 |
| Luxembourg SE | 37.3 | 101.1 | 62.5 | 44.4 |
| Mexican Exchange | 122.5 | 454.3 | 556.2 | 386.6 |
| Oslo Børs (Norway) | 95.9 | 295.3 | 250.6 | 183.5 |
| Korea Exchange | 298.2 | 1,091.9 | 1,146.7 | 1,197.1 |
| BME Spanish Exchanges | 726.2 | 1,171.6 | 1,014.0 | 703.4 |
| SIX Swiss Exchange | 727.1 | 1,229.4 | 1,397.4 | 1,395.7 |
| London SE | 2,425.8 | 3,613.1 | 3,821.9 | 3,541.3 |
| NYSE Euronext (U.S.) | 11,328.0 | 13,394.1 | 15,571.6 | 16,813.4 |
| **WFE Total** | **$30,721.0** | **$54,891.1** | **$58,538.9** | **$61,434.5** |

**Source:** World Federation of Exchanges. www.world-exchanges.org

Union). Second, international investors have turned to U.S. and other markets to expand their investment opportunities and improve their investment portfolio risk and return characteristics. This is especially so as the retirement value of public pension plans has declined in many European countries and investors have turned to private pension plans to boost their long-term savings. Third, information on foreign investments and markets is now more accessible and thorough—for example, via the Internet. Fourth, some U.S. FIs—such as specialized mutual funds—offer their customers opportunities to invest in foreign securities and emerging markets at relatively low transaction costs. Fifth, while the euro has had a significant effect throughout Europe, it is also having a notable impact on the global financial system. Despite challenges resulting from the Greek (and to some extent, the European) debt crisis of the 2010s, the euro is still one of the world's most important currencies for international transactions. Sixth, economic growth in Pacific Basin countries, China, and other emerging countries has resulted in significant growth in their stock markets. Finally, deregulation in many foreign countries has allowed international investors greater access and allowed the deregulating countries to expand their investor bases (e.g., until 2012, individual foreign investors faced severe restrictions on their ability to buy Indian stocks). As a result of these factors, the overall volume of investment and trading activity in foreign securities is increasing, as is the integration of U.S. and foreign financial markets.

Table 1–10 shows the extent of the growth in foreign investment in U.S. financial markets. From 1992 through 2015, foreign investors' holdings of U.S. financial market debt securities outstanding increased from $989.3 billion to $10,470.7 billion, while foreign financial market debt securities held by U.S. investors increased from $315.8 billion to $3,077.4 billion. While U.S. financial markets dominate world markets, the growth of U.S. financial markets depends more and more on the growth and development of other economies. In turn, the success of other economies depends to a significant extent on their financial market development. Further, for the same reasons discussed earlier (i.e., monitoring costs, liquidity risk, and price risk), financial institutions are of central importance to the development and integration of markets globally. However, U.S. FIs must now compete not only with other domestic FIs for a share of these markets, but increasingly with foreign FIs. Table 1–11 lists the 10 largest banks in the world, measured by total assets, as of 2016. Only 2 of these are U.S. banks.

**TABLE 1–10 Financial Market Securities Holdings** *(in billions of dollars)*

| | 1992 | 1996 | 2000 | 2010 | 2015* |
|---|---|---|---|---|---|
| **U.S. Financial Market Instruments Held by Foreign Investors** | | | | | |
| Open market paper | $ 12.9 | $ 57.9 | $ 114.3 | $ 191.0 | $ 102.7 |
| U.S. government securities | 595.0 | 1,293.9 | 1,462.8 | 5,550.6 | 7,048.2 |
| U.S. corporate bonds | 251.5 | 453.2 | 1,073.6 | 2,523.3 | 3,116.3 |
| Loans to U.S. corporate businesses | 129.9 | 126.2 | 117.3 | 160.4 | 203.5 |
| Total | 989.3 | 1,931.2 | 2,768.0 | 8,425.3 | 10,470.7 |
| U.S. corporate equities held | 326.2 | 666.6 | 1,632.0 | 3,475.8 | 6,289.1 |
| Total financial assets held | $1,315.5 | $2,597.8 | $4,400.0 | $11,901.1 | $16,759.8 |
| **Foreign Financial Market Instruments Held by U.S. Investors** | | | | | |
| Commercial paper | $ 78.4 | $ 67.5 | $ 120.9 | $ 398.6 | $ 444.8 |
| Bonds | 147.2 | 347.7 | 572.7 | 1,689.5 | 2,271.5 |
| Bank loans | 23.9 | 43.7 | 70.5 | 115.1 | 328.0 |
| Other loans & advances | 66.4 | 60.0 | 50.3 | 22.1 | 33.1 |
| Total | 315.8 | 518.8 | 814.4 | 2,225.3 | 3,077.4 |
| Foreign corporate equities held | 314.3 | 1,006.0 | 1,852.8 | 4,646.9 | 6,732.0 |
| Total financial assets held | $630.1 | $1,524.8 | $2,667.2 | $6,872.2 | $ 9,809.4 |

*As of the end of the first quarter.

**Sources:** Federal Reserve Board, "Financial Accounts of the United States," *Statistical Releases,* various issues. www.federalreserve.gov

**TABLE 1–11 The Largest (in Total Assets) Banks in the World** *(in trillions of dollars)*

| Bank | Country | Total Assets |
|---|---|---|
| **1.** Industrial Commerce Bank of China | China | $3.42 |
| **2.** China Construction Bank | China | 2.83 |
| **3.** Agricultural Bank of China | China | 2.74 |
| **4.** Bank of China | China | 2.59 |
| **5.** Mitsubishi UFJ Financial | Japan | 2.46 |
| **6.** HSBC Holdings | United Kingdom | 2.41 |
| **7.** J.P. Morgan Chase | United States | 2.35 |
| **8.** BNP Paribas | France | 2.17 |
| **9.** Bank of America | United States | 2.14 |
| **10.** Credit Agricole | France | 1.85 |

**Source:** Authors' research.

As a result of the increased globalization of financial markets and institutions, U.S. financial market movements now have a much greater impact on foreign markets than historically. For example, in mid-August 2007, overseas markets experienced dramatic selloffs as a result of increasing concern among investors that the credit market problems in the United States could trigger a slowdown in global economic growth. What started as a major decline in the U.S. bond markets led to fears of a wider credit crunch that could affect economies from South Korea to Mexico to China. The global selloff began late Wednesday August 15, 2007, in the United States as credit market worries hit Countrywide Financial Corp., one of the country's biggest mortgage lenders. The selloff continued on to hit worldwide markets in Asia, where the Japanese stock market fell 2 percent, the Hong Kong stock market fell 3.3 percent, and the South Korean stock market fell 6.9 percent. European stock markets followed, with UK stock markets falling 4.1 percent and German markets by 2.4 percent. The selling continued in the United States, with the Dow Jones

Industrial Average falling more than 300 points at the beginning of trading on Thursday, August 16.

**DO YOU UNDERSTAND:**

**15.** *What the trends are in the growth of global financial markets since the 1990s?*

Conversely, global events now have an impact on U.S. financial markets. For example, by the mid-2010s, after years of rapid growth, China was the world's second-biggest economy. However, by late 2015, as China matured into a more developed market, demand for raw materials eased significantly. This raised concerns that China's economy was slowing at a much faster pace than previously thought. For example, a private report released in January 2016 showed China's manufacturing sector contracted in December 2015 following two months of stabilization. As a result, the Shanghai Composite plummeted nearly 7 percent in one day. This negative news about China had global ramifications and the sharp selling spread overseas. The DJIA fell by as much as 467 points on January 4, 2016, closing below the 17,000 level for the first time since October 2015. Most recently, and as mentioned in the introduction, the June 2016 vote by the citizens of the UK to leave the European Union sent shockwaves around the world as the fate of the 43-year-old unified Europe was brought into question. Britain's vote to leave the European Union set in motion an unprecedented and unpredictable process that could unsettle markets for many years.



## SUMMARY

This introductory chapter reviewed the basic operations of domestic and foreign financial markets and institutions. It described the ways in which funds flow through an economic system from lenders to borrowers and outlined the markets and instruments that lenders and borrowers employ to complete this process. In addition, the chapter discussed the need for FI managers to understand the functioning of both the domestic as well as the international markets in which they participate.

The chapter also identified the various factors impacting the specialness of the services FIs provide and the manner in which they improve the efficiency with which funds flow from suppliers of funds to the ultimate users of funds. Currently, however, some forces—such as technology and especially the Internet—are so powerful that in the future FIs that have historically relied on making profits by performing traditional special functions such as brokerage will need to expand the array of financial services they sell as well as the way that such services are distributed or sold to their customers.

## QUESTIONS

**1.** Classify the following transactions as taking place in the primary or secondary markets: (*LG 1-1*)
- **a.** IBM issues $200 million of new common stock.
- **b.** The New Company issues $50 million of common stock in an IPO.
- **c.** IBM sells $5 million of GM preferred stock out of its marketable securities portfolio.
- **d.** The Magellan Fund buys $100 million of previously issued IBM bonds.
- **e.** Prudential Insurance Co. sells $10 million of GM common stock.

**2.** Classify the following financial instruments as money market securities or capital market securities: (*LG 1-2*)
- **a.** Banker's acceptances
- **b.** Commercial paper
- **c.** Common stock
- **d.** Corporate bonds
- **e.** Mortgages
- **f.** Negotiable certificates of deposit
- **g.** Repurchase agreements
- **h.** U.S. Treasury bills
- **i.** U.S. Treasury notes
- **j.** Federal funds

3. How does the location of money markets differ from that of capital markets? (*LG 1-2*)
4. Which of the money market instruments is the largest in terms of dollar amount outstanding in 2016? (*LG 1-2*)
5. What are the major instruments traded in capital markets? (*LG 1-2*)
6. Which of the capital market instruments is the largest in terms of dollar amount outstanding in 2016? (*LG 1-2*)
7. If a U.S. bank is holding Japanese yen in its portfolio, what type of exchange rate movement would the bank be most concerned about? (*LG 1-3*)
8. What are the different types of financial institutions? Include a description of the main services offered by each. (*LG 1-5*)
9. How would economic transactions between suppliers of funds (e.g., households) and users of funds (e.g., corporations) occur in a world without FIs? (*LG 1-6*)
10. Why would a world limited to the direct transfer of funds from suppliers of funds to users of funds likely result in quite low levels of fund flows? (*LG 1-6*)
11. How do FIs reduce monitoring costs associated with the flow of funds from fund suppliers to fund investors? (*LG 1-6*)
12. How do FIs alleviate the problem of liquidity and price risk faced by investors wishing to invest in securities of corporations? (*LG 1-6*)
13. How do financial institutions help individuals diversify their portfolio risks? Which financial institution is best able to achieve this goal? (*LG 1-6*)
14. What is meant by maturity intermediation? (*LG 1-6*)
15. What is meant by denomination intermediation? (*LG 1-6*)
16. What other services do FIs provide to the financial system? (*LG 1-6*)
17. What types of risks do FIs face? (*LG 1-7*)
18. Why are FIs regulated? (*LG 1-8*)
19. What events resulted in banks' shift from the traditional banking model of originate-and-hold to a model of originate-and-distribute? (*LG 1-6, LG 1-7, LG 1-8*)
20. How did the boom in the housing market in the early and mid-2000s exacerbate FIs' transition away from their role as specialists in risk measurement and management? (*LG 1-6, LG 1-7, LG 1-8*)
21. What countries have the most international debt securities outstanding? (*LG 1-9*)
22. What countries have the largest commercial banks? (*LG 1-9*)

## SEARCH THE SITE

Go to the New York Stock Exchange Facts & Figures: Interactive Viewer website at **www.nyxdata.com/nysedata/asp/factbook/viewer_interactive.asp** and find the latest figures for top NYSE volume days using the following steps: Click on "Market Activity." Click on "NYSE Group Volume Records—Top 10 Days." This brings up a file that contains the relevant data.

**Questions**

1. What is the largest number of daily shares traded on the NYSE? On what day did this occur?
2. Calculate the percentage change in daily trading volume since the 3.3 billion shares traded on April 18, 2016.

## APPENDIX 1A: The Financial Crisis: The Failure of Financial Institutions' Specialness

This appendix is available through Connect or your course instructor.

chapter

2

# Determinants of Interest Rates

OUTLINE

Interest Rate Fundamentals: Chapter Overview
Loanable Funds Theory
- Supply of Loanable Funds
- Demand for Loanable Funds
- Equilibrium Interest Rate
- Factors That Cause the Supply and Demand Curves for Loanable Funds to Shift

Movement of Interest Rates over Time
Determinants of Interest Rates for Individual Securities
- Inflation
- Real Risk-Free Rates
- Default or Credit Risk
- Liquidity Risk
- Special Provisions or Covenants
- Term to Maturity

Term Structure of Interest Rates
- Unbiased Expectations Theory
- Liquidity Premium Theory
- Market Segmentation Theory

Forecasting Interest Rates
Time Value of Money and Interest Rates
- Time Value of Money
- Lump Sum Valuation
- Annuity Valuation

## Learning Goals

**LG 2-1** *Know who the main suppliers of loanable funds are.*

**LG 2-2** *Know who the main demanders of loanable funds are.*

**LG 2-3** *Understand how equilibrium interest rates are determined.*

**LG 2-4** *Examine factors that cause the supply and demand curves for loanable funds to shift.*

**LG 2-5** *Examine how interest rates change over time.*

**LG 2-6** *Know what specific factors determine interest rates.*

**LG 2-7** *Examine the different theories explaining the term structure of interest rates.*

**LG 2-8** *Understand how forward rates of interest can be derived from the term structure of interest rates.*

**LG 2-9** *Understand how interest rates are used to determine present and future values.*

## INTEREST RATE FUNDAMENTALS: CHAPTER OVERVIEW

**Nominal interest rates** are the interest rates actually observed in financial markets. These nominal interest rates (or just interest rates) directly affect the value (price) of most securities traded in the money and capital markets, both at home and abroad. Changes in interest rates influence the performance and decision making for individual investors, businesses, and governmental units alike. Figure 2–1 illustrates the movement in several key U.S. interest rates over the past 40 years: the federal funds rate used for interbank borrowing, the three-month T-bill rate, the AAA-rated corporate bond rate, and the home mortgage rate. Notice in Figure 2–1 the variability over time in interest rate levels. For example, the federal funds rate was as low as 3.29 percent in the early 1970s, yet hit highs of almost 20 percent in the early 1980s, was well below 10 percent throughout much of the 1990s,

**Figure 2–1** Key U.S. Interest Rates, 1972–2016


**Source:** Federal Reserve Board website, May 2016. www.federalreserve.gov



**nominal interest rates**

*The interest rates actually observed in financial markets.*

and fell back to and was even below 4 percent in the early and late 2000s. As we discuss in detail in Chapter 4, in 2008 through 2016, the Federal Reserve lowered interest rates to historic lows as it took steps to stimulate the U.S. economy (which was suffering from its worst recession since the Great Depression).

This chapter examines factors that drive the level of current and future interest rates, as well as the link between interest rates and the time value of money. Sections 1 through 5 (as listed in the Learning Goals for this chapter) generally deal with the levels of interest rates, while Sections 6 through 8 are more concerned with differences among various interest rates. Finally, Section 9 demonstrates how interest rates affect the value of financial securities by reviewing time value of money concepts.

## LOANABLE FUNDS THEORY

Interest rates play a major part in the determination of the value of financial instruments. For example, in June 2013 the Federal Reserve announced that it expected to be able to reduce its efforts to support the U.S. economy as it recovered from the financial crisis of 2008–2009 by the end of 2013. The financial markets reacted significantly: the Dow Jones Industrial Average (which had previously posted three consecutive days of gains in value) declined over 200 points, 1.35 percent in value, the interest rate (for bond instruments the

interest rate is most often referred to as the yield to maturity[1] or just yield) on Treasury securities increased (i.e., the yield on two-year T-notes increased from 0.126 percent to 2.308 percent, the highest rate in over a year), gold prices dropped 3.4 percent, and the U.S. dollar strengthened against foreign currencies. When the Fed eventually raised interest rates in December 2015 (for the first time in 10 years), the DJIA jumped 224.18 points, or 1.3 percent, to 17,749.09, with only two of the 30 blue-chip companies on the index trading lower. Global equity markets rallied in volatile trading, while the dollar rose after the Fed's statement. However, this rate increase was highly anticipated. In a Reuters poll of more than 90 economists taken between December 4 and 9, the probability that the Fed would raise rates rose to 90 percent. Further, in its announcement, the Fed stressed that the pace of interest rate hikes would be gradual. Thus, benchmark 10-year Treasury notes that yielded 2.294 percent minutes ahead of the announcement, rose to 2.31 percent immediately after the announcement, before falling back to 2.2995 percent. Likewise, gold held steady after the announcement that the interest rate increase was a tentative beginning to a "gradual" tightening cycle. Given the impact a change in interest rates has on security values, financial institution and other firm managers spend much time and effort trying to identify factors that determine the level of interest rates at any moment in time, as well as what causes interest rate movements over time.

**loanable funds theory**

*A theory of interest rate determination that views equilibrium interest rates in financial markets as a result of the supply of and demand for loanable funds.*

One model that is commonly used to explain interest rates and interest rate movements is the **loanable funds theory.** The loanable funds theory views the level of interest rates as resulting from factors that affect the supply of and demand for loanable funds. It categorizes financial market participants—consumers, businesses, governments, and foreign participants—as net suppliers or demanders of funds.

