openstax™

Principles of Finance

Principles of Finance

SENIOR CONTRIBUTING AUTHORS

JULIE DAHLQUIST, TEXAS CHRISTIAN UNIVERSITY

RAINFORD KNIGHT, FLORIDA ATLANTIC UNIVERSITY

openstax™

OpenStax
Rice University
6100 Main Street MS-375
Houston, Texas 77005

To learn more about OpenStax, visit https://openstax.org.
Individual print copies and bulk orders can be purchased through our website.

HARDCOVER BOOK ISBN-13	**978-1-711470-53-5**
B&W PAPERBACK BOOK ISBN-13	**978-1-711470-52-8**
DIGITAL VERSION ISBN-13	**978-1-951693-54-1**
ORIGINAL PUBLICATION YEAR	**2022**

1 2 3 4 5 6 7 8 9 10 JAY 22

OpenStax

OpenStax provides free, peer-reviewed, openly licensed textbooks for introductory college and Advanced Placement® courses and low-cost, personalized courseware that helps students learn. A nonprofit ed tech initiative based at Rice University, we're committed to helping students access the tools they need to complete their courses and meet their educational goals.

Rice University

OpenStax, OpenStax CNX, and OpenStax Tutor are initiatives of Rice University. As a leading research university with a distinctive commitment to undergraduate education, Rice University aspires to path-breaking research, unsurpassed teaching, and contributions to the betterment of our world. It seeks to fulfill this mission by cultivating a diverse community of learning and discovery that produces leaders across the spectrum of human endeavor.

Philanthropic Support

OpenStax is grateful for the generous philanthropic partners who advance our mission to improve educational access and learning for everyone. To see the impact of our supporter community and our most updated list of partners, please visit openstax.org/impact.

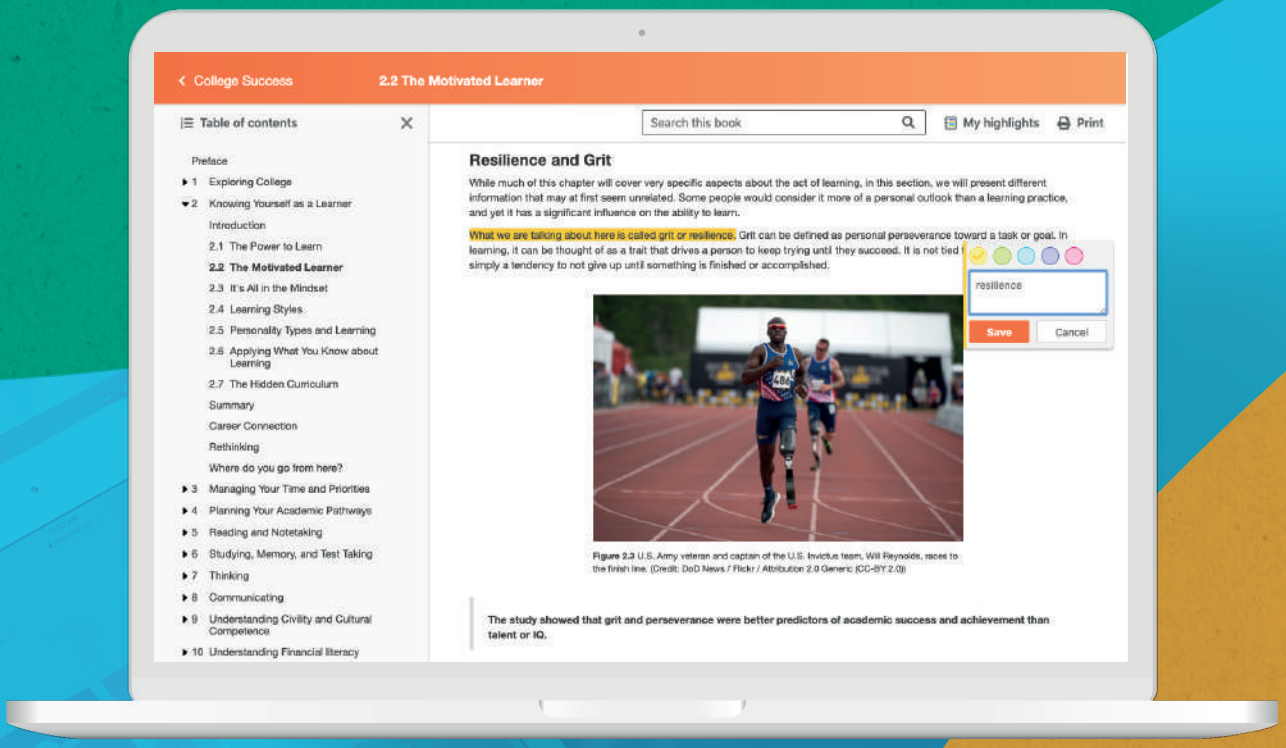
Arnold Ventures
Chan Zuckerberg Initiative
Chegg, Inc.
Arthur and Carlyse Ciocca Charitable Foundation
Digital Promise
Ann and John Doerr
Bill & Melinda Gates Foundation
Girard Foundation
Google Inc.
The William and Flora Hewlett Foundation
The Hewlett-Packard Company
Intel Inc.
Rusty and John Jaggers
The Calvin K. Kazanjian Economics Foundation
Charles Koch Foundation
Leon Lowenstein Foundation, Inc.
The Maxfield Foundation
Burt and Deedee McMurtry
Michelson 20MM Foundation
National Science Foundation
The Open Society Foundations
Jumee Yhu and David E. Park III
Brian D. Patterson USA-International Foundation
The Bill and Stephanie Sick Fund
Steven L. Smith & Diana T. Go
Stand Together
Robin and Sandy Stuart Foundation
The Stuart Family Foundation
Tammy and Guillermo Treviño
Valhalla Charitable Foundation
White Star Education Foundation
Schmidt Futures
William Marsh Rice University

openstax™

Study where you want, what you want, when you want.