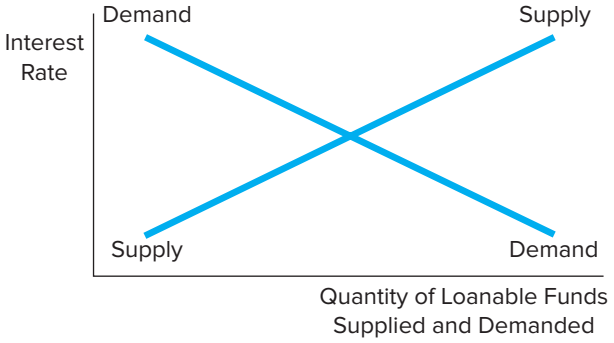
LG 2-1

## *Supply of Loanable Funds*

The *supply of loanable funds* is a term commonly used to describe funds provided to the financial markets by net suppliers of funds. In general, the quantity of loanable funds supplied increases as interest rates rise. Figure 2–2 illustrates the supply curve for loanable funds. Other factors held constant, more funds are supplied as interest rates increase (the reward for supplying funds is higher). Table 2–1 presents data on the supply of loanable funds from the various groups of market participants from U.S. flow of funds data as of 2016.

The household sector (consumer sector) is one of the largest suppliers of loanable funds in the United States—$70.33 trillion in 2016. Households supply funds when they have excess income or want to reallocate their asset portfolio holdings. For example, during times of high economic growth, households may replace part of their cash holdings with earning assets (i.e., by supplying loanable funds in exchange for holding securities). As the total wealth of a consumer increases, the total supply of loanable funds from that

**Figure 2–2** Supply of and Demand for Loanable Funds




1. As will be discussed in Chapter 3, the yield to maturity is the return the bond holder will earn on the bond if he or she buys the bond at its current market price, receives all coupon and principal payments as promised, and holds the bond until maturity.

**TABLE 2–1 Funds Supplied and Demanded by Various Groups** *(in trillions of dollars)*

| | Funds Supplied | Funds Demanded | Net Funds Supplied (Funds Supplied—Funds Demanded) |
|---|---|---|---|
| Households | $70.33 | $14.51 | $55.82 |
| Business—nonfinancial | 23.20 | 55.85 | −32.65 |
| Business—financial | 85.91 | 96.90 | −10.99 |
| Government units | 5.22 | 23.19 | −17.97 |
| Foreign participants | 23.03 | 17.24 | 5.79 |

**Source:** Federal Reserve Board website, "Financial Accounts of the United States," May 2016. www.federalreserve.gov

consumer will also generally increase. Households determine their supply of loanable funds not only on the basis of the general level of interest rates and their total wealth, but also on the risk of securities investments. The greater the perceived risk of securities investments, the less households are willing to invest at each interest rate. Further, the supply of loanable funds from households also depends on their immediate spending needs. For example, near-term educational or medical expenditures will reduce the supply of funds from a given household.

Higher interest rates will also result in higher supplies of funds from the U.S. business sector ($23.20 trillion from nonfinancial business and $85.91 trillion from financial business in 2016), which often has excess cash, or working capital, that it can invest for short periods of time in financial assets. In addition to the interest rates on these investments, the expected risk on financial securities and their businesses' future investment needs will affect their overall supply of funds.

Loanable funds are also supplied by some governments ($5.22 trillion in 2016). For example, some governments (e.g., municipalities) temporarily generate more cash inflows (e.g., through local taxes) than they have budgeted to spend. These funds can be loaned out to financial market fund users until needed. During the recent financial crisis, the federal government significantly increased the funds it supplied to businesses and consumers as it attempted to rescue the U.S. economy from a deep economic recession (see Appendix 1A).

Finally, foreign investors increasingly view U.S. financial markets as alternatives to their domestic financial markets ($23.03 trillion of funds were supplied to the U.S. financial markets in 2016). When interest rates are higher on U.S. financial securities than they are on comparable securities in their home countries, foreign investors increase their supply of funds to U.S. markets. Indeed the high savings rates of foreign households (such as Japanese households) has resulted in foreign market participants being major suppliers of funds to U.S. financial markets in recent years. Similar to domestic suppliers of loanable funds, foreigners assess not only the interest rate offered on financial securities, but also their total wealth, the risk on the security, and their future expenditure needs. Additionally, foreign investors alter their investment decisions as financial conditions in their home countries change relative to the U.S. economy and the exchange rate of their country's currency changes vis-à-vis the U.S. dollar (see Chapter 9). For example, during the recent financial crisis, investors worldwide, searching for a safe haven for their funds, invested huge amounts of funds in U.S. Treasury securities. The amount of money invested in Treasury bills from this "flight to quality" was so large that the yield on the three-month Treasury bill went below zero for the first time ever. Investors were essentially paying the U.S. government to borrow money.

LG 2-2

## *Demand for Loanable Funds*

The *demand for loanable funds* is a term used to describe the total net demand for funds by fund users. In general, the quantity of loanable funds demanded is higher as interest rates fall. Figure 2–2 also illustrates the demand curve for loanable funds. Other factors held constant, more funds are demanded as interest rates decrease (the cost of borrowing funds is lower).

Households (although they are net suppliers of funds) also borrow funds in financial markets ($14.51 trillion in 2016). The demand for loanable funds by households reflects the demand for financing purchases of homes (with mortgage loans), durable goods (e.g., car loans, appliance loans), and nondurable goods (e.g., education loans, medical loans). Additional nonprice conditions and requirements (discussed below) also affect a household's demand for loanable funds at every level of interest rates.

Businesses demand funds to finance investments in long-term (fixed) assets (e.g., plant and equipment) and for short-term working capital needs (e.g., inventory and accounts receivable) usually by issuing debt and other financial instruments ($55.85 trillion for nonfinancial businesses and $96.90 trillion for financial businesses in 2016). When interest rates are high (i.e., the cost of loanable funds is high), businesses prefer to finance investments with internally generated funds (e.g., retained earnings) rather than through borrowed funds. Further, the greater the number of profitable projects available to businesses, or the better the overall economic conditions, the greater the demand for loanable funds.

www.ustreas.gov

Governments also borrow heavily in the markets for loanable funds ($23.19 trillion in 2016). For example, state and local governments often issue debt instruments to finance temporary imbalances between operating revenues (e.g., taxes) and budgeted expenditures (e.g., road improvements, school construction). Higher interest rates can cause state and local governments to postpone borrowings and thus capital expenditures. Similar to households and businesses, governments' demand for funds varies with general economic conditions. The federal government is also a large borrower partly to finance current budget deficits (expenditures greater than taxes) and partly to finance past deficits. The cumulative sum of past deficits is called the national debt, which in the United States in 2016 stood at a record $19.21 trillion. Thus, the national debt and especially the interest payments on the national debt have to be financed in large part by additional government borrowing. Chapter 4 provides details of how government borrowing and spending impacts interest rates as well as overall economic growth.

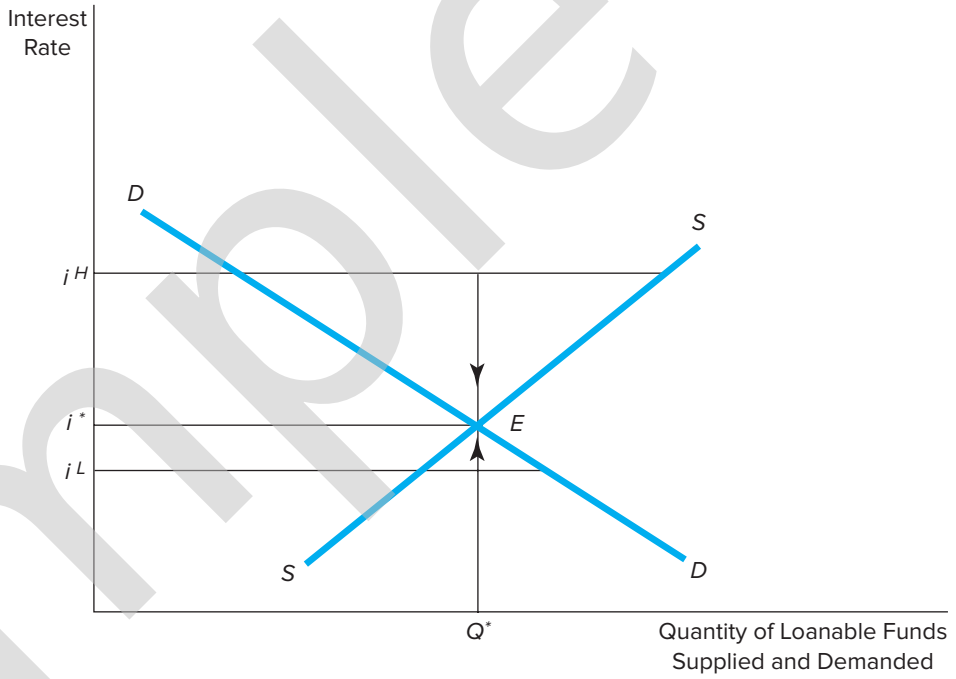
Finally, foreign participants (households, businesses, and governments) also borrow in U.S. financial markets ($17.24 trillion in 2016). Foreign borrowers look for the cheapest source of dollar funds globally. Most foreign borrowing in U.S. financial markets comes from the business sector. In addition to interest costs, foreign borrowers consider nonprice terms on loanable funds as well as economic conditions in their home country and the general attractiveness of the U.S. dollar relative to their domestic currency (e.g., the euro or the yen). In Chapter 9, we examine how economic growth in domestic versus foreign countries affects foreign exchange rates and foreign investors' demand and supply for funds.

LG 2-3

## *Equilibrium Interest Rate*

The aggregate supply of loanable funds is the sum of the quantity supplied by the separate fund supplying sectors (e.g., households, businesses, governments, foreign agents) discussed above. Similarly, the aggregate demand for loanable funds is the sum of the quantity demanded by the separate fund demanding sectors. As illustrated in Figure 2–3, the aggregate quantity of funds supplied is positively related to interest rates, while the aggregate quantity of funds demanded is inversely related to interest rates. As long as competitive forces are allowed to operate freely in a financial system, the interest rate that equates the aggregate quantity of loanable funds supplied with the aggregate quantity of loanable funds demanded for a financial security, $Q^*$, is the equilibrium interest rate for that security, $i^*$, point $E$ in Figure 2–3. For example, whenever the rate of interest is set higher than the equilibrium rate, such as $i^H$, the financial system has a surplus of loanable funds. As a result, some suppliers of funds will lower the interest rate at which they are willing to lend and the demanders of funds will absorb the loanable funds surplus. In contrast, when the rate of interest is lower than the equilibrium interest rate, such as $i^L$, there is a shortage of loanable funds in the financial system. Some borrowers will be unable to obtain the funds they need at current rates. As a result, interest rates will increase, causing more suppliers of loanable funds to enter the market and some demanders of funds to leave the market. These

**Figure 2–3** **Determination of Equilibrium Interest Rates**




competitive forces will cause the quantity of funds supplied to increase and the quantity of funds demanded to decrease until a shortage of funds no longer exists.

LG 2-4

## *Factors That Cause the Supply and Demand Curves for Loanable Funds to Shift*

While we have alluded to the fundamental factors that cause the supply and demand curves for loanable funds to shift, in this section we formally summarize these factors. We then examine how shifts in the supply and demand curves for loanable funds determine the equilibrium interest rate on a specific financial instrument. A shift in the supply or demand curve occurs when the quantity of a financial security supplied or demanded changes at every given interest rate in response to a change in another factor besides the interest rate. In either case, a change in the supply or demand curve for loanable funds causes interest rates to move. Table 2–2 recaps the factors that affect the supply and demand for loanable funds discussed in this section, their impact on the supply and demand for loanable funds for a specific security, and the impact on the market clearing (or equilibrium) interest rates holding all other factors constant.

**Supply of Funds.** We have already described the positive relation between interest rates and the supply of loanable funds along the loanable funds supply curve. Factors that cause the supply curve of loanable funds to shift, at any given interest rate, include the wealth of fund suppliers, the risk of the financial security, near-term spending needs, monetary policy objectives, and economic conditions.

*Wealth.* As the total wealth of financial market participants (households, businesses, etc.) increases, the absolute dollar value available for investment purposes increases. Accordingly, at every interest rate, the supply of loanable funds increases, or the supply curve shifts down and to the right. For example, as the U.S. economy grew in the early and mid-2010s, total wealth of U.S. investors increased as well. Consequently, the supply of funds available for investing (e.g., in stock and bond markets) increased at

**TABLE 2–2 Factors That Affect the Supply of and Demand for Loanable Funds for a Financial Security**

| Panel A: The supply of funds | | |
|---|---|---|
| **Factor** | **Impact on Supply of Funds** | **Impact on Equilibrium Interest Rate*** |
| Interest rate | Movement along the supply curve | Direct |
| Total wealth | Shift supply curve | Inverse |
| Risk of financial security | Shift supply curve | Direct |
| Near-term spending needs | Shift supply curve | Direct |
| Monetary expansion | Shift supply curve | Inverse |
| Economic conditions | Shift supply curve | Inverse |
| **Panel B: The demand for funds** | | |
| **Factor** | **Impact on Demand for Funds** | **Impact on Equilibrium Interest Rate** |
| Interest rate | Movement along the demand curve | Direct |
| Utility derived from asset purchased with borrowed funds | Shift demand curve | Direct |
| Restrictiveness of nonprice conditions | Shift demand curve | Inverse |
| Economic conditions | Shift demand curve | Direct |

*A "direct" impact on equilibrium interest rates means that as the "factor" increases (decreases) the equilibrium interest rate increases (decreases). An "inverse" impact means that as the factor increases (decreases) the equilibrium interest rate decreases (increases).

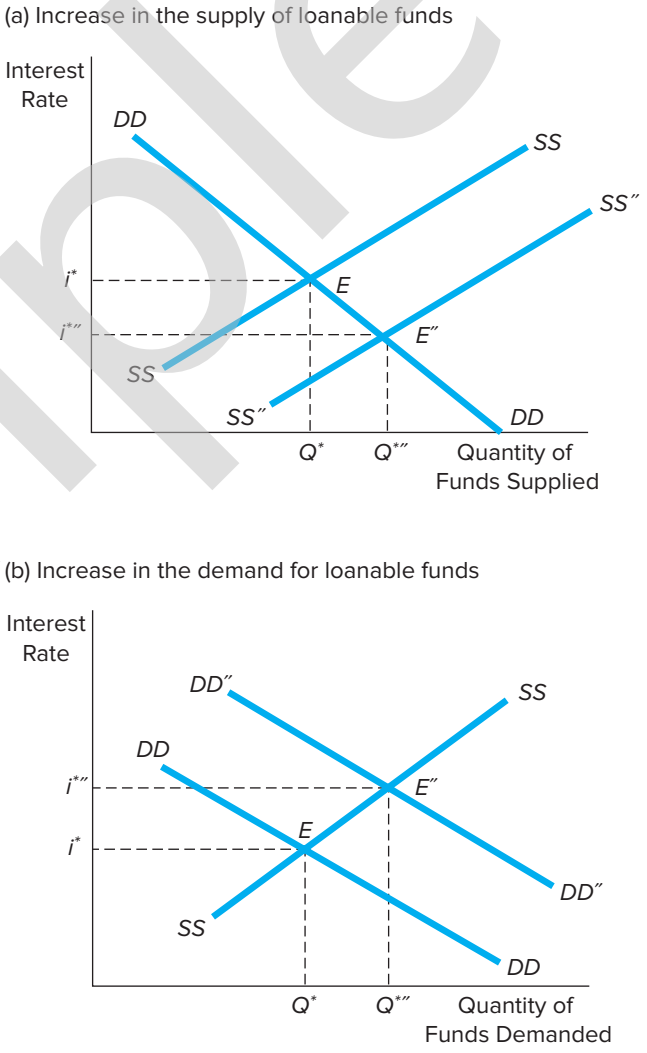
every available interest rate. We show this shift (increase) in the supply curve in Panel a of Figure 2–4 as a move from $SS$ to $SS''$. The shift in the supply curve creates a disequilibrium between demand and supply. To eliminate the imbalance or disequilibrium in this financial market, the equilibrium interest rate falls, from $i^*$ to $i^{*''}$, which is associated with an increase in the quantity of funds loaned between fund suppliers and fund demanders from $Q^*$ to $Q^{*''}$.

Conversely, as the total wealth of financial market participants decreases, the absolute dollar value available for investment purposes decreases. Accordingly, at every interest rate, the supply of loanable funds decreases, or the supply curve shifts up and to the left. The decrease in the supply of funds due to a decrease in the total wealth of market participants results in an increase in the equilibrium interest rate and a decrease in the equilibrium quantity of funds loaned (traded).

*Risk.* As the risk of a financial security decreases (e.g., the probability that the issuer of the security will default on promised repayments of the funds borrowed), it becomes more attractive to suppliers of funds. At every interest rate, the supply of loanable funds increases, or the supply curve shifts down and to the right, from $SS$ to $SS''$ in Panel a of Figure 2–4. Holding all other factors constant, the increase in the supply of funds, due to a decrease in the risk of the financial security, results in a decrease in the equilibrium interest rate, from $i^*$ to $i^{*''}$, and an increase in the equilibrium quantity of funds traded, from $Q^*$ to $Q^{*''}$.

Conversely, as the risk of a financial security increases, it becomes less attractive to suppliers of funds. Accordingly, at every interest rate, the supply of loanable funds decreases, or the supply curve shifts up and to the left. Holding all other factors constant, the decrease in the supply of funds due to an increase in the financial security's risk results in an increase in the equilibrium interest rate and a decrease in the equilibrium quantity of funds loaned (or traded). For example, during the financial crisis, the

**Figure 2–4** **The Effect on Interest Rates from a Shift in the Supply Curve of or Demand Curve for Loanable Funds**




Baa corporate bond rates spiked and 10-year T-note rates dropped significantly as suppliers of funds moved away from riskier investments (Baa corporate bonds) to the safest possible investments (Treasury notes). In the loanable funds framework, this can be interpreted as a reduction in the supply of funds, due to investor uncertainty about credit quality of firms in the corporate bond market and as an increase in the supply of funds in the Treasury notes market, as investors fled to quality investments. Consequently, the equilibrium interest rate was higher in the corporate bond market and lower in the Treasury notes market.

*Near-Term Spending Needs.* When financial market participants have few near-term spending needs, the absolute dollar value of funds available to invest increases. For example, when a family's son or daughter moves out of the family home to live on his or her own, current spending needs of the family decrease and the supply of available funds (for investing) increases. At every interest rate, the supply of loanable funds increases, or the supply curve shifts down and to the right. The financial market, holding all other factors constant, reacts to this increased supply of funds by decreasing the equilibrium interest rate and increasing the equilibrium quantity of funds traded.

Conversely, when financial market participants have increased near-term spending needs, the absolute dollar value of funds available to invest decreases. At every interest rate, the supply of loanable funds decreases, or the supply curve shifts up and to the left. The shift in the supply curve creates a disequilibrium in the financial market that results in an increase in the equilibrium interest rate and a decrease in the equilibrium quantity of funds loaned (or traded).

www.federalreserve.gov

*Monetary Expansion.* One method used by the Federal Reserve to implement monetary policy is to alter the availability of funds, the growth in the money supply, and thus the rate of economic expansion of the economy (we explain this process in detail in Chapter 4). When monetary policy objectives are to allow the economy to expand (as was the case in the late 2000s, during the financial crisis, and in the early 2010s), the Federal Reserve increases the supply of funds available in the financial markets. At every interest rate, the supply of loanable funds increases, the supply curve shifts down and to the right, and the equilibrium interest rate falls, while the equilibrium quantity of funds traded increases.

Conversely, when monetary policy objectives are to restrict the rate of economic expansion (and thus inflation), the Federal Reserve decreases the supply of funds available in the financial markets. At every interest rate, the supply of loanable funds decreases, the supply curve shifts up and to the left, and the equilibrium interest rate rises, while the equilibrium quantity of funds loaned or traded decreases.

*Economic Conditions.* Finally, as the underlying economic conditions themselves (e.g., the inflation rate, unemployment rate, economic growth) improve in a country relative to other countries, the flow of funds to that country increases. This reflects the lower risk (country or sovereign risk) that the country, in the guise of its government, will default on its obligation to repay funds borrowed. For example, the severe economic crisis in Greece in the early 2010s resulted in a decrease in the supply of funds to that country. An increased inflow of foreign funds to U.S. financial markets increases the supply of loanable funds at every interest rate and the supply curve shifts down and to the right. Accordingly, the equilibrium interest rate falls and the equilibrium quantity of funds loaned or traded increases.

Conversely, when economic conditions in foreign countries improve, domestic and foreign investors take their funds out of domestic financial markets (e.g., the United States) and invest abroad. Thus, the supply of funds available in the financial markets decreases and the equilibrium interest rate rises, while the equilibrium quantity of funds traded decreases.

**Demand for Funds.** We explained above that the quantity of loanable funds demanded is negatively related to interest rates. Factors that cause the demand curve for loanable funds to shift include the utility derived from assets purchased with borrowed funds, the restrictiveness of nonprice conditions on borrowing, and economic conditions.

*Utility Derived from Assets Purchased with Borrowed Funds.* As the utility (i.e., satisfaction or pleasure) derived from an asset purchased with borrowed funds increases, the willingness of market participants (households, businesses, etc.) to borrow increases and the absolute dollar value borrowed increases. Accordingly, at every interest rate, the demand for loanable funds increases, or the demand curve shifts up and to the right. For example, suppose a change in jobs takes an individual from Arizona to Minnesota. The individual currently has a convertible automobile. Given the move to Minnesota, the individual's utility from the convertible decreases, while it would increase for a car with heated seats. Thus, with a potential increased utility from the purchase of a new car, the individual's demand for funds in the form of an auto loan increases. We show this shift (increase) in the demand curve in Panel b of Figure 2–4 as a move from $DD$ to $DD''$. The shift in the demand curve creates a disequilibrium in this financial market. Holding all other factors constant, the increase in the demand for funds due to an increase in the utility from the

purchased asset results in an increase in the equilibrium interest rate, from $i^*$ to $i^{*\prime\prime}$, and an increase in the equilibrium quantity of funds traded, from $Q^*$ to $Q^{*\prime\prime}$.

Conversely, as the utility derived from an asset purchased with borrowed funds decreases, the willingness of market participants (households, businesses, etc.) to borrow decreases and the absolute dollar amount borrowed decreases. Accordingly, at every interest rate, the demand for loanable funds decreases, or the demand curve shifts down and to the left. The shift in the demand curve again creates a disequilibrium in this financial market. As competitive forces adjust, and holding all other factors constant, the decrease in the demand for funds due to a decrease in the utility from the purchased asset results in a decrease in the equilibrium interest rate and a decrease in the equilibrium quantity of funds loaned or traded.

*Restrictiveness of Nonprice Conditions on Borrowed Funds.* As the nonprice restrictions put on borrowers as a condition of borrowing decrease, the willingness of market participants to borrow increases and the absolute dollar value borrowed increases. Such nonprice conditions may include fees, collateral, or requirements or restrictions on the use of funds (so-called restrictive covenants; see Chapter 6). The lack of such restrictions makes the loan more desirable to the user of funds. Accordingly, at every interest rate, the demand for loanable funds increases, or the demand curve shifts up and to the right, from $DD$ to $DD''$. As competitive forces adjust, and holding all other factors constant, the increase in the demand for funds due to a decrease in the restrictive conditions on the borrowed funds results in an increase in the equilibrium interest rate, from $i^*$ to $i^{*\prime\prime}$, and an increase in the equilibrium quantity of funds traded, from $Q^*$ to $Q^{*\prime\prime}$.

Conversely, as the nonprice restrictions put on borrowers as a condition of borrowing increase, market participants' willingness to borrow decreases, and the absolute dollar value borrowed decreases. Accordingly, the demand curve shifts down and to the left. The shift in the demand curve results in a decrease in the equilibrium interest rate and a decrease in the equilibrium quantity of funds traded.

**DO YOU UNDERSTAND:**

1. *Who the main suppliers of loanable funds are?*
2. *Who the major demanders of loanable funds are?*
3. *What happens to the equilibrium interest rate when the demand for loanable funds increases?*
4. *What happens to the equilibrium interest rate when the supply of loanable funds increases?*
5. *How supply and demand, together, determine interest rates?*

*Economic Conditions.* When the domestic economy experiences a period of growth, such as that in the United States in the mid-2000s and early 2010s, market participants are willing to borrow more heavily. For example, state and local governments are more likely to repair and improve decaying infrastructure when the local economy is strong. Accordingly, the demand curve for funds shifts up and to the right. Holding all other factors constant, the increase in the demand for funds due to economic growth results in an increase in the equilibrium interest rate and an increase in the equilibrium quantity of funds traded.

Conversely, when domestic economic growth is stagnant, market participants reduce their demand for funds. Accordingly, the demand curve shifts down and to the left, resulting in a decrease in the equilibrium interest rate and a decrease in the equilibrium quantity of funds traded.

## MOVEMENT OF INTEREST RATES OVER TIME

**LG 2-5**

As discussed in the previous section of this chapter, the loanable funds theory of interest rates is based on the supply of and demand for loanable funds as functions of interest rates. The equilibrium interest rate (point $E$ in Figure 2–4) is only a temporary equilibrium. Changes in underlying factors that determine the demand for and supply of loanable funds can cause continuous shifts in the supply and/or demand curves for loanable funds. Market forces will react to the resulting disequilibrium with a change in the equilibrium interest rate and quantity of funds traded in that market. Refer again to Panel a of Figure 2–4, which shows the effects of an *increase in the supply curve* for loanable

funds, from *SS* to *SS″* (and the resulting *decrease in the equilibrium interest rate,* from $i^*$ to $i^{*\prime\prime}$), while Panel b of Figure 2–4 shows the effects of an *increase in the demand curve* for loanable funds, from *DD* to *DD″* (and the resulting *increase in the equilibrium interest rate,* from $i^*$ to $i^{*\prime\prime}$).

## DETERMINANTS OF INTEREST RATES FOR INDIVIDUAL SECURITIES

LG 2-6

So far we have looked at the general determination of equilibrium (nominal) interest rates for financial securities in the context of the loanable demand and supply theory of the flow of funds. In this section, we examine the specific factors that affect differences in interest rates across the range of real-world financial markets (i.e., differences among interest rates on individual securities, given the underlying level of interest rates determined by the demand and supply of loanable funds). These factors include inflation, the "real" risk-free rate, default risk, liquidity risk, special provisions regarding the use of funds raised by a security's issuance, and the term to maturity of the security. We examine each of these factors in this section and summarize them in Table 2–3.

### Inflation

**inflation**

*The continual increase in the price level of a basket of goods and services.*

The first factor to affect interest rates is *actual or expected inflation* in the economy. **Inflation** of the general price index of goods and services (*IP*) is defined as the (percentage) increase in the price of a standardized basket of goods and services over a given period of time. The higher the level of actual or expected inflation, the higher will be the level of interest rates. The intuition behind the positive relationship between interest rates and inflation rates is that an investor who buys a financial asset must earn a higher interest rate when inflation increases to compensate for the increased cost of forgoing consumption of real goods and services today and buying these more highly priced goods and services in the future. In other words, the higher the rate of inflation, the more expensive the same basket of goods and services will be in the future. In the United States, inflation is measured using indexes such as the consumer price index (*CPI*) and the producer price index (*PPI*). For example, the annual inflation rate using the CPI index between years $t$ and $t + 1$ would be equal to:

$$\text{Inflation } (IP) = \frac{CPI_{t+1} - CPI_t}{CPI_t} \times 100$$

**real risk-free rate**

*The risk-free rate that would exist on a default-free security if no inflation were expected.*

### Real Risk-Free Rates

A **real risk-free rate** is the interest rate that would exist on a risk-free security if no inflation were expected over the holding period (e.g., a year) of a security. The real risk-free

**TABLE 2–3 Factors Affecting Nominal Interest Rates**

**Inflation—**the continual increase in the price level of a basket of goods and services.
**Real risk-free rate—**nominal risk-free rate that would exist on a security if no inflation were expected.
**Default risk—**risk that a security issuer will default on the security by missing an interest or principal payment.
**Liquidity risk—**risk that a security cannot be sold at a predictable price with low transaction costs at short notice.
**Special provisions—**provisions (e.g., taxability, convertibility, and callability) that impact the security holder beneficially or adversely and as such are reflected in the interest rates on securities that contain such provisions.
**Term to maturity—**length of time a security has until maturity.

rate on an investment is the percentage change in the buying power of a dollar. As such, it measures society's relative time preference for consuming today rather than tomorrow. The higher society's preference to consume today (i.e., the higher its time value of money or rate of time preference), the higher the real risk-free rate (*RFR*) will be.

**Fisher Effect.** The relationship among the real risk-free rate (*RFR*), the expected rate of inflation [*E*(*IP*)], described above, and the nominal interest rate (*i*) is often referred to as the Fisher effect, named for the economist Irving Fisher, who identified these relationships early last century. The Fisher effect theorizes that nominal risk-free rates observed in financial markets (e.g., the one-year Treasury bill rate) must compensate investors for (1) any reduced purchasing power on funds lent (or principal lent) due to inflationary price changes and (2) an additional premium above the expected rate of inflation for forgoing present consumption (which reflects the real risk-free rate discussed above), or

$$(1 + i) = [1 + E(IP)](1 + RFR)$$

Rearranging this relation, when an investor purchases a security that pays interest, the nominal risk-free rate exceeds the real risk-free rate because of inflation.

$$i = RFR + E(IP) + [RFR \times E(IP)]$$

where $RFR \times E(IP)$ is the inflation premium for the loss of purchasing power on the promised nominal risk-free rate payments due to inflation. For small values of *RFR* and *E*(*IP*) this term is negligible.

Thus, the Fisher effect formula is often written as:

$$i = RFR + E(IP) \tag{2-1}$$

The approximation formula, in Equation (2-1), assumes $RFR \times E(IP)$ is small. Thus, the nominal risk-free rate will be equal to the real risk-free rate only when market participants expect the inflation rate to be zero—$E(IP) = 0$. Similarly, nominal risk-free rates will be equal to the expected inflation rate only when real risk-free rates are zero. Note that we can rearrange the nominal risk-free rate equation to show the determinants of the real risk-free rate as follows:

$$RFR = i - E(IP) \tag{2-2}$$

## EXAMPLE 2–1 Calculations of Real Risk-Free Rates

The one-year Treasury bill rate in 2007 averaged 4.53 percent and inflation (measured by the consumer price index) for the year was 4.10 percent. If investors had expected the same inflation rate as that actually realized (i.e., 4.10 percent), then according to the Fisher effect the real risk-free rate for 2007 was:

$$4.53\% - 4.10\% = 0.43\%$$

The one-year T-bill rate in 2015 was 0.32 percent, while the CPI change for the year was 0.70 percent. This implies a real risk-free rate of −0.38 percent, that is, the real risk-free rate was actually negative.

stats.bls.gov/cpi/home.htm

Panel a of Figure 2–5 shows the nominal risk-free rate (one-year T-bill rate) versus the change in the CPI from 1962 through 2016. Panel b shows the difference in the two rates (i.e., the real risk-free rate over the period). Because the expected inflation rate is difficult to estimate accurately, the real risk-free rate can be difficult to estimate accurately as well, since investors' expectations are not always realized. Figure 2–5 shows the realized inflation and real risk-free rates.

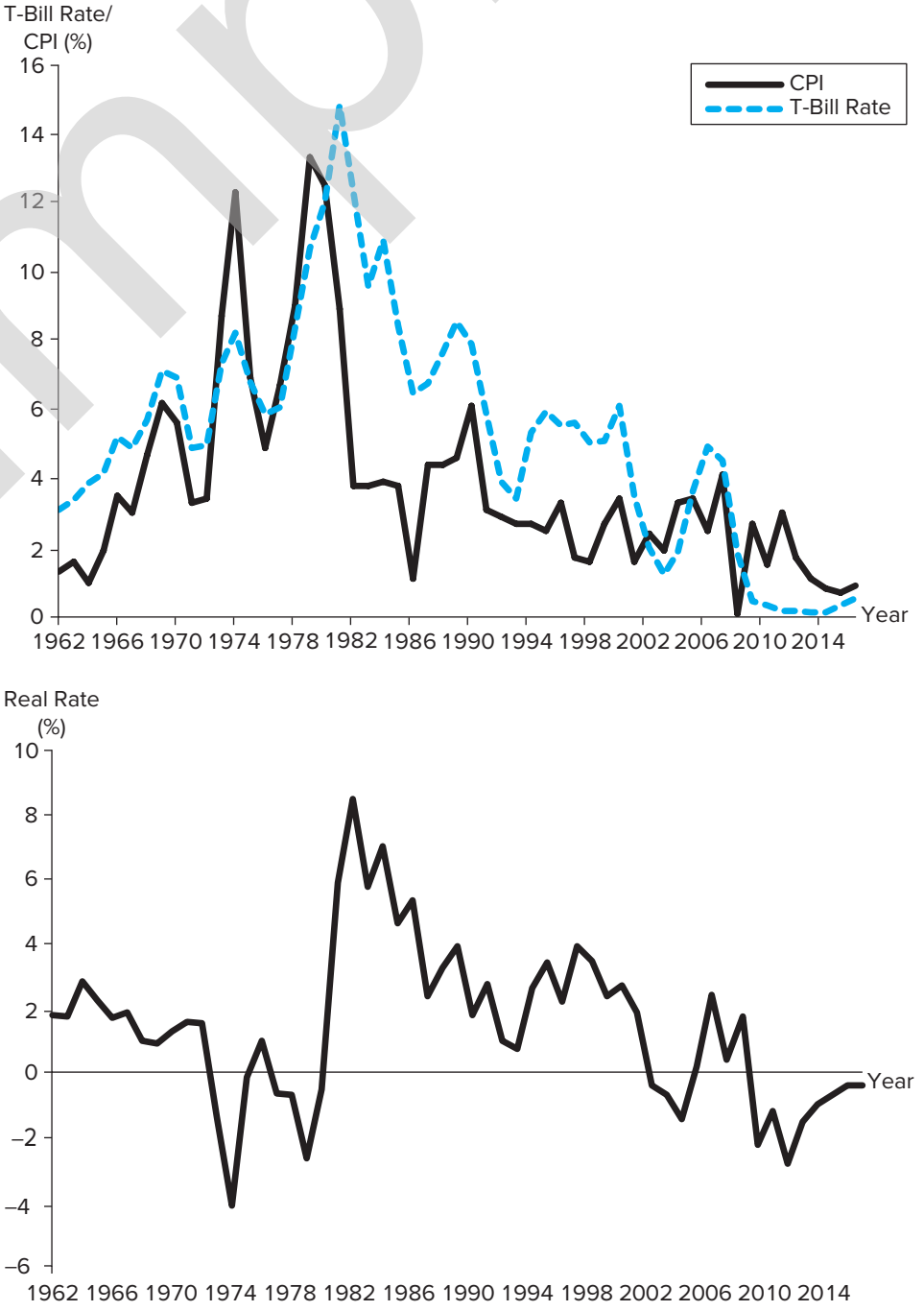
**default risk**

*The risk that a security issuer will default on that security by being late on or missing an interest or principal payment.*