When you access your book in our web view, you can use our new online **highlighting and note-taking** features to create your own study guides.

Our books are free and flexible, forever.
Get started at **openstax.org/details/books/principles-finance**



Access. The future of education.
openstax.org

RICE

CONTENTS

Preface

About OpenStax

OpenStax is part of Rice University, which is a 501(c)(3) nonprofit charitable corporation. As an educational initiative, it's our mission to transform learning so that education works for every student. Through our partnerships with philanthropic foundations and our alliance with other educational resource companies, we're breaking down the most common barriers to learning. Because we believe that everyone should and can have access to knowledge.

About OpenStax Resources

Customization

Principles of Finance is licensed under a Creative Commons Attribution 4.0 International (CC BY) license, which means that you can distribute, remix, and build upon the content, as long as you provide attribution to OpenStax and its content contributors.

Because our books are openly licensed, you are free to use the entire book or select only the sections that are most relevant to the needs of your course. Feel free to remix the content by assigning your students certain chapters and sections in your syllabus, in the order that you prefer. You can even provide a direct link in your syllabus to the sections in the web view of your book.

Instructors also have the option of creating a customized version of their OpenStax book. The custom version can be made available to students in low-cost print or digital form through their campus bookstore. Visit the Instructor Resources section of your book page on OpenStax.org for more information.

Art Attribution

In *Principles of Finance*, most art contains attribution to its title, creator or rights holder, host platform, and license within the caption. Because the art is openly licensed, anyone may reuse the art as long as they provide the same attribution to its original source.

To maximize readability and content flow, some art does not include attribution in the text. If you reuse illustrations, graphs, or charts from this text that do not have attribution provided, use the following attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license.

Errata

All OpenStax textbooks undergo a rigorous review process. However, like any professional-grade textbook, errors sometimes occur. Writing style guides and other contextual frameworks also change frequently. Since our books are web-based, we can make updates periodically when deemed pedagogically necessary. If you have a correction to suggest, submit it through the link on your book page on OpenStax.org. Subject matter experts review all errata suggestions. OpenStax is committed to remaining transparent about all updates, so you will also find a list of past errata changes on your book page on OpenStax.org.

Format

You can access this textbook for free in web view or PDF through OpenStax.org, and for a low cost in print.

About *Principles of Finance*

Summary

Principles of Finance is targeted at the core finance course for undergraduate business majors. The book is designed for conceptual accessibility to students who are relatively early in their business curriculum (such as second-year students), yet it is also suitable for more advanced students. Due to the wide range of audiences and course approaches, the book is designed to be as flexible as possible. Its modular structure allows the introduction and review of content from prerequisite subjects in financial accounting, statistics, and

economics, depending on student preparation. It provides a solid grounding in the core concepts of financial theory so that business students interested in a major or minor in finance will also be prepared for more rigorous upper-level courses. Concepts are further reinforced through applicable connections and practical calculation techniques for more detailed and realistic company scenarios from various industries.

Pedagogical Foundation

Principles of Finance emphasizes financial concepts relevant to people working in a variety of business functions. To illuminate the meaningful applications and implications of financial ideas, the book incorporates a unique use-case approach, providing connections among topics, solutions, and real-world problems. This multifaceted framework drives the integration of concepts while maintaining a modular chapter structure. Theoretical and practical aspects are presented in a balanced manner, and select ethical considerations are introduced, particularly in the context of corporate governance.

In order to create meaning for all students, *Principles of Finance* exposes them to a range of companies, industries, and scenarios reflecting different contexts. Examples of large companies such as Apple, Peloton, and American Airlines are balanced with small businesses—coffee shops, clothing stores, and salons—that may be more aligned with student experiences. The text includes authentic narratives from corporate finance, small business, and personal finance to drive relevance and interest of the discipline. Profiles and interviews include diverse figures in finance, such as Carlos Slim, Irina Simmons, Janet Yellen, and Ben Bernanke. Problems and exercises have been carefully constructed to place students into a range of settings and contexts as they develop knowledge and put it into practice. Finally, to reflect very recent experiences, the authors have incorporated several discussions regarding the COVID-19 pandemic and its impact on people and businesses.

Throughout, there is an emphasis on data use in business decision-making, with integrative sections on the importance and analysis of financial, economic, and statistical data. Data types include FRED (https://openstax.org/r/fred-stlouisfed)® economic data, company financial statements, and stock prices. Practical techniques and calculation examples for data analysis with financial calculators (the Texas Instruments BA II Plus™ Professional model is used as the basis for example illustrations) and/or spreadsheets are included for relevant topics. For key chapters, downloadable Microsoft® Excel® data files are available for student reference. This technical feature provides students with access to the Excel data files used in the chapter examples for time value of money (Chapters 7, 8, 9) and statistics (Chapters 14, 15, 16) problems. The downloadable files for the chapters covering financial forecasting and trade credit (18 and 19) allow students to see how changing assumptions and variables impact financial decision-making. Chapters 13 and 14 (statistical and regression analysis, respectively) also include brief sections about the R software (https://openstax.org/r/r-software) package to promote further interest in trends in data science.