## *Default or Credit Risk*

**Default risk** is the risk that a security issuer will fail to make its promised interest and principal payments to the buyer of a security. The higher the default risk, the higher the interest rate that will be demanded by the buyer of the security to compensate him or her for this default (or credit) risk exposure. Not all securities exhibit default risk. For example, U.S. Treasury securities are regarded as having no default risk since they

**Figure 2–5** Nominal Interest Rates versus Inflation




**Sources:** Federal Reserve Board website and U.S. Department of Labor website, May 2016. www.federalreserve.gov and stats.bls.gov/cpi/home.htm

are issued by the U.S. government, and the probability of the U.S. government defaulting on its debt payments is practically zero given its taxation powers and its ability to print currency. Some borrowers, however, such as corporations or individuals, have less predictable cash flows (and no taxation powers), and therefore investors charge them an interest rate risk premium reflecting their perceived probability of default and the potential recovery of the amount loaned. The difference between a quoted interest rate on a security (security $j$) and a Treasury security with similar maturity, liquidity, tax, and other features (such as callability or convertibility) is called a *default* or *credit risk premium* ($DRP_j$). That is:

$$DRP_j = i_{jt} - i_{Tt} \tag{2-3}$$

where

$i_{jt}$ = interest rate on a security issued by a non-Treasury issuer (issuer $j$) of maturity $m$ at time $t$

$i_{Tt}$ = interest rate on a security issued by the U.S. Treasury of maturity $m$ at time $t$

**www.moodys.com**

**www.standardandpoors.com**

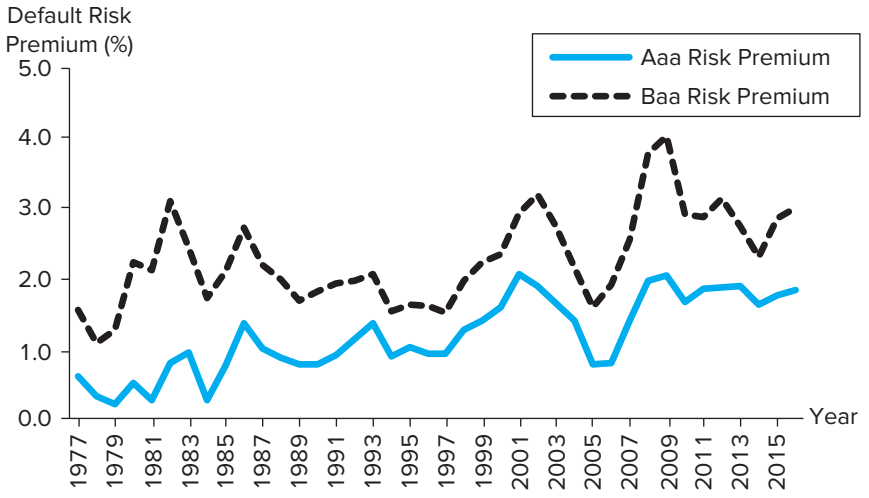
The default risk on many corporate bonds is evaluated and categorized by various bond rating agencies such as Moody's and Standard & Poor's. (We discuss these ratings in more detail in Chapter 6.)

In May 2016, the 10-year Treasury interest rate, or yield, was 1.77 percent. On Aaa-rated and Baa-rated corporate debt, interest rates were 3.61 and 4.78 percent, respectively. Thus, the average default risk premiums on the Aaa-rated and Baa-rated corporate debt were:

$$DRP_{Aaa} = 3.61\% - 1.77\% = 1.84\%$$
$$DRP_{Baa} = 4.78\% - 1.77\% = 3.01\%$$

Figure 2–6 presents these risk premiums from 1977 through 2016. Notice from this figure and Figure 2–5 that default risk premiums tend to increase when the economy is contracting and decrease when the economy is expanding. For example, from 2008 to 2009 real risk-free rates (T-bills/CPI in Figure 2–5) decreased from 1.73 percent to −2.23 percent. Over the same period, default risk premiums on Aaa-rated bonds increased from 1.97 percent to 2.05 percent and on Baa-rated bonds from 3.78 percent to 4.03 percent. Conversely, from 2009 to 2010, the real risk-free rate increased from −2.23 percent to −1.18 percent. Over this period, default risk premiums on Aaa-rated bonds decreased from 2.05 percent to 1.67 percent and on Baa-rated bonds from 4.03 percent to 2.92 percent.

**Figure 2–6** **Default Risk Premium on Corporate Bonds**




**Source:** Federal Reserve Board website, May 2016. www.federalreserve.gov

### Liquidity Risk

**liquidity risk**

*The risk that a security can be sold at a predictable price with low transaction costs on short notice.*

A highly liquid asset is one that can be sold at a predictable price with low transaction costs and thus can be converted into its full market value at short notice. If a security is illiquid, investors add a **liquidity risk** premium (LRP) to the interest rate on the security that reflects its relative liquidity. In the United States, liquid markets exist for most government securities and the stocks and some bonds issued by large corporations. Many bonds, however, do not trade on a regular basis or on organized exchanges such as the NYSE. As a result, if investors wish to sell these bonds quickly, they may get a lower price than they could have received if they had waited until maturity to sell the bonds. Consequently, investors demand a liquidity premium on top of all other premiums to compensate for the bond's lack of liquidity and the potential price discount from selling it early. Thus, the liquidity risk premium might also be thought of as an "illiquidity" premium.

A different type of liquidity risk premium may also exist (see below) if investors dislike long-term securities because their prices (present values) are more sensitive to interest rate changes than short-term securities (see Chapter 3). In this case, a higher liquidity risk premium may be added to a security with a longer maturity simply because of its greater exposure to price risk (loss of capital value) on the security as interest rates change.

### Special Provisions or Covenants

Numerous special provisions or covenants that may be written into the contract underlying a security also affect the interest rates on different securities (see Chapter 6). Some of these special provisions include the security's taxability, convertibility, and callability.

For example, for investors, interest payments on municipal securities are free of federal, state, and local taxes. Thus, the interest rate required by a municipal bond holder is smaller than that on a comparable taxable bond—for example, a Treasury bond, which is taxable at the federal level but not at the state or local (city) levels, or a corporate bond, whose interest payments are taxable at the state and local levels as well as federal levels.

A convertible (special) feature of a security offers the holder the opportunity to exchange one security for another type of the issuer's securities at a preset price. Because of the value of this conversion option, the convertible security holder requires a lower interest rate than a comparable nonconvertible security holder (all else equal). In general, special provisions that provide benefits to the security holder (e.g., tax-free status and convertibility) are associated with lower interest rates, and special provisions that provide benefits to the security issuer (e.g., callability, by which an issuer has the option to retire—call—a security prior to maturity at a preset price) are associated with higher interest rates.

### Term to Maturity

**term structure of interest rates**

*A comparison of market yields on securities, assuming all characteristics except maturity are the same.*

Interest rates are also related to the term to maturity of a security.[2] This relationship is often called the **term structure of interest rates** or the yield curve. The term structure of interest rates compares interest rates on securities, assuming that all characteristics (i.e., default risk, liquidity risk) *except maturity* are the same. The change in required interest rates as the maturity of a security changes is called the maturity premium (MP). The MP, or the difference between the required yield on long- and short-term securities of the same characteristics except maturity can be positive, negative, or zero. The term structure of interest rates for U.S. Treasury securities is the most frequently reported and analyzed yield curve. The shape of the yield curve on Treasury securities has taken many forms over

2. As we discuss in Chapter 3, only debt securities have an identifiable maturity date; equity securities do not.

**Figure 2–7** **Common Shapes for Yield Curves on Treasury Securities**


**Source:** U.S. Treasury, Daily Treasury Yield Curves, various dates. www.ustreas.gov



the years, but the three most common shapes are shown in Figure 2–7. In Panel a, the yield curve on May 4, 2016, yields rise steadily with maturity when the yield curve is upward sloping. This is the most common yield curve, so that on average the MP is positive. Panel b shows an inverted or downward-sloping yield curve, reported on November 24, 2000, for which yields decline as maturity increases. Inverted yield curves do not generally last very long. Finally, Panel c shows a flat yield curve, reported on June 4, 2007, in which the yield is virtually unaffected by the term to maturity.

Note that these yield curves may reflect factors other than investors' preferences for the maturity of a security, since in reality there may be liquidity differences among the securities traded at different points along the yield curve. For example, yields on newly issued 30-year Treasury bonds may be less than yields on (seasoned issues) 10-year Treasury bonds if investors prefer new ("on the run") securities to previously issued ("off the run") securities. Specifically, since (historically) the Treasury issues new 10-year notes and 30-year bonds only at the long end of the maturity spectrum, an existing 10-year Treasury bond would have to have been issued 20 years previously (i.e., it was originally a 30-year bond when it was issued 20 years previously). The increased demand for the newly issued "liquid" 30-year Treasury bonds relative to the less liquid 10-year Treasury bonds can be large enough to push the equilibrium interest rate on the 30-year Treasury bonds below that on the 10-year Treasury bonds and even below short-term rates. In the next section, we review three major theories that are often used to explain the shape of the yield curve.

Putting the factors that impact interest rates in different markets together, we can use the following general equation to determine the factors that functionally impact the fair interest rate ($i_j$*) on an individual ($j$th) financial security:

$$i_j^* = f(IP, RFR, DRP_j, LRP_j, SCP_j, MP_j) \quad \textbf{(2-4)}$$

where

$IP$ = Inflation premium
$RFR$ = Real risk-free rate
$DRP_j$ = Default risk premium on the $j$th security
$LRP_j$ = Liquidity risk premium on the $j$th security
$SCP_j$ = Special feature premium on the $j$th security
$MP_j$ = Maturity premium on the $j$th security

The first two factors, $IP$ and $RFR$, are common to all financial securities, while the other factors can be unique to each security.

**DO YOU UNDERSTAND:**

6. *What the difference is between inflation and real risk-free rates?*
7. *What should happen to a security's equilibrium interest rate as the security's liquidity risk increases?*
8. *What term structure of interest rates means?*

## TERM STRUCTURE OF INTEREST RATES

LG 2-7

As discussed previously in the context of the maturity premium, the relationship between a security's interest rate and its remaining term to maturity (the term structure of interest rates) can take a number of different shapes. Explanations for the shape of the yield curve fall predominantly into three theories: the unbiased expectations theory, the liquidity premium theory, and the market segmentation theory. Table 2–4 summarizes the theories. We discuss them in detail below. Review again Panel a in Figure 2–7, which presents the Treasury yield curve as of May 4, 2016. As can be seen, the yield curve on this date reflected the normal upward-sloping relationship between yield and maturity.

### *Unbiased Expectations Theory*

According to the unbiased expectations theory of the term structure of interest rates, at a given point in time the yield curve reflects the market's current expectations of future short-term rates. As illustrated in Figure 2–8, the intuition behind the unbiased expectations theory is that if investors have a four-year investment horizon, they could either buy a current, four-year bond and earn the current or spot yield on a four-year bond ($_1R_4$, if held to maturity) each year, or invest in four successive one-year bonds—of which they know only the current one-year spot rate ($_1R_1$), but form expectations of the unknown future one-year

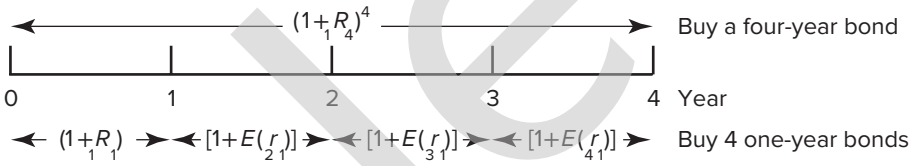
**TABLE 2–4 Explanations for the Shape of the Term Structure of Interest Rates**

**Unbiased expectations theory**—at any given point in time, the yield curve reflects the market's current expectations of future short-term rates. According to the unbiased expectations theory, the return for holding a four-year bond to maturity should equal the expected return for investing in four successive one-year bonds (as long as the market is in equilibrium).

**Liquidity premium theory**—long-term rates are equal to geometric averages of current and expected short-term rates, plus liquidity risk premiums that increase with the security's maturity. Longer maturities on securities mean greater market and liquidity risk. So, investors will hold long-term maturities only when they are offered at a premium to compensate for future uncertainty in the security's value. The liquidity premium increases as maturity increases.

**Market segmentation theory**—assumes that investors do not consider securities with different maturities as perfect substitutes. Rather, individual investors and FIs have preferred investment horizons (habitats) dictated by the nature of the liabilities they hold. Thus, interest rates are determined by distinct supply and demand conditions within a particular maturity segment (e.g., the short end and long end of the bond market).

**Figure 2–8** **Unbiased Expectations Theory of the Term Structure of Interest Rates**




rates [$E({}_2r_1)$, $E({}_3r_1)$, and $E({}_4r_1)$]. Note that each interest rate term has two subscripts, for example, ${}_1R_4$. The first subscript indicates the period in which the security is bought, so that 1 represents the purchase of a security in period 1. The second subscript indicates the maturity on the security, so that 4 represents the purchase of a security with a four-year life. Similarly, $E({}_3r_1)$ is the expected return on a security with a one-year life purchased in period 3.

In equilibrium, the return to holding a four-year bond to maturity should equal the expected return to investing in four successive one-year bonds. If this equality does not hold, an arbitrage opportunity exists. For example, if the investor could earn more on the one-year bond investments, he could short (or sell) the four-year bond, use the proceeds to buy the four successive one-year bonds, and earn a guaranteed profit over the four-year investment horizon. Thus, according to the unbiased expectations theory, if future one-year rates are expected to rise each successive year into the future, then the yield curve will slope upward. Specifically, the current four-year T-bond rate will exceed the three-year bond rate, which will exceed the two-year bond rate, and so on. Similarly, if future one-year rates are expected to remain constant each successive year into the future, then the four-year bond rate will be equal to the three-year bond rate—that is, the term structure of interest rates will remain constant over the relevant time period. Specifically, the unbiased expectations theory posits that current long-term interest rates (${}_1R_N$) are geometric averages of current (${}_1R_1$) and expected *future* $E({}_Nr_1)$ short-term interest rates. The mathematical equation representing this relationship is:

$$(1 + {}_1R_N)^N = (1 + {}_1R_1)(1 + E({}_2r_1)) \ldots (1 + E({}_Nr_1)) \qquad \textbf{(2-5)}$$

therefore:

$${}_1R_N = [(1 + {}_1R_1)(1 + E({}_2r_1)) \ldots (1 + E({}_Nr_1))]^{1/N} - 1$$

where

$${}_1R_N = \text{Actual } N\text{-period rate today (i.e., the first day of year 1)}$$
$$N = \text{Term to maturity, } N = 1, 2, \ldots, 4, \ldots$$
$${}_1R_1 = \text{Actual current one-year rate today}$$
$$E({}_ir_1) = \text{Expected one-year rates for years, } i = 2, 3, 4, \ldots, N \text{ in the future}$$

Notice that uppercase interest rate terms, ${}_1R_t$, are the actual current interest rates on securities purchased today with a maturity of $t$ years. Lowercase interest rate terms, ${}_tr_1$, are estimates of future one-year interest rates starting $t$ years into the future.

## EXAMPLE 2–2 Construction of a Yield Curve Using the Unbiased Expectations Theory of the Term Structure of Interest Rates

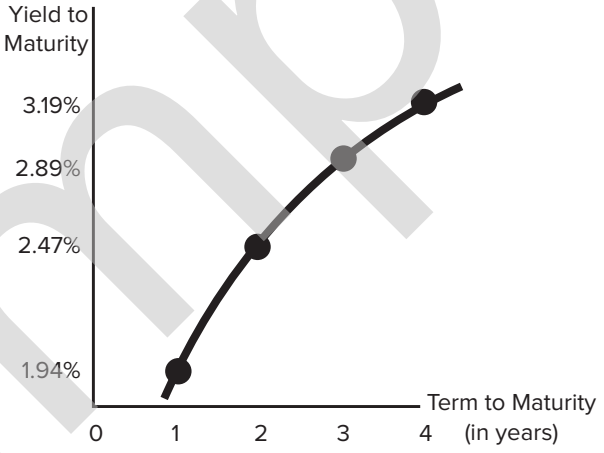
Suppose that the current one-year rate (one-year spot rate) and expected one-year T-bond rates over the following three years (i.e., years 2, 3, and 4, respectively) are as follows:

$${}_1R_1 = 1.94\%, \quad E({}_2r_1) = 3.00\%, \quad E({}_3r_1) = 3.74\%, \quad E({}_4r_1) = 4.10\%$$

Using the unbiased expectations theory, current (or today's) rates for one-, two-, three-, and four-year maturity Treasury securities should be:

$$
\begin{aligned}
{}_1R_1 &= 1.94\% \\
{}_1R_2 &= [(1 + 0.0194)(1 + 0.03)]^{1/2} - 1 = 2.47\% \\
{}_1R_3 &= [(1 + 0.0194)(1 + 0.03)(1 + 0.0374)]^{1/3} - 1 = 2.89\% \\
{}_1R_4 &= [(1 + 0.0194)(1 + 0.03)(1 + 0.0374)(1 + 0.041)]^{1/4} - 1 = 3.19\%
\end{aligned}
$$

and the current yield curve will be upward sloping as shown:




This upward-sloping yield curve reflects the market's expectation of persistently rising one-year (short-term) interest rates over the future horizon.[3]

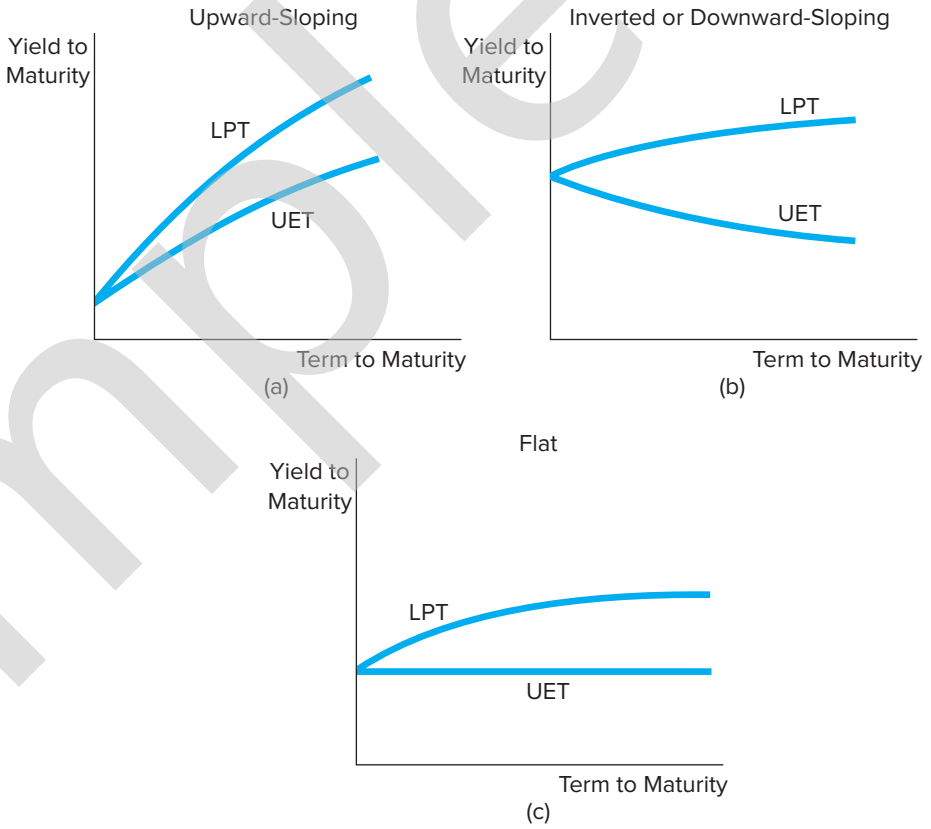
## Liquidity Premium Theory

A weakness of the unbiased expectations theory is that it assumes that investors are equally willing to invest in short-term and long-term securities with no additional reward (in the form of higher interest rates) to compensate them for any added risk from locking in their funds in long-term securities, i.e., it assumes investors are risk neutral. However, with uncertainty about future interest rates (and future monetary policy actions) and hence about future security prices, these instruments become risky in the sense that the return over a future investment period is unknown. In other words, because of future uncertainty of returns, there is a risk in holding long-term securities, and that risk increases with the security's maturity, i.e., investors are risk averse.