Teaching Plan Options

Principles of Finance includes chapters on basic, applied, and integrative finance topics as well as key concepts from prerequisite financial accounting, quantitative methods (statistics), and economics courses. The chapters on prerequisite topics highlight examples relevant to finance students. For instructors with a limited one-semester schedule or whose students have solid knowledge of prerequisite disciplines, we recommend focusing on the “core” chapters, as indicated in the following table of contents:

1	Introduction to Finance	Core
2	Corporate Structure and Governance	Core
3	Economic Foundations: Money and Rates	Extension
4	Accrual Accounting Process	Extension

Table 1

5	Financial Statements	Core
6	Measures of Financial Health	Core
7	Time Value of Money I: Single Payment Value	Core
8	Time Value of Money II: Equal Multiple Payments	Core
9	Time Value of Money III: Unequal Multiple Payment Values	Core
10	Bonds and Bond Valuation	Core
11	Stocks and Stock Valuation	Core
12	Historical Performance of US Markets	Core
13	Statistical Analysis in Finance	Extension
14	Regression Analysis in Finance	Extension
15	How to Think about Investing	Core
16	How Companies Think about Investing	Core
17	How Firms Raise Capital	Core
18	Financial Forecasting	Core
19	The Importance of Trade Credit and Working Capital in Planning	Extension
20	Risk Management and the Financial Manager	Extension

Table 1

Although chapters are written to be independent, they do generally build on the understanding in the previous core chapters. Please bear this in mind when considering alternate sequences.

Key Features to Drive Understanding

- **Concepts in Practice** presents examples of financial challenges, managerial decisions, and the range of accepted business practice in companies and industries.
- **Think It Through** guides students through the process of applying the concepts in the chapter to analyzing and interpreting data.
- **Link to Learning** introduces students to online resources (further reading, data sources, or videos) that are pertinent to students' exploration of the topic at hand.

Organizational and Reinforcement Materials to Support Learning

- **Learning Outcomes.** Every section begins with a set of clear and concise learning outcomes (LOs). These outcomes are designed to help the instructor decide what content to include or assign and to guide students on what they can expect to learn.
- **Why It Matters.** Chapter opening examples include real-world topics from corporate finance, small business, and personal finance to explain the relevance and interest of the topic for students.
- **CFA® Institute.** For certain chapters, a topical connection to the learning outcome statements (LOS) for the Level I Study Sessions (https://openstax.org/r/level1-study-session) of the CFA Institute's professional curriculum is indicated at the end of the chapter.
- **Summaries.** Designed to support both students and instructors, chapter summaries distill the information in each section down to key, concise points.
- **Key Terms.** Key terms are bold and are followed by an explanation in context. Definitions of key terms are also listed in a glossary that appears at the end of each module online and at the end of each chapter in print.
- **Assessments.** A mix of multiple-choice questions, short-answer review questions, and quantitative problems is provided, depending on topic, providing opportunities for students to recall, discuss, and

examine the concepts learned in each chapter.
  - **Multiple-choice questions** are basic review questions that test comprehension.
  - **Short-answer questions** are brief open-response questions that allow the application of concepts or critical thinking.
  - **Quantitative problems** range from single-variable to multistep or multivariable calculations, depending on the difficulty and application level of the chapter.
  - **Sample answers and solutions** are provided as part of the instructor resources.

- **Video Activity.** This optional interactive activity at the end of every chapter provides reflection questions for students to apply to two online YouTube videos that offer a variety of corporate, economic, government, and skills-based examples and perspectives.

About the Authors

Senior Contributing Authors

Julie Dahlquist, Texas Christian University
Dr. Dahlquist is a professor of professional practice in the Finance Department of the Neeley School of Business at Texas Christian University. She holds a PhD from Texas A&M University, an MA from St. Mary's University, a BBA from the University of Louisiana at Monroe, and a Chartered Market Technician® (CMT) designation. Previously, she served on the finance faculties of the University of Texas at San Antonio and St. Mary's University. She has extensive international experience teaching finance to undergraduate, graduate, and executive MBA students in programs in Mexico, Austria, Germany, Switzerland, Italy, Belgium, Greece, and South Korea. Dr. Dahlquist is president of the Technical Analysis Educational Foundation (TAEF), which works with universities to include technical analysis as an integral part of their finance curricula. She has coauthored *Technical Analysis: The Complete Resource for Financial Market Technicians* (with Charles Kirkpatrick, 3rd edition, FT Press, 2015) and has contributed to many other scholarly publications. Her research has appeared in *Financial Analysts Journal*, *Managerial Finance*, *Applied Economics*, *Working Money*, *Financial Practices and Education*, and the *Journal of Financial Education*. Dr. Dahlquist has served as editor of the *Journal of Technical Analysis*, a member of the editorial board of the *Southwestern Business Administration Journal*, and a reviewer for several other journals.

Rainford Knight, Florida Atlantic University
Dr. Knight is adjunct faculty in the Finance Department of the College of Business at Florida Atlantic University and the director of its Financial Analyst Program, which he founded in partnership with Bloomberg in 2011. He holds a BBA, an MBA, and a PhD in finance from Florida Atlantic University. Dr. Knight is a member of the CFA Institute and a former director of the CFA Society of South Florida. He has extensive experience teaching finance at the undergraduate, graduate, and executive levels. Previously, he served on the finance faculty of Fairleigh Dickinson University. Dr. Knight has coauthored articles on corporate sustainability, cost-benefit analyses, mutual fund returns, and CEO compensation. He also has significant private industry experience in corporate finance, investment management, and hedge funds. He has been an adviser to CEOs of small to midsize companies on a variety of issues, including restructurings, valuation, financing, and acquisitions. Internationally, he was part of the consulting team advising a sovereign government on the restructuring of its financial sector and has also made presentations regarding financial sector restructuring to central banks in Latin America. Since 2021, Dr. Knight has been CEO and cofounder of Transparency Invest, which supports accountability in organizations.