The second theory, the liquidity premium theory of the term structure of interest rates, is an extension of the unbiased expectations theory. It is based on the idea that investors will hold long-term maturities only if they are offered at a premium to compensate for future uncertainty in a security's value, which increases with an asset's maturity. Specifically, in a world of uncertainty, short-term securities provide greater marketability (due to their more active secondary market) and have less price risk (due to smaller price fluctuations for a given change in interest rates) than long-term securities. As a result, investors prefer to hold shorter-term securities because they can be converted into cash with little risk of a capital loss (i.e., a fall in the price of the security below its original purchase price). Thus, investors

3. That is, $E({}_4r_1) > E({}_3r_1) > E({}_2r_1) > {}_1R_1$.

**Figure 2–9** **Yield Curve under the Unbiased Expectations Theory (UET) versus the Liquidity Premium Theory (LPT)**




must be offered a liquidity premium to buy longer-term securities which have a higher risk of capital losses. This difference in price or liquidity risk can be directly related to the fact that longer-term securities are more sensitive to interest rate changes in the market than are shorter-term securities—see Chapter 3 for a discussion on bond interest rate sensitivity and the link to a bond's maturity or duration. Because the longer the maturity on a security the greater its risk, the liquidity premium increases as maturity increases.

The liquidity premium theory states that long-term rates are equal to geometric averages of current and expected short-term rates (as under the unbiased expectations theory), plus liquidity risk premiums that increase with the maturity of the security. Figure 2–9 illustrates the differences in the shape of the yield curve under the unbiased expectations theory versus the liquidity premium theory. For example, Panel c of Figure 2–9 shows that according to the liquidity premium theory, an upward-sloping yield curve may reflect investors' expectations that future short-term rates will be flat, but because liquidity premiums increase with maturity, the yield curve will nevertheless be upward sloping. Indeed, an upward-sloping yield curve may reflect expectations that future interest rates will rise (Panel a), be flat (Panel c), or even fall (Panel b), as long as the liquidity premium increases with maturity fast enough to produce an upward-sloping yield curve. The liquidity premium theory may be mathematically represented as:

$$ {}_1R_N = [(1 + {}_1R_1)(1 + E({}_2r_1) + L_2) \ldots (1 + E({}_Nr_1) + L_N)]^{1/N} - 1 \qquad \textbf{(2-6)} $$

where

$L_t$ = Liquidity premium for a period $t$
$L_2 < L_3 < \ldots L_N$

## EXAMPLE 2–3 Construction of a Yield Curve Using the Liquidity Premium Theory of the Term Structure of Interest Rates

Suppose that the current one-year rate (one-year spot rate) and expected one-year T-bond rates over the following three years (i.e., years 2, 3, and 4, respectively) are as follows:

$$_1R_1 = 1.94\%, \quad E(_2r_1) = 3.00\%, \quad E(_3r_1) = 3.74\%, \quad E(_4r_1) = 4.10\%$$

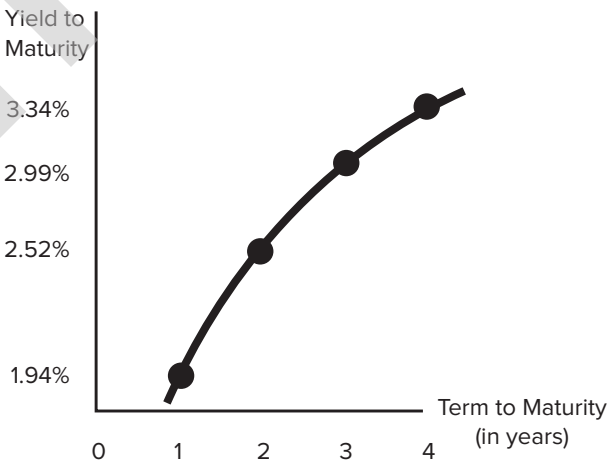
In addition, investors charge a liquidity premium on longer-term securities such that:

$$L_2 = 0.10\%, \quad L_3 = 0.20\%, \quad L_4 = 0.30\%$$

Using the liquidity premium theory, current rates for one-, two-, three-, and four-year maturity Treasury securities should be:

$$_1R_1 = 1.94\%$$
$$_1R_2 = [(1 + 0.0194)(1 + 0.03 + 0.001)]^{1/2} - 1 = 2.52\%$$
$$_1R_3 = [(1 + 0.0194)(1 + 0.03 + 0.001)(1 + 0.0374 + 0.002)]^{1/3} - 1 = 2.99\%$$
$$_1R_4 = [(1 + 0.0194)(1 + 0.03 + 0.001)(1 + 0.0374 + 0.002)(1 + 0.041 + 0.003)]^{1/4} - 1 = 3.34\%$$

and the current yield curve will be upward sloping as shown:




Comparing the yield curves in Example 2–2 and this example, notice that the liquidity premium in year 2 ($L_2 = 0.10\%$) produces a 0.05 percent premium on the yield to maturity on a two-year T-note, the liquidity premium for year 3 ($L_3 = 0.20\%$) produces a 0.10 percent premium on the yield to maturity on the three-year T-note, and the liquidity premium for year 4 ($L_4 = 0.30\%$) produces a 0.15 percent premium on the yield to maturity on the four-year T-note.

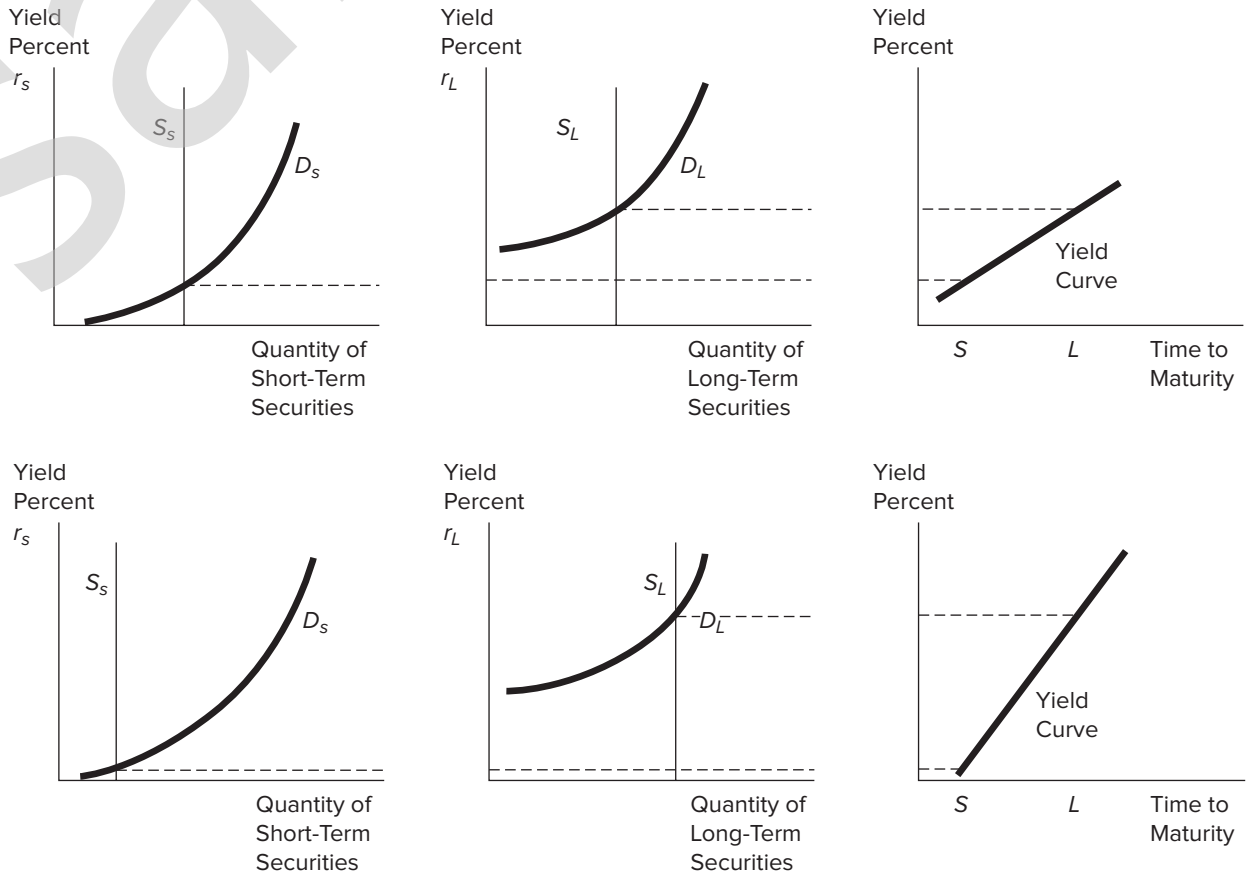
### *Market Segmentation Theory*

www.ustreas.gov

A weakness of both the unbiased expectations and liquidity premium theories is that they assume that investors have no preference when it comes to different maturities and the risks associated with them. The market segmentation theory argues that individual investors and FIs have specific maturity preferences, and to get them to hold securities with maturities other than their most preferred requires a higher interest rate (maturity premium). Accordingly, the market segmentation theory does not consider securities with different maturities

as perfect substitutes. Rather, individual investors and FIs have preferred investment horizons (habitats) dictated by the nature of the liabilities they hold (i.e., investors have complete risk aversion for securities outside their maturity preferences). For example, banks might prefer to hold relatively short-term U.S. Treasury bonds because of the short-term nature of their deposit liabilities, while insurance companies may prefer to hold long-term U.S. Treasury bonds because of the long-term nature of their life insurance contractual liabilities. Accordingly, interest rates are determined by distinct supply and demand conditions within a particular maturity segment (e.g., the short end and long end of the bond market). The market segmentation theory assumes that investors and borrowers are generally unwilling to shift from one maturity sector to another without adequate compensation in the form of an interest rate premium. Figure 2–10 demonstrates how changes in the supply curve for short- versus long-term bond segments of the market result in changes in the shape of the yield curve. Specifically in Figure 2–10, the higher the yield on securities (the lower the price), the higher the demand for them.[4] Thus, as the *supply* of securities *decreases in the short-term* market and *increases in the long-term* market, the *slope* of the yield curve *becomes steeper.* If the *supply* of *short-term* securities had *increased* while the *supply* of *long-term* securities had *decreased,* the *yield curve would have a flatter slope* and might even have sloped downward. Indeed, the large-scale repurchases of long-term Treasury bonds (i.e., reductions in supply) by the U.S. Treasury in early 2000 has been viewed as the major cause of the inverted yield curve that appeared in February 2000. More recently, between October 2011 and June 2012 the Federal Reserve conducted its Operation Twist.

**Figure 2–10** **Market Segmentation and Determination of the Slope of the Yield Curve**




4. In general, the price and yield on a bond are inversely related. Thus, as the price of a bond falls (becomes cheaper), the demand for the bond will rise. This is the same as saying that as the yield on a bond rises, it becomes cheaper and the demand for it increases.

**DO YOU UNDERSTAND:**

9. *What the three explanations are for the shape of the yield curve? Discuss each and compare them.*

The program involved the sale of $400 billion of short-term Treasuries in exchange for long-term Treasuries. The program was designed to lower rates on long-term bonds, while keeping short-term interest rates unchanged. By intentionally lowering yields, the Fed was forcing investors to consider other investments that would help the economy more. Many argue that the policy worked. In June 2012, the yield on the 10-year Treasury fell to a 200-year low. As a result, the housing market and bank lending started to come back.

## FORECASTING INTEREST RATES

LG 2-8

As will be seen in the time value of money examples in the next section, as interest rates change, so do the values of financial securities. Accordingly, the ability to predict or forecast interest rates is critical to the profitability of financial institutions and individual investors alike. For example, if interest rates rise, the value of investment portfolios of FIs and individuals will fall, resulting in a loss of wealth. Thus, interest rate forecasts are extremely important for the financial wealth of both FIs and individuals. The discussion of the unbiased expectations theory in the previous section of this chapter indicated that the shape of the yield curve is determined by the market's current expectations of future short-term interest rates. For example, an upward-sloping yield curve suggests that the market expects future short-term interest rates to increase. Given that the yield curve represents the market's current expectations of future short-term interest rates, the unbiased expectations theory can be used to forecast (short-term) interest rates in the future (i.e., forward one-year interest rates). A **forward rate** is an expected or "implied" rate on a short-term security that is to be originated at some point in the future. Using the equations representing the unbiased expectations theory, the market's expectation of forward rates can be derived directly from existing or actual rates on securities currently traded in the spot market. In this section, we use the notation $f$, rather than $E(r)$ used in the previous section, to highlight the terminology "forward rate."

**forward rate**

*An expected rate (quoted today) on a security that originates at some point in the future.*

### EXAMPLE 2–4 Calculation of Implied Forward Rates on One-Year Securities Using the Unbiased Expectations Theory

To find an implied forward rate on a one-year security to be issued one year from today, the unbiased expectations theory equation can be rewritten as follows:

$$_1R_2 = [(1 + {}_1R_1)(1 + [{}_2f_1])]^{1/2} - 1$$

where

$_2f_1$ = Expected one-year rate for year 2, or the implied forward one-year rate for next year

Therefore, $_2f_1$ is the market's estimate of the expected one-year rate for year 2. Solving for $_2f_1$, we get:

$$_2f_1 = [(1 + {}_1R_2)^2/(1 + {}_1R_1)] - 1$$

In general, we can find the one-year forward rate for any year, $N$ years into the future, using the following equation:[5]

$$_Nf_1 = [(1 + {}_1R_N)^N/(1 + {}_1R_{N-1})^{N-1}] - 1 \quad \textbf{(2-7)}$$

5. This formula focuses on solving for one-year rates only. However, practitioners construct the entire implied future yield curve. The general formula that allows solving for forward rates beyond the one-year maturity, $K$, is as follows:

$$_{N-K}f_K = \left[\frac{(1 + R_N)^N}{(1 + R_{N-K})^{N-K}}\right]^{1/K} - 1$$

**DO YOU UNDERSTAND:**

10. *What a forward rate is?*
11. *How an implied forward rate can be obtained from current short- and long-term interest rates?*

For example, on May 4, 2016, the existing or current (spot) one-year, two-year, three-year, and four-year zero-coupon Treasury security rates were as follows:

$$_1R_1 = 0.553\%, \quad _1R_2 = 0.774\%, \quad _1R_3 = 0.905\%, \quad _1R_4 = 1.278\%$$

Using the unbiased expectations theory, one-year forward rates on zero-coupon Treasury bonds for years 2, 3, and 4 as of May 4, 2016, were:

$$_2f_1 = [(1.00774)^2/(1.00553)] - 1 = 0.995\%$$
$$_3f_1 = [(1.00905)^3/(1.00774)^2] - 1 = 1.012\%$$
$$_4f_1 = [(1.01278)^4/(1.00905)^3] - 1 = 2.405\%$$

Thus, the expected one-year rate, one year in the future, was 0.995 percent; the expected one-year rate, two years into the future, was 1.012 percent; and the expected one-year rate, three years into the future, was 2.405 percent.