Contributing Authors

Alan S. Adams, Dean College

Curtis J. Bacon, Southern Oregon University

Samantha T. Cooper, Buena Vista University

Michael P. Griffin, University of Massachusetts Dartmouth

Kevin C. Higgins, Maryville University

Larry Musolino, Pennsylvania State University

Reviewers

Curtis J. Bacon, Southern Oregon University

John Paul Broussard, Rutgers University

Jeffrey M. Brown, Johnson University

Raul S. Consunji, Salem State University

Aaron Cook, Pennsylvania State University

Samantha T. Cooper, Buena Vista University

Ramon P. DeGennaro, University of Tennessee

Francis H. Dong, formerly of The Catholic University of America

Wayne Durr, Western New England University

Fernando Garcia, California State University

Lenaye Harris, Utah State University

Kevin C. Higgins, Maryville University

Samira Hussein, Johnson County Community College

Jiya L. Jain, University of Maryland Global Campus

Robert Jozkowski, Eckerd College

Kristin Burke Martin, Franklin University

Michael McDonald, Fairfield University

Harini Mittal, Bronx Community College, City University of New York

Andrew Jason Novak, Southern New Hampshire University

Daniel E. Rhem, Pitt Community College

Sanjay Sharma, Columbia University

Dennis C. Shea, Upper Iowa University

Jere Smith, Southern New Hampshire University

Tih Koon Tan, University of the District of Columbia

Wilson Zehr, Eastern Oregon University

Additional Resources

We've compiled additional resources for instructors, including PowerPoint™ lecture slides, an instructor's manual, a test bank, and a solution guide. Instructor resources require a verified instructor account, which you can apply for when you log in or create your account on OpenStax.org.

Instructor resources are typically available within a few months after the book's initial publication. Take advantage of these resources to supplement your OpenStax book.

Community Hubs

OpenStax partners with the Institute for the Study of Knowledge Management in Education (ISKME) to offer Community Hubs on OER Commons—a platform for instructors to share community-created resources that support OpenStax books, free of charge. Through our Community Hubs, instructors can upload their own materials or download resources to use in their own courses, including additional ancillaries, teaching material, multimedia, and relevant course content. We encourage instructors to join the hubs for the subjects most relevant to your teaching and research as an opportunity both to enrich your courses and to engage with other faculty. To reach the Community Hubs, visit www.oercommons.org/hubs/openstax.

Technology Partners

As allies in making high-quality learning materials accessible, our technology partners offer optional low-cost tools that are integrated with OpenStax books. To access the technology options for your text, visit your book page on OpenStax.org.

1

Introduction to Finance

Figure 1.1 Finance is the linchpin that connects and directs many parts of a business or organization. (credit: modification of work "Finance behind the Glass" by Max London/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

Finance is essential to the management of a business or organization. Without good financial protocol, safeguards, and tools, running a successful business is more difficult. In 1978, Bacon Signs was a family-owned, regional Midwestern sign company engaged in the manufacture, sale, installation, and maintenance of commercial signage. The company was about to transition from the second to third generation of family ownership. Bacon Signs, established in 1901, had weathered the Great Depression, World War II, the Vietnam War, and the oil embargo and was working its way through historically high rates of inflation and interest rates. The family business had successfully struggled through the ebb and flow of the regional and national economy by providing quality products and service to its regional clients.

In the early 1980s, the company's fortunes changed permanently for the better. The owner recognized that the custom signs built by his firm were superior in quality to the signs it installed for national franchises. The owner worked with the company's banker and vice president of finance and operations to develop a production, sales, and financing plan that could be offered to the larger national sign companies. The larger companies agreed to subcontract manufacturing of midsize orders to Bacon Signs. The firm then made a commitment to build and deliver these signs on time and under budget. As Bacon Signs' reputation for quality grew, so did demand for its products. The original financing plan anticipated this potential growth and was

designed to meet anticipated capital requirements so that the firm could expand how and when it needed to.

Bacon Signs' ability to manufacture and deliver a high-quality product at a good price was the true value of the firm. However, without the planning and ability to raise capital facilitated by the financing plan, the firm would not have been able to act on its strengths at the critical moment. Financing was the key to expansion and financial stability for the firm.[1]

In this book, we demonstrate that business finance is about developing and understanding the tools that help people make consistently good and repeatable decisions.

1.1 What Is Finance?

Learning Outcomes

By the end of this section, you will be able to:

- Describe the main areas in finance.
- Explain the importance of studying finance.
- Discuss the concepts of risk and return.

Definition of Finance

Finance is the study of the management, movement, and raising of money. The word *finance* can be used as a verb, such as when the First National Bank agrees to finance your home mortgage loan. It can also be used as a noun referring to an entire industry. At its essence, the study of finance is about understanding the uses and sources of cash, as well as the concept of risk-reward trade-off. Finance is also a tool that can help us be better decision makers.

Basic Areas in Finance

Finance is divided into three primary areas in the domestic market: business finance, investments, and financial markets and institutions (see Figure 1.2). We look at each here in turn.

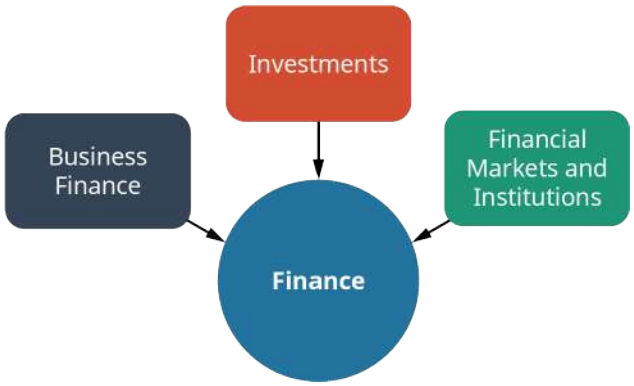


Figure 1.2 The Three Basic Areas of Study in Finance

Business Finance

Business finance looks at how managers can apply financial principles to maximize the value of a firm in a risky environment. Businesses have many stakeholders. In the case of corporations, the shareholders own the company, and they hire managers to run the company with the intent to maximize shareholder wealth. Consequently, all management decisions should run through the filter of these questions: "How does this decision impact the wealth of the shareholders?" and "Is this the best decision to be made for shareholders?"

In business finance, managers focus on three broad areas (see Figure 1.3).

1 Dun & Bradstreet. "Bacon Signs, Inc." *D&B Business Directory.* https://www.dnb.com/business-directory/company-profiles.bacon_signs_inc.90df737e33956dd7c76717a20e9d56ad.html#financials-anchor

1. **Working capital management** (WCM) is the study and management of short-term assets and liabilities. The chief financial officer (CFO) and the finance team are responsible for establishing company policy for how to manage WCM. The finance department determines credit policy, establishes minimum criteria for the extension of credit to clients, terms of lending, when to extend, and when to take advantage of short-term creditor financing. The accounting department basically implements the finance department's policies. In many firms, the accounting and finance functions operate in the same department; in others, they are separate.
2. **Capital budgeting** is the process of determining which long-term or fixed assets to acquire in an effort to maximize shareholder value. Capital budgeting decisions add the greatest value to a firm. As such, capital budgeting is thought to be one of the most important financial functions within a firm. The capital budgeting process consists of estimating the value of potential investments by forecasting the size, timing, and risk of cash flows associated with the investments. The finance department develops and compiles cash flow estimates with input from the marketing, operations, accounting, human resources, and economics departments to develop a portfolio of investment projects that collectively maximize the value of the firm.
3. **Capital structure** is the process by which managers focus more specifically on long-term debt and increasing shareholder wealth. Capital structure questions require financial managers to work with economists, lenders, underwriters, investment bankers, and other sources of external financial information and financial capital. When Bacon Signs developed its financial plan, the executives included each of these three aspects of business finance into the plan.

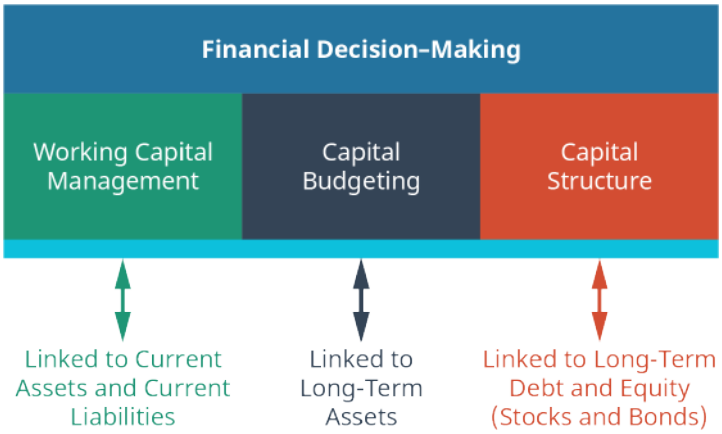


Figure 1.3 How Corporate Finance Decision-Making Activities Relate to the Balance Sheet

Figure 1.3 demonstrates how the three essential decision-making activities of the financial manager are related to a balance sheet. Working capital management focuses on short-term assets and liabilities, capital budgeting is focused on long-term assets, and capital structure is concerned with the mix of long-term debt and equity financing.

Investments

Investments are products and processes used to create and grow wealth. Most commonly, investment topics include the discussion and application of the different types of financial instruments, delivery vehicles, regulation, and risk-and-return opportunities. Topics also include a discussion of stocks, bonds, and derivative securities such as futures and options. A broad coverage of investment instruments would include mutual funds, exchange-traded funds (ETFs), and investment vehicles such as 401k plans or individual retirement accounts (IRAs). In addition, real assets such as gold, real estate, and commodities are also common discussion topics and investment opportunities.

Investments is the most interesting area of finance for many students. Television programs such as *Billions* and movies such as *Wall Street* make investing appear glamorous, dangerous, shady, or intoxicating,

depending on the situation and the attitude of the viewer. In these programs, the players and their decisions can lead to tremendous wealth or tremendous losses. In reality, most of us will manage our portfolios well shy of the extremes portrayed by the entertainment industry. However, we will need to make personal and business investment decisions, and many students reading this material will work in the investment industry as personal investment advisers, investment analysts, or portfolio managers.

Financial Markets and Institutions

Financial markets and institutions are the firms and regulatory agencies that oversee our financial system. There is overlap in this area with investments and business finance, as the firms involved are profit seeking and need good financial management. They also are commonly the firms that facilitate investment practices in our economy. A financial institution regulated by a federal or state agency will likely handle an individual investment such as the purchase of a stock or mutual fund.

Much of the US regulatory structure for financial markets and institutions developed in the 1930s as a response to the stock market crash of 1929 and the subsequent Great Depression. In the United States, the desire for safety and protection of investors and the financial industry led to the development of many of our primary regulatory agencies and financial regulations. The Securities and Exchange Commission (SEC) was formed with the passage of the Securities Act of 1933 and Securities Exchange Act of 1934. Major bank regulation in the form of the Glass-Steagall Act (1933) and the Banking Act of 1935 gave rise to government-backed bank deposit insurance and a more robust Federal Reserve Bank.