## TIME VALUE OF MONEY AND INTEREST RATES[6]

LG 2-9

So far, we have looked at factors that determine the level of interest rates and at what causes interest rate movements over time. We finish the chapter with a look at the technical details of how interest rates affect the value of financial securities by reviewing time value of money concepts. Time value of money is a crucial tool for much of the analysis in this textbook. For example, interest rates have a direct and immediate effect on the value of virtually all financial securities—that is, interest rates affect the price or value the seller of a security receives and the buyer of a security pays in organized financial markets.

### *Time Value of Money*

Time value of money is the basic notion that a dollar received today is worth more than a dollar received at some future date. This is because a dollar received today can be invested and its value enhanced by an interest rate or return such that the investor receives more than a dollar in the future. The interest rate or return reflects the fact that people generally prefer to consume now rather than wait until later. To compensate them for delaying consumption (i.e., saving), they are paid a rate of interest by those who wish to consume more today than their current resources permit (users of funds). Users of funds are willing to pay this rate of interest because they plan to productively use the borrowed funds such that they will earn even more than the rate of interest promised to the savers (suppliers of the funds).

**lump sum payment**

*A single cash flow occurs at the beginning and end of the investment horizon with no other cash flows exchanged.*

**annuity**

*A series of equal cash flows received at fixed intervals over the investment horizon.*

The time value of money concept can be used to convert cash flows earned over an investment horizon into a value at the end of the investment horizon: the investment's future value (*FV*). Alternatively, the time value of money concept can be used to convert the value of future cash flows into their current or present values (*PV*) (i.e., future dollars converted into their equivalent present value or current dollars). Two forms of time value of money calculations are commonly used in finance for security valuation purposes: the value of a lump sum and the value of annuity payments. A **lump sum payment** is a single cash payment received at the beginning or end of some investment horizon (e.g., $100 received at the end of five years). **Annuity** payments are a series of equal cash flows received at fixed intervals over the entire investment horizon (e.g., $100 a year received each year for five years). In actual practice, "annuity" payments can be paid more

6. The time value of money concept is a topic that finance students probably studied in introductory financial management courses. However, an understanding of its use in the valuation of financial instruments created, traded, and held by individual investors and financial institutions is critical. Therefore, in this chapter, we review and provide a reference guide to the general relationships between interest rates and security valuation. This material can be included or dropped from the chapter reading, depending on the need for review of the material, without harming the continuity of the chapter. In Chapter 3, we use these general relationships to determine the values of specific securities (e.g., equities and bonds).

frequently than once a year—so that the term *annuity* really means a constant payment received at equal intervals throughout an investment horizon (e.g., twice, three times, . . . a year). We first discuss lump sum time value of money calculations, followed by annuity calculations.

## Lump Sum Valuation

**Present Value of a Lump Sum.** The present value function converts cash flows received over a future investment horizon into an equivalent (present) value as if they were received at the beginning of the current investment horizon. This is done by discounting future cash flows back to the present using the current market interest rate. The present value of an investment is the intrinsic value or price of the investment. The time value of money equation used to calculate this value can be represented as follows.

Present value ($PV$) of a *lump sum* received at the end of the investment horizon, or future value ($FV$):

$$PV = FV_t/(1 + r)^t \tag{2-8}$$

where

$PV$ = Present value of cash flows
$FV_t$ = Future value of cash flows (lump sum) received in $t$ periods
$r$ = Interest rate earned per period on an investment (equals the nominal annual interest rate, $i$, divided by the number of compounding periods per year—for example, daily, weekly, monthly, quarterly, semiannually)
$t$ = Number of compounding periods in the investment horizon (equals the number of years in the investment horizon times the number of compounding periods per year)

### EXAMPLE 2–5 Calculation of Present Value of a Lump Sum

**CALCULATOR HINTS**
$N = 6$
$I = 8$
$FV = 10{,}000$
$PMT = 0$
CPT $PV = -6{,}301.70$

You have been offered a security investment such as a bond that will pay you $10,000 at the end of six years in exchange for a fixed payment today. If the appropriate annual interest rate on the investment is 8 percent compounded annually, the present value of this investment is computed as follows:

$$PV = FV_t/(1 + r)^t = \$10{,}000/(1 + 0.08)^6 = \$10{,}000\ (0.630170) = \$6{,}301.70$$

If the annual interest rate on the investment rises to 12 percent, the present value of this investment becomes:

$$PV = \$10{,}000/(1 + 0.12)^6 = \$10{,}000\ (0.506631) = \$5{,}066.31$$

If the annual interest rate on the investment rises to 16 percent, the present value of this investment becomes:

$$PV = \$10{,}000/(1 + 0.16)^6 = \$10{,}000\ (0.410442) = \$4{,}104.42$$

Finally, if the annual interest rate on the investment of 16 percent is compounded semiannually (that is, you will receive $t = 12\ (= 6 \times 2)$ total interest payments, each calculated as $r = 8$ percent ( = 16 percent ÷ 2) times the principal value in the investment, where $r$ in this case is the semiannual interest payment) rather than annually, the present value of this investment becomes:

$$PV = \$10{,}000/(1 + 0.08)^{12} = \$10{,}000\ (0.397114) = \$3{,}971.14$$

Notice from the previous examples that the *present values* of the security investment *decrease as interest rates increase*. For example, as the interest rate rose from 8 percent to

12 percent, the (present) value of the security investment fell $1,235.39 (from $6,301.70 to $5,066.31). As interest rates rose from 12 percent to 16 percent, the value of the investment fell $961.89 (from $5,066.31 to $4,104.42). This is because as interest rates increase, fewer funds need to be invested at the beginning of an investment horizon to receive a stated amount at the end of the investment horizon. This inverse relationship between the value of a financial instrument—for example, a bond—and interest rates is one of the most fundamental relationships in finance and is evident in the swings that occur in financial asset prices whenever major changes in interest rates arise.

Note also that *as interest rates increase,* the *present values* of the investment *decrease at a decreasing rate.* The fall in present value is greater when interest rates rose by 4 percent, from 12 percent to 16 percent, compared to when they rose from 8 percent to 12 percent—the inverse relationship between interest rates and the present value of security investments is neither linear nor proportional.

Finally, from this example notice that the greater the number of compounding periods per year (i.e., semiannually versus annually), the smaller the present value of a future amount.[7]

**Future Value of a Lump Sum.** The future value of a lump sum equation translates a cash flow received at the beginning of an investment period to a terminal (future) value at the end of an investment horizon (e.g., 5 years, 6 years, 10 years, etc.). The future value (*FV*) equation can be represented as follows:

Future value (*FV*) of a lump sum received at the beginning of the investment horizon:

$$FV_t = PV(1 + r)^t \tag{2-9}$$

## EXAMPLE 2–6 Calculation of Future Value of a Lump Sum

**CALCULATOR HINTS**
$N = 6$
$I = 8$
$PV = 10{,}000$
$PMT = 0$
CPT $FV = -15{,}868.74$

You plan to invest $10,000 today in exchange for a fixed payment at the end of six years. If the appropriate annual interest rate on the investment is 8 percent compounded annually, the future value of this investment is computed as follows:

$$FV = PV(1 + r)^t = \$10{,}000\ (1 + 0.08)^6 = \$10{,}000\ (1.586874) = \$15{,}868.74$$

If the annual interest rate on the investment rises to 12 percent, the future value of this investment becomes:

$$FV = \$10{,}000(1 + 0.12)^6 = \$10{,}000\ (1.973823) = \$19{,}738.23$$

If the annual interest rate on the investment rises to 16 percent, the future value of this investment becomes:

$$FV = \$10{,}000(1 + 0.16)^6 = \$10{,}000\ (2.436396) = \$24{,}363.96$$

Finally, if the annual interest rate on the investment of 16 percent is compounded semiannually rather than annually (i.e., $r = 16\%/2 = 8\%$ and $t = 6 \times 2 = 12$), the future value of this investment becomes:

$$FV = \$10{,}000(1 + 0.08)^{12} = \$10{,}000\ (2.518170) = \$25{,}181.70$$

7. The ultimate of compounding periods is instantaneous, or continuous, compounding over the investment horizon (period). In this case the present value formula becomes:

$$PV = FV_t[1/(1 + r/\infty)]^{n\infty} = FV_n(e^{-rn})$$

where $n$ is the number of years in the investment horizon (period). Thus, in Example 2–5, if the annual interest rate on the investment is 16 percent compounded continuously, the present value of the $10,000 investment in six years is:

$$PV = \$10{,}000(e^{-0.16\times 6}) = \$10{,}000(0.382893) = \$3{,}828.93$$

Notice that the *future value of an investment increases as interest rates increase.* As interest rates rose from 8 percent to 12 percent, the (future) value of the investment of $10,000 for six years rose by $3,869.49 (from $15,868.74 to $19,738.23). As rates rose from 12 percent to 16 percent, the (future) value of the investment rose $4,625.73 (from $19,738.23 to $24,363.96). Note also that *as interest rates increase, future values increase at an increasing rate.* The increase in future value is greater when interest rates rose by 4 percent, from 8 percent to 12 percent, compared to when they rose from 12 percent to 16 percent—the positive relationship between interest rates and the future value of security investments is neither linear nor proportional. With the compounding of interest rates, as interest rates increase, a stated amount of funds invested at the beginning of an investment horizon accumulates to an expotentially larger amount at the end of the investment horizon. By contrast, as stated earlier, as interest rates increase, the present value of an investment decreases at a decreasing rate. Finally, notice that as the number of compounding periods per year increases, the *future value* of a present amount increases.

## Annuity Valuation

**Present Value of an Annuity.** The present value of an annuity equation converts a finite series of constant (or equal) cash flows received on the last day of equal intervals throughout the investment horizon into an equivalent (present) value as if they were received at the beginning of the investment horizon. The time value of money equation used to calculate this value is represented as follows:

Present value ($PV$) of an annuity stream ($PMT$) received in the future:

$$PV = PMT \sum_{j=1}^{t} [1/(1+r)]^j \tag{2-10}$$

which can be reduced to the simpler equation:

$$PV = PMT \times \left[ \frac{1 - \frac{1}{(1+r)^t}}{r} \right]$$

where

$PMT$ = Periodic annuity payment received during an investment horizon

$\sum_{j=1}^{t}$ = Summation sign for addition of all terms from $j = 1$ to $j = t$.

### EXAMPLE 2–7 Calculation of Present Value of an Annuity

**CALCULATOR HINTS**
$N = 6$
$I = 8$
$FV = 0$
$PMT = 10{,}000$
CPT $PV = -46{,}228.80$

You have been offered a bond that will pay you $10,000 on the last day of every year for the next six years in exchange for a fixed payment today. If the appropriate annual interest rate on the investment is 8 percent, the present value of this investment is computed as follows:

$$\begin{aligned} PV &= PMT \times \left[ \frac{1 - \frac{1}{(1+r)^t}}{r} \right] \\ &= \$10{,}000 \times \left[ \frac{1 - \frac{1}{(1+0.08)^6}}{0.08} \right] \\ &= \$10{,}000\ (4.622880) = \$46{,}228.80 \end{aligned}$$

If the investment pays you \$10,000 on the last day of every quarter for the next six years (i.e., $r = 8\%/4 = 2\%$ and $t = 6 \times 4 = 24$), the present value of the annuity becomes:

$$PV = \$10{,}000 \times \left[\frac{1 - \dfrac{1}{(1+0.02)^{24}}}{0.02}\right]$$

$$= \$10{,}000\ (18.913926) = \$189{,}139.26$$

If the annuity is paid on the first day of each quarter (referred to as an annuity due), an extra interest payment would be received for each \$10,000 payment. Thus, the time value of money equation for the present value of an annuity due becomes:

$$PV = PMT\left[\frac{1 - \dfrac{1}{(1+r)^{t}}}{r}\right](1+r)$$

The present value of this investment becomes:

$$PV = \$10{,}000\left[\frac{1 - \dfrac{1}{(1+0.02)^{24}}}{0.02}\right](1+0.02)$$

$$= \$10{,}000\ (18.913926)(1.02) = \$192{,}922.04$$

**Future Value of an Annuity.** The future value of an annuity equation converts a series of equal cash flows received at equal intervals throughout the investment horizon into an equivalent future amount at the end of the investment horizon. The equation used to calculate this value is represented as follows:

Future value ($FV$) of an annuity payment stream received over an investment horizon:[8]

$$FV_t = PMT\sum_{j=0}^{t-1}(1+r)^{j} \qquad \textbf{(2-11)}$$

which can be reduced to the simpler equation:

$$FV_t = PMT \times \left[\frac{(1+r)^{t} - 1}{r}\right]$$

## EXAMPLE 2–8 Calculation of the Future Value of an Annuity

**CALCULATOR HINTS**
$N = 6$
$I = 8$
$PV = 0$
$PMT = 10{,}000$
CPT $FV = -73{,}359.29$

You plan to invest \$10,000 on the last day of every year for the next six years. If the interest rate on the investment is 8 percent, the future value of your investment in six years is computed as follows:

$$FV = \$10{,}000\left[\frac{(1+0.08)^{6} - 1}{0.08}\right]$$

$$= \$10{,}000\ (7.335929) = \$73{,}359.29$$

8. Note that the last annuity payment occurs on the last day of the investment horizon. Thus, it earns no interest (i.e., the future value interest factor takes a power of zero). Similarly, the first annuity payment earns only five years of interest. Thus, the future value interest factor takes a power of five. Accordingly, in the future value interest factor of annuity term, $j$ runs from 0 to $t - 1$, or, in this example, $(6 - 1 =)$ 5. In Example 2–7, note that the first annuity payment earns one year of interest. Thus, the present value interest factor term takes a power of one. Likewise, the last annuity payment earns six years of interest. Thus, the present value interest factor takes a power of six. Accordingly, in the present value interest factor of annuity term, $j$ runs from 1 to $t$.

If the investment pays you $10,000 on the last day of every quarter for the next six years (i.e., $r = 8\%/4 = 2\%$ and $t = 6 \times 4 = 24$), the future value of the annuity becomes:

$$FV = \$10{,}000 \left[\frac{(1 + 0.02)^{24} - 1}{0.02}\right]$$
$$= \$10{,}000\ (30.421862) = \$304{,}218.62$$

If the annuity is paid on the first day of each quarter (an annuity due), an extra interest payment would be earned on each $10,000 investment. The time value of money equation for the future value of an annuity due becomes:

$$FV = PMT \left[\frac{(1 + r)^t - 1}{r}\right](1 + r)$$

Thus, the future value of this investment becomes:

$$FV = \$10{,}000 \left[\frac{(1 + 0.02)^{24} - 1}{0.02}\right](1 + 0.02)$$
$$= \$10{,}000\ (30.421862)(1.02) = \$310{,}303.00$$

**DO YOU UNDERSTAND:**

12. *What should happen to the present value of a lump sum cash flow as interest rates increase?*
13. *What should happen to the future value of an annuity stream of cash flows as interest rates increase?*

## SUMMARY

This chapter reviewed the determinants of nominal interest rates and their effects on security prices and values in domestic and foreign financial markets. It described the way funds flow through the financial system from lenders to borrowers and how the level of interest rates and its movements over time are determined. The chapter also introduced theories regarding the determination of the shape of the term structure of interest rates.