These regulatory acts separated investment banking from commercial banking. Investment banks and investment companies continued to underwrite and facilitate new bond and equity issues, provide financial advice, and manage mutual funds. Commercial banks and other depository institutions such as savings and loans and credit unions left the equity markets and reduced their loan portfolios to commercial and personal lending but could purchase insurance for their primary sources of funds, checking, and savings deposits.

Today, the finance industry barely resembles the structure your parents and grandparents grew up and/or worked in. Forty years of deregulation have reshaped the industry. Investment and commercial bank operations and firms have merged. The separation of activities between investment and commercial banking has narrowed or been eliminated. Competition from financial firms abroad has increased, and the US financial system, firms, and regulators have learned to adapt, change, and innovate to continue to compete, grow, and prosper.

The **Financial Industry Regulatory Authority (FINRA)** formed in 2007 to consolidate and replace existing regulatory bodies. FINRA is an independent, nongovernmental organization that writes and enforces the rules governing registered brokers and broker-dealer firms in the United States. The **Securities Investor Protection Corporation (SIPC)** is a nonprofit corporation created by an act of Congress to protect the clients of brokerage firms that declare bankruptcy. SIPC is an insurance that provides brokerage customers up to $500,000 coverage for cash and securities held by the firm.

The regulation of the financial industry kicked into high gear in the 1930s and for those times and conditions was a necessary development of our financial industry and regulatory oversight. Deregulation of the finance industry beginning in the 1970s was a necessary pendulum swing in the opposite direction toward more market-based and less restrictive regulation and oversight. The Great Recession of 2007–2009 resulted in the reregulation of several aspects of the financial industry. Some would argue that the regulatory pendulum has swung too far toward deregulation and that the time for more or smarter regulation has returned.

CONCEPTS IN PRACTICE

The Great Recession

The Great Recession of 2007–2009 exposed many of the weaknesses of our financial system. The ease with which banks could lower credit standards to allow ill-prepared consumers to purchase real estate and the resulting speed with which the world economy plunged into recession is astounding.

Regulation to address the economic crisis was also swift. Fortunately, Ben Bernanke, chairman of the Federal Reserve at the time, had throughout his career conducted extensive research into the causes of and potential resolution of the Great Depression of the 1930s.[2] He was uniquely qualified to lead the economic response to the crisis. Some resulting laws moved to address the immediate needs and others to correct the underlying causes of the recession.

One immediate fix was the Troubled Asset Relief Program (TARP). TARP authorized the Treasury to buy illiquid assets in order to save the financial institutions so important to lubricating our economy. Politically this was a tough decision, as it appeared that the government bailed out greedy bankers. In the end, however, the program was justified because the economy immediately began a slow but steady recovery, most financial institutions did not fail, and the Treasury recouped all of its investment used in the bailout. However, individual homeowners suffered greatly.

The Dodd-Frank Act of 2008 attempted to address many of the underlying causes of the Great Recession by reorganizing and toughening the regulatory framework, including tighter oversight of critically important financial institutions. Dodd-Frank also created the Consumer Financial Protection Bureau (CFPB) to protect consumers from harm caused by unscrupulous banking activities. Today, the hope is that financial institutions will be stopped short of the gross negligence evident prior to 2007 and consumers won't be left out in the cold due to actions beyond their control.

Sources: History Channel. "Here's What Caused the Great Recession." *YouTube*. May 15, 2018. https://www.youtube.com/watch?v=yM0uonkloXY. Accessed April 18, 2021; Randall D. Guynn, Davis Polk, and Wardwell LLP, "The Financial Panic of 2008 and Financial Regulatory Reform." *Harvard Law School Forum on Corporate Governance*. November 20, 2010. https://corpgov.law.harvard.edu/2010/11/20/the-financial-panic-of-2008-and-financial-regulatory-reform/. Accessed April 18, 2021; Sean Ross. "What Major Laws Were Created for the Financial Sector Following the 2008 Crisis?" *Investopedia*. Updated March 31, 2020. https://www.investopedia.com/ask/answers/063015/what-are-major-laws-acts-regulating-financial-institutions-were-created-response-2008-financial.asp. Accessed April 18, 2021.

Why We Study Finance

Finance is the lubricant that keeps our economy running smoothly. Issuing a mortgage can be profitable for a bank, but it also allows people to live in their own homes and to pay for them over time. Do MasterCard, Venmo, and PayPal make money when you use their product? Sure, but think how much more convenient and safer it is to carry a card or use an app instead of cash. In addition, these services allow you to easily track where and how you spend your money. A well-regulated and independent financial system is important to capital-based economies. Our smoothly functioning financial system has removed us from the days of strictly bartering to our system today, where transactions are as simple as a tap on your mobile phone.

There are any number of professional and personal reasons to study finance. A search of the internet provides a long list of finance-related professions. Interviews with senior managers reveal that an understanding of financial tools and concepts is an important consideration in hiring new employees. Financial skills are among

2 Brookings Institution. "Ben S. Bernanke." *Brookings Institute*. https://www.brookings.edu/experts/ben-s-bernanke/; Ben S. Bernanke. "On Milton Friedman's 90th Birthday." *The Federal Reserve Board*. November 8, 2002. https://www.federalreserve.gov/boarddocs/speeches/2002/20021108/

the most important tools for advancement toward greater responsibility and remuneration. Government and work-guaranteed pension benefits are growing less common and less generous, meaning individuals must take greater responsibility for their personal financial well-being now and at retirement. Let's take a closer look at some of the reasons why we study finance.

There are many career opportunities in the fields of finance. A single course in finance such as this one may pique your interest and encourage you to study more finance-related topics. These studies in turn may qualify you for engaging and high-paying finance careers. We take a closer look at financial career opportunities in Careers in Finance.

A career in finance is just one reason to study finance. Finance is an excellent decision-making tool; it requires analytical thinking. Further, it provides a framework for estimating value through an assessment of the timing, magnitude, and risk of cash flows for long-term projects. Finance is important for more immediate activities as well, such as the development of budgets to assure timely distribution of cash flows such as dividends or paychecks.

An understanding of finance and financial markets opens a broader world of available financial investment opportunities. At one time, commercial bank deposits and the occasional investment in stocks, bonds, real estate, or gold may have provided sufficient coverage of investment opportunities, portfolio diversification, and adequate returns. However, in today's market of financial technology, derivative securities, and cryptocurrencies, an understanding of available financial products and categories is key for taking advantage of both new and old financial products.

LINK TO LEARNING

Job Information

The internet provides a wealth of information about types of jobs in finance, as well as reasons to study it. Investigate the *Occupational Outlook Handbook (https://openstax.org/r/bls-gov)* issued by the Bureau of Labor Statistics to see how many of the career opportunities in finance look interesting to you. Think about the type of people you want to work with, the type of work-related activities you enjoy, and where you would like to live. Read "5 Reasons Why You Should Study Finance" at Harvard Business School Online (https://openstax.org/r/why-study-finance) to gain a better understanding of why finance offers a broad career path and is intellectually stimulating and satisfying.

Risk and Return in Finance

Finance tells us that an increase in risk results in an increase in expected return. The study of historical financial markets demonstrates that this relationship generally holds true and that riskier investments over time have provided greater returns. Of course, this is not true all the time and under all conditions; otherwise, where's the risk?

At its most basic level, risk is uncertainty. The study of finance attempts to quantify risk in a way that helps individuals and organizations assess an appropriate trade-off for risk. Risk-return tradeoffs are all around us in our everyday decision-making. When we consider walking across the street in the middle of a city block or walking down to the marked intersection, we are assessing the trade-off between convenience and safety. Should you buy the required text for your class or instead rely on the professor's notes and the internet? Should you buy that new-to-you used car sight unseen, or should you spend the money for a mechanic to assess the vehicle before you buy? Should you accept your first job offer at graduation or hold out for the offer you really want? A better understanding of finance makes these types of decisions easier and can provide you, as the decision maker, with statistics instead of just intuition.

Return is compensation for making an investment and waiting for the benefit (see Figure 1.4). Return could be

the interest earned on an investment in a bond or the dividend from the purchase of stock. Return could be the higher income received and the greater job satisfaction realized from investing in a college education. Individuals tend to be risk averse. This means that for investors to take greater risks, they must have the expectation of greater returns. Investors would not be satisfied if the average return on stocks and bonds were the same as that for a risk-free savings account. Stocks and bonds have greater risk than a savings account, and that means investors expect a greater average return.

The study of finance provides us with the tools to make better and more consistent assessments of the risk-return trade-offs in all decision-making, but especially in financial decision-making. Finance has many different definitions and measurements for risk. Portfolios of investment securities tend to demonstrate the characteristics of a normal return distribution, or the familiar "bell-shaped" curve you studied in your statistics classes. Understanding a security's average and variability of returns can help us estimate the range and likelihood of higher- or lower-than-expected outcomes. This assessment in turn helps determine appropriate prices that satisfy investors' required return premiums based on quantifiable expectations about risk or uncertainty. In other words, finance attempts to measure with numbers what we already "know."

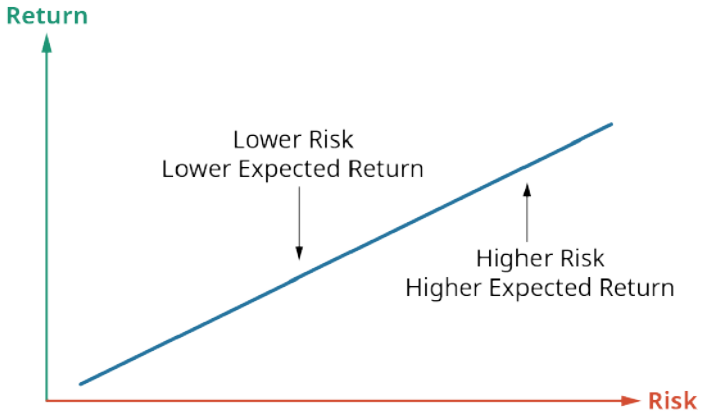


Figure 1.4 Risk and Expected Return This describes the trade-off that invested money can bring higher profits if the investor is willing to accept the risk of possible loss.

The overall uncertainty of returns has several components.

- **Default risk** on a financial security is the chance that the issuer will fail to make the required payment. For example, a homeowner may fail to make a monthly mortgage payment, or a corporation may default on required semiannual interest payments on a bond.
- **Inflation risk** occurs when investors have less purchasing power from the realized cash flows from an investment due to rising prices or inflation.
- **Diversifiable risk**, also known as unsystematic risk, occurs when investors hold individual securities or smallish portfolios and bear the risk that a larger, more well-rounded portfolio could eliminate. In these situations, investors carry additional risk or uncertainty without additional compensation.
- **Non-diversifiable risk**, or systematic risk, is what remains after portfolio diversification has eliminated unnecessary diversifiable risk. We measure non-diversifiable risk with a statistical term called *beta.* Subsequent chapters on risk and return provide a more in-depth discussion of beta.
- **Political risk** is associated with macroeconomic issues beyond the control of a company or its managers. This is the risk of local, state, or national governments "changing the rules" and disrupting firm cash flows. Political risk could come about due to zoning changes, product liability decisions, taxation, or even nationalization of a firm or industry.