## QUESTIONS

1. Who are the suppliers of loanable funds? (*LG 2-1*)
2. Who are the demanders of loanable funds? (*LG 2-2*)
3. What factors cause the supply of funds curve to shift? (*LG 2-4*)
4. What factors cause the demand for funds curve to shift? (*LG 2-4*)
5. What are six factors that determine the nominal interest rate on a security? (*LG 2-6*)
6. What should happen to a security's nominal interest rate as the security's liquidity risk increases? (*LG 2-6*)
7. Discuss and compare the three explanations for the shape of the yield curve. (*LG 2-7*)
8. If we observe a one-year Treasury security rate higher than the two-year Treasury security rate, what can we infer about the one-year rate expected one year from now? (*LG 2-7*)
9. How does the liquidity premium theory of the term structure of interest rates differ from the unbiased expectations theory? In a normal economic environment, that is, an upward-sloping yield curve, what is the relationship of liquidity premiums for successive years into the future? Why? (*LG 2-7*)
10. What is a forward interest rate? (*LG 2-8*)
11. What is the relationship between present values and interest rates as interest rates increase? (*LG 2-9*)

## PROBLEMS

1. A particular security's equilibrium rate of return is 8 percent. For all securities, the inflation risk premium is 1.75 percent and the real risk-free rate is 3.5 percent. The security's liquidity risk premium is 0.25 percent and maturity risk premium is 0.85 percent. The security has no special covenants. Calculate the security's default risk premium. (*LG 2-6*)
2. You are considering an investment in 30-year bonds issued by Moore Corporation. The bonds have no special covenants. *The Wall Street Journal* reports that 1-year T-bills

are currently earning 3.25 percent. Your broker has determined the following information about economic activity and Moore Corporation bonds: (*LG 2-6*)

| | | |
|---|---|---|
| Real risk-free rate | = | 2.25% |
| Default risk premium | = | 1.15% |
| Liquidity risk premium | = | 0.50% |
| Maturity risk premium | = | 1.75% |

**a.** What is the inflation premium?
**b.** What is the fair interest rate on Moore Corporation 30-year bonds?

**3.** Dakota Corporation 15-year bonds have an equilibrium rate of return of 8 percent. For all securities, the inflation premium is 1.75 percent and the real risk-free rate is 3.50 percent. The security's liquidity risk premium is 0.25 percent and maturity risk premium is 0.85 percent. The security has no special covenants. Calculate the bond's default risk premium. (*LG 2-6*)

**4.** A two-year Treasury security currently earns 1.94 percent. Over the next two years, the real risk-free rate is expected to be 1.00 percent per year and the inflation premium is expected to be 0.50 percent per year. Calculate the maturity risk premium on the two-year Treasury security. (*LG 2-6*)

**5.** Tom and Sue's Flowers Inc.'s 15-year bonds are currently yielding a return of 8.25 percent. The expected inflation premium is 2.25 percent annually and the real risk-free rate is expected to be 3.50 percent annually over the next 15 years. The default risk premium on Tom and Sue's Flowers's bonds is 0.80 percent. The maturity risk premium is 0.75 percent on 5-year securities and increases by 0.04 percent for each additional year to maturity. Calculate the liquidity risk premium on Tom and Sue's Flowers Inc.'s 15-year bonds. (*LG 2-6*)

**6.** Nikki G's Corporation's 10-year bonds are currently yielding a return of 6.05 percent. The expected inflation premium is 1.00 percent annually and the real risk-free rate is expected to be 2.10 percent annually over the next 10 years. The liquidity risk premium on Nikki G's bonds is 0.25 percent. The maturity risk premium is 0.10 percent on 2-year securities and increases by 0.05 percent for each additional year to maturity. Calculate the default risk premium on Nikki G's 10-year bonds. (*LG 2-6*)

**7.** The current one-year Treasury-bill rate is 5.2 percent and the expected one-year rate 12 months from now is 5.8 percent. According to the unbiased expectations theory, what should be the current rate for a two-year Treasury security? (*LG 2-7*)

**8.** Suppose that the current one-year rate (one-year spot rate) and expected one-year T-bill rates over the following three years (i.e., years 2, 3, and 4, respectively) are as follows:

$_1R_1 = 6\%, E(_2r_1) = 7\%, E(_3r_1) = 7.5\%, E(_4r_1) = 7.85\%$

Using the unbiased expectations theory, calculate the current (long-term) rates for one-, two-, three-, and four-year-maturity Treasury securities. Plot the resulting yield curve. (*LG 2-7*)

**9.** One-year Treasury bills currently earn 3.45 percent. You expect that one year from now, one-year Treasury bill rates will increase to 3.65 percent. If the unbiased expectations theory is correct, what should the current rate be on two-year Treasury securities? (*LG 2-7*)

**10.** Suppose we observe the following rates: $_1R_1 = 8\%$, $_1R_2 = 10\%$. If the unbiased expectations theory of the term structure of interest rates holds, what is the one-year interest rate expected one year from now, $E(_2r_1)$? (*LG 2-7*)

**11.** Suppose we observe the three-year Treasury security rate to be 12 percent, the expected one-year rate next year—$E(_2r_1)$—to be 8 percent, and the expected one-year rate the following year—$E(_3r_1)$—to be 10 percent. If the unbiased expectations theory of the term structure of interest rates holds, what is the one-year Treasury security rate? (*LG 2-7*)

**12.** *The Wall Street Journal* reports that the rate on four-year Treasury securities is 5.60 percent and the rate on five-year Treasury securities is 6.15 percent. According to the unbiased expectations theory, what does the market expect the one-year Treasury rate to be four years from today, $E(_5r_1)$? (*LG 2-7*)

**13.** A recent edition of *The Wall Street Journal* reported interest rates of 2.25 percent, 2.60 percent, 2.98 percent, and 3.25 percent for three-year, four-year, five-year, and six-year Treasury notes, respectively. According to the unbiased expectations theory of the term structure of interest rates, what are the expected one-year rates during years 4, 5, and 6? (*LG 2-7*)

**14.** Based on economists' forecasts and analysis, one-year Treasury bill rates and liquidity premiums for the next four years are expected to be as follows:

$_1R_1 = 5.65\%$
$E(_2R_1) = 6.75\%$ $\quad L_2 = 0.05\%$
$E(_3R_1) = 6.85\%$ $\quad L_3 = 0.10\%$
$E(_4R_1) = 7.15\%$ $\quad L_4 = 0.12\%$

Using the liquidity premium theory, plot the current yield curve. Make sure you label the axes on the graph and identify the four annual rates on the curve both on the axes and on the yield curve itself. (*LG 2-7*)

**15.** Suppose we observe the following rates: $_1R_1 = 10\%$, $_1R_2 = 14\%$, and $E(_2r_1) = 18\%$. If the liquidity premium theory of the term structure of interest rates holds, what is the liquidity premium for year 2? (*LG 2-7*)

**16.** *The Wall Street Journal* reports that the rate on three-year Treasury securities is 5.25 percent and the rate on four-year Treasury securities is 5.50 percent. The one-year interest rate expected in three years, $E(_4r_1)$, is 6.10 percent. According to the liquidity premium theory, what is the liquidity premium on the four-year Treasury security, $L_4$? (*LG 2-7*)

**17.** If you note the following yield curve in *The Wall Street Journal,* what is the one-year forward rate for the period beginning one year from today, $_2f_1$ according to the unbiased expectations theory? (*LG 2-8*)

| Maturity | Yield |
|---|---|
| One day | 2.00% |
| One year | 5.50 |
| Two years | 6.50 |
| Three years | 9.00 |

**18.** You note the following yield curve in *The Wall Street Journal.* According to the unbiased expectations theory, what is the one-year forward rate for the period beginning two years from today, ${}_3f_1$? (*LG 2-8*)

| Maturity | Yield |
|---|---|
| One day | 2.00% |
| One year | 5.50 |
| Two years | 6.50 |
| Three years | 9.00 |

**19.** On March 11, 20XX, the existing or current (spot) one-year, two-year, three-year, and four-year zero-coupon Treasury security rates were as follows:

$${}_1R_1 = 4.75\%, \quad {}_1R_2 = 4.95\%, \quad {}_1R_3 = 5.25\%, \quad {}_1R_4 = 5.65\%$$

Using the unbiased expectations theory, calculate the one-year forward rates on zero-coupon Treasury bonds for years two, three, and four as of March 11, 20XX. (*LG 2-8*)

**20.** A recent edition of *The Wall Street Journal* reported interest rates of 6 percent, 6.35 percent, 6.65 percent, and 6.75 percent for three-year, four-year, five-year, and six-year Treasury notes, respectively. According to the unbiased expectations theory, what are the expected one-year rates for years 4, 5, and 6 (i.e., what are ${}_4f_1$, ${}_5f_1$, and ${}_6f_1$)? (*LG 2-8*)

**21.** Assume the current interest rate on a one-year Treasury bond (${}_1R_1$) is 4.50 percent, the current rate on a two-year Treasury bond (${}_1R_2$) is 5.25 percent, and the current rate on a three-year Treasury bond (${}_1R_3$) is 6.50 percent. If the unbiased expectations theory of the term structure of interest rates is correct, what is the one-year interest rate expected on Treasury bills during year 3 ($E({}_3r_1)$ or ${}_3f_1$)? (*LG 2-8*)

**22.** Calculate the present value of $5,000 received five years from today if your investments pay

**a.** 6 percent compounded annually
**b.** 8 percent compounded annually
**c.** 10 percent compounded annually
**d.** 10 percent compounded semiannually
**e.** 10 percent compounded quarterly

What do your answers to these questions tell you about the relation between present values and interest rates and between present values and the number of compounding periods per year? (*LG 2-9*)

**23.** Calculate the future value in five years of $5,000 received today if your investments pay

**a.** 6 percent compounded annually
**b.** 8 percent compounded annually
**c.** 10 percent compounded annually
**d.** 10 percent compounded semiannually
**e.** 10 percent compounded quarterly

What do your answers to these questions tell you about the relation between future values and interest rates and between future values and the number of compounding periods per year? (*LG 2-9*)

**24.** Calculate the present value of the following annuity streams: (*LG 2-9*)

**a.** $5,000 received each year for five years on the last day of each year if your investments pay 6 percent compounded annually.
**b.** $5,000 received each quarter for five years on the last day of each quarter if your investments pay 6 percent compounded quarterly.
**c.** $5,000 received each year for five years on the first day of each year if your investments pay 6 percent compounded annually.
**d.** $5,000 received each quarter for five years on the first day of each quarter if your investments pay 6 percent compounded quarterly.

**25.** Calculate the future value of the following annuity streams: (*LG 2-9*)

**a.** $5,000 received each year for five years on the last day of each year if your investments pay 6 percent compounded annually.
**b.** $5,000 received each quarter for five years on the last day of each quarter if your investments pay 6 percent compounded quarterly.
**c.** $5,000 received each year for five years on the first day of each year if your investments pay 6 percent compounded annually.
**d.** $5,000 received each quarter for five years on the first day of each quarter if your investments pay 6 percent compounded quarterly.

**26.** Compute the future values of the following first assuming that payments are made on the last day of the period and then assuming payments are made on the first day of the period: (*LG 2-9*)

| Payment | Years | Interest Rate | Future Value (Payment made on last day of period) | Future Value (Payment made on first day of period) |
|---|---|---|---|---|
| $ 123 | 13 | 13% | | |
| 4,555 | 8 | 8 | | |
| 74,484 | 5 | 10 | | |
| 167,332 | 9 | 1 | | |

**27.** Compute the present values of the following first assuming that payments are made on the last day of the period and then assuming payments are made on the first day of the period: (*LG 2-9*)

| Payment | Years | Interest Rate | Present Value (Payment made on last day of period) | Present Value (Payment made on first day of period) |
|---|---|---|---|---|
| $ 678.09 | 7 | 13% | | |
| 7,968.26 | 13 | 6 | | |
| 20,322.93 | 23 | 4 | | |
| 69,712.54 | 4 | 31 | | |

**28.** If you deposit $500 in a bank account that earns 6 percent per year, how much total interest will you have earned after the third year? (*LG 2-9*)

**29.** How much money would you have to deposit today in order to have $2,000 in four years if the discount rate is 8 percent per year? (*LG 2-9*)

**30.** If an ounce of gold, valued at $1,200, increases at a rate of 7.5 percent per year, how long will it take to be valued at $2,000? (*LG 2-9*)

**31.** You can save $1,000 per year for the next six years in an account earning 10 percent per year. How much will you have at the end of the sixth year if you make the first deposit today? (*LG 2-9*)

**32.** What are the monthly payments (principal and interest) on a 15-year home mortgage for an $180,000 loan when interest rates are fixed at 8 percent? (*LG 2-9*)

## SEARCH THE SITE

Go to the U.S. Treasury website and find the latest information available on the size of the U.S. national debt. Go to **www.treasurydirect.gov**. Under "Government," click on "Public Debt Reports." Click on "Debt to the Penny." This will bring up the relevant tables. For example, on May 4, 2016, the size of the national debt was $19.21 trillion.

**Questions**

1. What is the most recent dollar value of the U.S. national debt?
2. Calculate the percentage change in the U.S. national debt since May 4, 2016.

chapter

3

# Interest Rates and Security Valuation

OUTLINE

Interest Rates as a Determinant of Financial Security Values: Chapter Overview
Various Interest Rate Measures
- Coupon Rate
- Required Rate of Return
- Expected Rate of Return
- Required versus Expected Rates of Return: The Role of Efficient Markets
- Realized Rate of Return

Bond Valuation
- Bond Valuation Formula Used to Calculate Fair Present Values
- Bond Valuation Formula Used to Calculate Yield to Maturity

Equity Valuation
- Zero Growth in Dividends
- Constant Growth in Dividends
- Supernormal (or Nonconstant) Growth in Dividends

Impact of Interest Rate Changes on Security Values
Impact of Maturity on Security Values
- Maturity and Security Prices
- Maturity and Security Price Sensitivity to Changes in Interest Rates

Impact of Coupon Rates on Security Values
- Coupon Rate and Security Price
- Coupon Rate and Security Price Sensitivity to Changes in Interest Rates

Duration
- A Simple Illustration of Duration
- A General Formula for Duration
- Features of Duration
- Economic Meaning of Duration
- Large Interest Rate Changes and Duration

Appendix 3A: Duration and Immunization
Appendix 3B: More on Convexity
(Appendixes 3A and 3B available through Connect or your course instructor)

## Learning Goals

**LG 3-1** *Understand the differences in the required rate of return, the expected rate of return, and the realized rate of return.*

**LG 3-2** *Calculate bond values.*

**LG 3-3** *Calculate equity values.*

**LG 3-4** *Appreciate how security prices are affected by interest rate changes.*

**LG 3-5** *Understand how the maturity and coupon rate on a security affect its price sensitivity to interest rate changes.*

**LG 3-6** *Know what duration is.*

**LG 3-7** *Understand how maturity, yield to maturity, and coupon rate affect the duration of a security.*

**LG 3-8** *Understand the economic meaning of duration.*

## INTEREST RATES AS A DETERMINANT OF FINANCIAL SECURITY VALUES: CHAPTER OVERVIEW

In Chapter 2, we reviewed the basic concepts of time value of money and how time value of money equations can be used to convert cash flows received or paid over an investment horizon into either a present value or future value. Of particular importance was the fact that interest rate levels, and changes in interest rate levels, affect security values. We also reviewed factors that determine the level of interest rates, changes in interest rates, and interest rate differences among securities (e.g., default risk, callability).

With this understanding of how and why interest rates change, in this chapter we apply time value of money principles to the valuation of specific financial securities, paying particular attention to the change in a security's value when interest rates change. We examine how characteristics specific to a financial security (e.g., coupon rate and remaining time to maturity) also influence a financial security's price.[1] We conclude the chapter with an

analysis of the duration of a security. Duration, which measures the weighted-average time to maturity of an asset or liability, using the present values of the cash flows as weights, also has economic meaning as the sensitivity of an asset or liability's value or price to a small interest rate change. The valuation and duration models reviewed in this chapter are used by traders to determine whether to transact in the various financial markets we discuss in Chapters 5 through 10.

## VARIOUS INTEREST RATE MEASURES

LG 3-1

In Chapter 2, we presented a general discussion of interest rates and how they are determined. The term *interest rates* can actually have many different meanings depending on the time frame used for analysis and the type of security being analyzed. In this chapter, we start off by defining different interest rate measures employed in the valuation of financial securities by market participants. These definitions are summarized in Table 3–1. In the body of the chapter, we apply these rates to the valuation of bonds (bond markets and their operations are discussed in detail in Chapter 6) and the valuation of stocks (stock markets and their operations are discussed in Chapter 8).

### *Coupon Rate*

**coupon rate**

*Interest rate used to calculate the annual cash flow the bond issuer promises to pay the bond holder.*

One variation on the meaning of the term *interest rate* specific to debt instruments is the **coupon rate** paid on a bond. As discussed in detail in the next section, the coupon rate on a bond instrument is the annual (or periodic) cash flow that the bond issuer contractually promises to pay the bond holder. This coupon rate is only one component of the overall return (required, expected, or realized rate of return) the bond holder earns on a bond, however. As discussed below, required, expected, or realized rates of return incorporate not only the coupon payments but all cash flows on a bond investment, including full and partial repayments of principal by the issuer.

### *Required Rate of Return*

Market participants use time value of money equations to calculate the fair present value of a financial security over an investment horizon. As we discussed in Chapter 2 and will see later in this chapter, this process involves the discounting of all projected cash flows[2]

**TABLE 3–1** Various Interest Rate Measures

**Coupon rate**—interest rate on a bond instrument used to calculate the annual cash flow the bond issuer promises to pay the bond holder.
**Required rate of return**—interest rate an investor should receive on a security given its risk. Required rate of return is used to calculate the fair present value on a security.
**Expected rate of return**—interest rate an investor expects to receive on a security if he or she buys the security at its current market price, receives all expected payments, and sells the security at the end of his or her investment horizon.
**Realized rate of return**—actual interest rate earned on an investment in a financial security. Realized rate of return is a historical (ex post) measure of the interest rate.

1. Security valuation is a topic that finance students probably studied in introductory financial management courses. However, these models are critical tools for traders of financial securities and managers of financial institutions. Therefore, in this chapter we review and provide a reference guide to the general pricing relationships. This material can be included or dropped from the chapter reading, depending on the need for review of the material, without harming the continuity of the chapter.

2. The projected cash flows used in these equations may be those promised by the security issuer or expected cash flows estimated by the security purchaser (or some other analyst) from a probability distribution of the possible cash flows received on the security. In either case, the cash flows received are not ex ante known with perfect certainty because of default and other risks.

(*CF*s) on the security at an appropriate interest rate. (For easy reference to the notation used in this chapter, we list and define all variables used in this chapter at the end of the chapter.) The interest rate used to find the fair present value of a financial security is called the **required rate of return** ($r$). This interest rate is a function of the various risks associated with a security (discussed in Chapter 2) and is thus the interest rate the investor *should* receive on the security given its risk (default risk, liquidity risk, etc.). The required rate of return is thus an ex ante (before the fact) measure of the interest rate on a security. The *present value* (*PV*) is determined by the following formula:

**required rate of return**

*The interest rate an investor should receive on a security, given its risk.*

$$PV = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \ldots + \frac{CF_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}$$

where

$r$ = Required rate of return
$CF_t$ = Cash flow projected in period $t$ ($t = 1, \ldots, n$)
$n$ = Number of periods in the investment horizon

Once a *PV* is calculated, market participants then compare this present value with the *current market price* ($\bar{P}$) at which the security is trading in a financial market. If the current market price of the security ($\bar{P}$) is less than its fair value (*PV*), the security is currently undervalued. The market participant would want to buy more of this security at its current price. If the current market price of the security is greater than its present value, the security is overvalued. The market participant would not want to buy this security at its current price. If the present value of the security equals its current market price, the security is said to be fairly priced given its risk characteristics. In this case, *PV* equals $\bar{P}$.

## EXAMPLE 3–1 Application of Required Rate of Return

A Walmart bond you purchased two years ago for $890 is now selling for $925. The bond paid $100 per year in coupon interest on the last day of each year (the last payment made today). You intend to hold the bond for four more years and project that you will be able to sell it at the end of year 4 for $960. You also project that the bond will continue paying $100 in interest per year. Given the risk associated with the bond, its required rate of return ($r$) over the next four years is 11.25 percent. Accordingly, the bond's fair present value is:

$$PV = \frac{100}{(1+0.1125)^1} + \frac{100}{(1+0.1125)^2} + \frac{100}{(1+0.1125)^3} + \frac{100+960}{(1+0.1125)^4}$$
$$= \$935.31$$

Given the current selling price of the Walmart bond, $925, relative to the fair present value, $935.31, this bond is currently undervalued.

**CALCULATOR HINTS**
*N* = 4
*I* = 11.25
*PMT* = 100
*FV* = 960
CPT *PV* = 935.31

### *Expected Rate of Return*

The **expected rate of return,** $E(r)$, on a financial security is the interest rate a market participant *expects to* earn by buying the security at its *current market price* ($\bar{P}$), receiving all projected cash flow payments (*CF*s) on the security, and selling the security at the end of the participant's investment horizon. Thus, the expected rate of return is also an ex ante measure of the interest rate on a security. However, the expected rate of return on an investment is based on the current market price rather than fair present value. As discussed above, these may or may not be equal.

**expected rate of return**

*The interest rate an investor would expect to earn on a security if he or she were to buy the security at its current market price, receive all promised or expected payments on the security, and sell the security at the end of his or her investment horizon.*

Again, time value of money equations are used to calculate the expected rate of return on a security. In this case, the current market price of the security is set equal to the present value of all projected cash flows received on the security over the investment horizon. The

**TABLE 3–2 The Relation between Required Rate of Return and Expected Rate of Return**

| | |
|---|---|
| $E(r) \geq r$ or $\bar{P} \leq PV$ | The projected cash flows received on the security are greater than or equal to those required to compensate for the risk incurred from investing in the security. Thus, buy this security. |
| $E(r) < r$ or $\bar{P} > PV$ | The projected cash flows received on the security are less than is required to compensate for the risk incurred from investing in the security. Thus, do *not* buy this security. |

expected rate of return is the discount rate in the present value equation that just makes the present value of projected cash flows equal to its current market price ($\bar{P}$)[3] That is:

$$\bar{P} = \frac{CF_1}{[1 + E(r)]^1} + \frac{CF_2}{[1 + E(r)]^2} + \frac{CF_3}{[1 + E(r)]^3} + \ldots + \frac{CF_n}{[1 + E(r)]^n}$$

where

$E(r)$ = Expected rate of return

$CF_t$ = Cash flow projected in period $t$ ($t = 1, \ldots, n$)

$n$ = Number of periods in the investment horizon

Once an expected rate of return, $E(r)$, on a financial security is calculated, the market participant compares this expected rate of return to its required rate of return ($r$). If the expected rate of return is greater than the required rate of return, the projected cash flows on the security are greater than is required to compensate for the risk incurred from investing in the security. Thus, the market participant would want to buy more of this security. If the expected rate of return is less than the required rate of return, the projected cash flows from the security are less than those required to compensate for the risk involved. Thus, the market participant would not want to invest in the security.[4] We summarize these relationships in Table 3–2.

**CALCULATOR HINTS**
$N = 4$
$PMT = 100$
$FV = 960$
$PV = -925$
CPT $I = 11.607\%$

## EXAMPLE 3–2 Application of Expected Rate of Return

Refer to information in Example 3–1 describing a Walmart bond you purchased two years ago for $890. Using the current market price of $925, the expected rate of return on the bond over the next four years is calculated as follows:

$$925 = \frac{100}{[1 + E(r)]^1} + \frac{100}{[1 + E(r)]^2} + \frac{100}{[1 + E(r)]^3} + \frac{100 + 960}{[1 + E(r)]^4}$$

$$\Rightarrow Er = 11.607\%$$

Given that the required return on the bond is 11.25 percent, the projected cash flows on the bond are greater than is required to compensate you for the risk on the bond.

### *Required versus Expected Rates of Return: The Role of Efficient Markets*

We have defined two ex ante (before the fact) measures of interest rates. The *required* rate of return is used to calculate a *fair* present value of a financial security, while the *expected* rate of return is a discount rate used in conjunction with the *current* market price of a

3. We are also assuming that any cash flows on the investment can be reinvested to earn the same expected rate of return.

4. Note also that by implication, if $E(r) > r$, then the market price of a security ($\bar{P}$) is less than its fair present value ($PV$) and vice versa if $E(r) < r$.

security. As long as financial markets are efficient (see below), the current market price of a security tends to equal its fair price present value. This is the case most of the time. However, when an event occurs that unexpectedly changes interest rates or a characteristic of a financial security (e.g., an unexpected dividend increase, an unexpected decrease in default risk), the current market price of a security can temporarily diverge from its fair present value. When investors determine a security is undervalued (i.e., its current market price is less than its fair present value), demand for the security increases, as does its price. Conversely, when investors determine a security is overvalued (i.e., its current market price is greater than its fair present value), they will sell the security, resulting in a price drop. The speed with which financial security prices adjust to unexpected news, so as to maintain equality with the fair present value of the security, is referred to as **market efficiency.** We examine the three forms of market efficiency (weak form, semistrong form, and strong form) in Chapter 8.

**market efficiency**

*The process by which financial security prices move to a new equilibrium when interest rates or a security-specific characteristic changes.*

## Realized Rate of Return

Required and expected rates of return are interest rate concepts pertaining to the returns expected or required just prior to the investment being made. Once made, however, the market participant is concerned with how well the financial security actually performs. The **realized rate of return** ($\bar{r}$) on a financial security is the interest rate *actually* earned on an investment in a financial security. The realized rate of return is thus a historical interest rate of return—it is an ex post (after the fact) measure of the interest rate on the security.

**realized rate of return**

*The actual interest rate earned on an investment in a financial security.*

To calculate a realized rate of return ($\bar{r}$), all cash flows actually paid or received are incorporated in time value of money equations to solve for the realized rate of return. By setting the price actually paid for the security ($\bar{P}$) equal to the present value of the realized cash flows ($RCF_1, RCF_2, \ldots, RCF_n$), the realized rate of return is the discount rate that just equates the purchase price to the present value of the realized cash flows. That is:

$$\bar{P} = \frac{RCF_1}{(1+\bar{r})^1} + \frac{RCF_2}{(1+\bar{r})^2} + \ldots + \frac{RCF_n}{(1+\bar{r})^n}$$

where

$RCF_t$ = Realized cash flow in period $t$ ($t = 1, \ldots, n$)

$\bar{r}$ = Realized rate of return on a security

If the realized rate of return ($\bar{r}$) is greater than the required rate of return ($r$), the market participant actually earned more than was needed to be compensated for the ex ante or expected risk of investing in the security. If the realized rate of return is less than the required rate of return, the market participant actually earned less than the interest rate required to compensate for the risk involved.

**DO YOU UNDERSTAND:**

1. *The difference between a required rate of return and an expected rate of return?*
2. *The difference between the coupon rate on a bond and the realized rate of return on a bond?*

### EXAMPLE 3–3 Application of Realized Rate of Return

**CALCULATOR HINTS**
$N = 2$
$PMT = 100$
$FV = 925$
$PV = -890$
CPT $I = 13.08\%$

Consider again the Walmart bond investment described in Examples 3–1 and 3–2. Using your original purchase price, \$890, and the current market price on this bond, the realized rate of return you have earned on this bond over the last two years is calculated as follows:

$$890 = \frac{100}{(1+\bar{r})^1} + \frac{100+925}{(1+\bar{r})^2}$$

$$\Rightarrow \bar{r} = 13.08\%$$

## BOND VALUATION

The valuation of a bond instrument employs time value of money concepts. The fair value of a bond reflects the present value of all cash flows promised or projected to be received on that bond discounted at the required rate of return ($r_b$). Similarly, the expected rate of return, $E(r_b)$, is the interest rate that equates the current market price of the bond with the present value of all promised cash flows received over the life of the bond. Finally, a realized rate of return ($\bar{r}_b$) on a bond is the actual return earned on a bond investment that has already taken place. Promised cash flows on bonds come from two sources: (1) interest or coupon payments paid over the life of the bond and (2) a lump sum payment (face or par value) when a bond matures.

LG 3-2

### *Bond Valuation Formula Used to Calculate Fair Present Values*

**coupon bonds**

*Bonds that pay interest based on a stated coupon rate. The interest, or coupon, payments per year are generally constant over the life of the bond.*

**zero-coupon bonds**

*Bonds that do not pay interest.*

Most bonds pay a stated coupon rate of interest to the holders of the bonds. These bonds are called **coupon bonds.** The interest, or coupon, payments per year, INT, are generally constant (fixed) over the life of the bond.[5] Thus, the fixed interest payment is essentially an annuity paid to the bond holder periodically (normally semiannually) over the life of the bond. Bonds that do not pay coupon interest are called **zero-coupon bonds.** For these bonds, INT is zero. In addition to coupon payments, the face or par value of the bond, *M,* is a lump sum payment received by the bond holder when the bond matures. Face value is generally set at $1,000 in the U.S. bond market. When new bonds are issued, the coupon rate on the new bonds is typically set at the current required rate of return. As discussed below, this results in the original sale of the bond occurring at the par value.

Using time value of money formulas, and assuming that the bond issuer makes its promised semiannual coupon and principal payments, the present value of a bond, $V_b$, can be written as:[6]

$$\begin{aligned} V_b &= \frac{INT/2}{(1+r_b/2)^1} + \frac{INT/2}{(1+r_b/2)^2} + \ldots + \frac{INT/2}{(1+r_b/2)^{2T}} + \frac{M}{(1+r_b/2)^{2T}} \\ &= \frac{INT}{2}\sum_{t=1}^{2T}\left(\frac{1}{1+r_b/2}\right)^t + \frac{M}{(1+r_b/2)^{2T}} \\ &= \frac{INT}{(2)}\left[\frac{1-\dfrac{1}{(1+r_b/2)^{2T}}}{r_b/2}\right] + M\left[\frac{1}{(1+r_b/2)^{2T}}\right] \end{aligned}$$

where

$V_b$ = Present value of the bond
$M$ = Par or face value of the bond
$INT$ = Annual interest (or coupon) payment on the bond; equals the par value of the bond times the (percentage) coupon rate
$T$ = Number of years until the bond matures
$r_b$ = Annual interest rate used to discount cash flows on the bond

5. Variable rate bonds pay interest that is indexed to some broad interest rate measure (such as Treasury bill rates) and thus experience variable coupon payments. Income bonds pay interest only if the issuer has sufficient earnings to make the promised payments. Index (or purchasing power) bonds pay interest based on an inflation index. Each of these types of bonds, therefore, can have variable interest payments.

6. More generally, for bonds that pay interest other than semiannually:

$$V_b = \frac{INT}{m}\left[\frac{1-\dfrac{1}{(1+r_b/m)^{mT}}}{r_b/m}\right] + M\left[\frac{1}{(1+r_b/m)^{mT}}\right]$$

where $m$ = Number of times per year interest is paid.

**CALCULATOR HINTS**
$N = 12(2) = 24$
$I = 4.00$
$PMT = 50$
$FV = 1{,}000$
CPT $PV = -1{,}152.47$

## EXAMPLE 3–4 Calculation of the Fair Value of a Coupon Bond

You are considering the purchase of a $1,000 face value bond issued by ExxonMobil. The bond pays 10 percent coupon interest per year, with the coupon paid semiannually (i.e., $50 [= 1,000(0.10)/2] over the first half of the year and $50 over the second half of the year). The bond matures in 12 years (i.e., the bond pays interest (12 × 2 =) 24 times before it matures). If the required rate of return ($r_b$) on this bond is 8 percent (i.e., the periodic discount rate is (8%/2 = 4 percent), the market value of the bond is calculated as follows:

$$V_b = \frac{1{,}000(0.10)}{2}\left[\frac{1 - \dfrac{1}{[1 + (0.08/2)]^{2(12)}}}{0.08/2}\right] + 1{,}000/[1 + (0.08/2)]^{2(12)}$$
$$= 50(15.24696) + 1{,}000(0.39012) = \$1{,}152.47$$

or an investor would be willing to pay no more than $1,152.47 for this bond.

If the required rate of return on this bond is 10 percent, the market value of the bond is calculated as follows:

$$V_b = \frac{1{,}000(0.10)}{2}\left[\frac{1 - \dfrac{1}{[1 + (0.10/2)]^{2(12)}}}{0.10/2}\right] + 1{,}000/[1 + (0.10/2)]^{2(12)}$$
$$= 50(13.79864) + 1{,}000(0.31007) = \$1{,}000.00$$

or an investor would be willing to pay no more than $1,000.00 for this bond.

If the required rate of return on this bond is 12 percent, the market value of the bond is calculated as follows:

$$V_b = \frac{1{,}000(0.10)}{2}\left[\frac{1 - \dfrac{1}{[1 + (0.12/2)]^{2(12)}}}{0.12/2}\right] + 1{,}000/[1 + (0.12/2)]^{2(12)}$$
$$= 50(12.55036) + 1{,}000(0.24698) = \$874.50$$

or an investor would be willing to pay no more than $874.50 for this bond.

**bond**
*Long-term debt obligation issued by corporations and government units.*

**premium bond**
*A bond in which the present value of the bond is greater than its face value.*

**discount bond**
*A bond in which the present value of the bond is less than its face value.*

**par bond**
*A bond in which the present value of the bond is equal to its face value.*

In the preceding example, when the required rate of return ($r_b$) on the bond is 8 percent, the present value of the bond, $1,152.47, is greater than its face value of $1,000. When the bond's coupon rate is greater than the required rate of return (10 percent versus 8 percent in our example), the **bond** should sell at a **premium.** To achieve the required rate of return, the bond holder takes a loss on the difference between the purchase price of the bond and the face value received at maturity. When the bond's required rate of return is 12 percent, its present value is less than its face value and the bond should sell at a **discount.** This occurs because the coupon rate on the bond is below the required rate of return. To achieve the required rate of return, the bond holder experiences a gain on the difference between the purchase price of the bond and the face value received at maturity. Finally, when the bond's required rate of return is 10 percent, its present value is equal to its face value and the bond should sell at **par.** This occurs because the coupon rate on the bond is equal to the required rate of return on the bond. To achieve the required rate of return on the bond, the bond holder experiences neither a gain nor a loss on the difference between the purchase price of the bond and the face value received at maturity. We summarize the scenarios for premium, discount,[7] and par bonds in Table 3–3.

7. The term *discount bond* is also used to denote a zero-coupon bond.

**TABLE 3–3 Description of a Premium, Discount, and Par Bond**

**Premium bond**—when the *coupon rate* on a bond is greater than the *required rate of return* on the bond, the *fair present value* is greater than the *face value* of the bond.
When the *coupon rate* on a bond is greater than the *yield to maturity* on the bond, the *current market price* is greater than the *face value* of the bond.
**Discount bond**—when the *coupon rate* on a bond is less than the *required rate of return* on the bond, the *fair present value* is less than the *face value* of the bond.
When the *coupon rate* on a bond is less than the *yield to maturity* on the bond, the *current market price* is less than the *face value* of the bond.
**Par bond**—when the *coupon rate* on a bond is equal to the *required rate of return* on the bond, the *fair present value* is equal to the *face value* of the bond.
When the *coupon rate* on a bond is equal to the *yield to maturity* on the bond, the *current market price* is equal to the *face value* of the bond.

The designation as a premium, discount, or par bond does not help in the decision to buy or sell a bond. These terms are simply descriptive designations regarding the relationship between the present value of the bond and its face value. Rather, investors make the decision to buy or sell by comparing the bond's present value to its current market price. As we noted above, the present value of the bond will equal the bond's price only in an efficient market where prices instantaneously adjust to new information about the security's value.

Bond issuers usually set a bond's coupon rate close to the required rate of return at the time of issuance, which forces new bonds to sell close to par. As time goes by, a bond's required rate of return may change due to the arrival of new information (e.g., changes in future expected inflation or the issuer's credit risk). As a result, a bond may become a premium or a discount bond, and its price may oscillate above and below par throughout the bond's life.

## Bond Valuation Formula Used to Calculate Yield to Maturity

**yield to maturity**

*The return or yield the bond holder will earn on the bond if he or she buys it at its current market price, receives all coupon and principal payments as promised, and holds the bond until maturity.*

The present value formulas can also be used to find the expected rate of return, $E(r_b)$, or, assuming all promised coupon and principal payments are made as promised, what is often called the **yield to maturity (ytm)** on a bond (i.e., the return the bond holder will earn on the bond if he or she buys the bond at its current market price, receives all coupon and principal payments as promised, and holds the bond until maturity). The yield to maturity calculation implicitly assumes that all coupon payments periodically received by the bond holder can be reinvested at the same rate—that is, reinvested at the calculated yield to maturity.[8]

Rewriting the bond valuation formula, where $V_b$ is the current market price that has to be paid to buy the bond, we can solve for the yield to maturity ($ytm$) on a bond as follows—where we write $ytm$ instead of $E(r_b)$:

$$V_b = \frac{INT/2}{(1+ytm/2)^1} + \frac{INT/2}{(1+ytm/2)^2} + \ldots + \frac{INT/2}{(1+ytm/2)^{2T}} + \frac{M}{(1+ytm/2)^{2T}}$$

$$= \frac{INT}{2}\left[\frac{1-\dfrac{1}{(1+ytm/2)^{2T}}}{ytm/2}\right] + M\left[1+(ytm/2)\right]^{2T}$$

8. As discussed in Appendix 3A to this chapter (available through Connect or your course instructor), if coupon payments are reinvested at less (more) than this rate, the yield to maturity will be lower (higher) than that calculated in this section. This concept will be key to understanding interest rate risk discussed later in the text (Chapters 22 and 23).