1.2 The Role of Finance in an Organization

Learning Outcomes

By the end of this section, you will be able to:

- Describe the finance function.
- Explain the role of finance and its importance within an organization.

The Finance Function

Finance has many functions within an organization, and there are many job titles to reflect the varied job responsibilities. The **comptroller**, or more commonly a *controller*, in a for-profit business relies heavily on a knowledge of accounting. Controllers are in charge of financial reporting and the oversight of the accounting activities necessary to develop those reports. Controllers are concerned with payroll functions, accounts receivable, and accounts payable including taxes, inventory control, and any number of short-term asset and liability tracking and monitoring activities. They aid internal and external auditors and are responsible for monitoring and implementing the day-to-day financial operations of the firm.

In most organizations, the **treasurer** might assume many of the duties of the controller. However, the treasurer is also responsible for monitoring cash flow at a firm and frequently is the contact person for bankers, underwriters, and other outside sources of financing. A treasurer may be responsible for structuring loan and debt obligations and determining when and from whom to borrow funds. Treasurers are also responsible for investing excess funds. Where a controller may face inward toward the organization, the treasurer often faces outward as a representative to the public.

The vice president of finance (VP-F) is an executive-level position and oversees the activities of the controller and treasurer. The chief responsibility of the VP-F is to create and mentor a sufficient and qualified staff that generates reports that are timely, accurate, and thorough.

The **chief financial officer**, or **CFO**, is in a "big picture" position. The CFO sets policy for working capital management, determines optimal capital structure for the firm, and makes the final decision in matters of capital budgeting. The CFO is also forward looking and responsible for strategic financial planning and setting financial goals. Compared to a VP-F, a CFO is less of a "hands-on" manager and engages more in visionary and strategic planning.

Financial Planning

Financial planning is critical to any organization, large or small, private or public, for profit or not-for-profit. Financial planning allows a firm to understand the past, present, and future funding needs and distributions required to satisfy all interested parties. For-profit businesses work to maximize the wealth of the owners. These could be shareholders in a publicly traded corporation, the owner-managers of a "mom and pop" store, partners in a law firm, or the principal owners of any other number of business entities. Financial planning helps managers understand the firm's current status, plan and create processes and contingencies to pursue objectives, and adjust to unexpected events. The more thoughtful and thorough the financial planning process, the more likely a firm will be able to achieve its goals and/or weather hard times. Financial plans typically consider the firm's strategic objectives, ethical practices, and sources and costs of funds, as well as the development of budgets, scenarios, and contingencies. The financial plan Bacon Signs developed was thorough enough to anticipate when and how growth might occur. The plan that was presented to commercial banks allowed the firm to be guaranteed new financing at critical moments in the firm's expansion.

Good financial planning has a number of common features.

- It uses past, current, and pro forma (forward-looking) income statements. Pro forma income statements are created using assumptions from past events to make projections for future events. These income statements should develop likely scenarios and provide a sensitivity analysis of key assumptions.

- Cash flow statements are a critical part of any financial planning. Cash flow statements estimate the timing and magnitude of actual cash flows available to meet financial obligations.
- Balance sheets are critical for demonstrating the sources and uses of funds for a firm. One of the most important aspects of business is accounting (see Figure 1.5).
- Forecasting in the form of expected sales, cost of funds, and microeconomic and macroeconomic conditions are essential elements of financial planning.
- Financial analysis including ratio analysis, common-size financial statements, and trend statements are important aspects of financial planning. Such analysis aids in the understanding of where a firm has been, how it stacks up against the competition, and the assessment of target objectives.

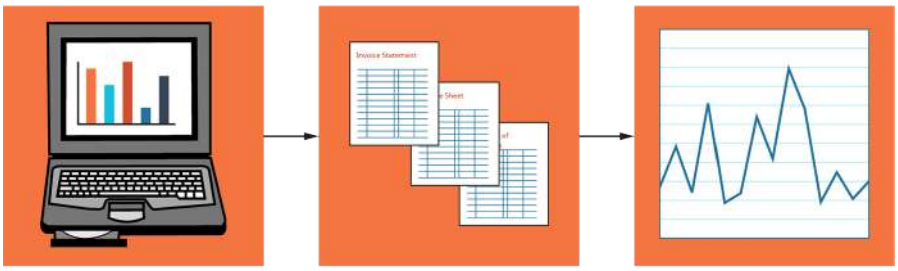


Figure 1.5 The Accounting System The accounting system relies on accurate data used to prepare all the financial reports that help to evaluate a firm.

LINK TO LEARNING

Elements of a Financial Plan

You can view key elements in a financial plan (https://openstax.org/r/write-your-business-plan) at the US Small Business Administration's website.

Forecasting and Budgeting

Forecasting and budgeting are common practices for businesses, governmental agencies, not-for-profit firms, and individual households. As with many of the financial topics introduced in this chapter, these activities are valuable for individuals and businesses alike. Budgeting, or planning for the amount, sources, and uses of cash, occurs early in the planning process. It is common for businesses to have developed an annual budget well before the start of the year. With budgeting, a firm establishes objectives for the upcoming period by developing financial statements based on historical data and expectations, as well as aspirations for the future. The budgeting process helps the firm identify what actions need to be undertaken to achieve its objectives. However, no matter how strong the budgeting process, actual events can change the timing and magnitude of expected cash flows.

Financial forecasting addresses the changes necessary to the budgeting process. Budgeting can help identify the differences or variance from expectations, and forecasting becomes the process for adapting to those changes. We attribute to President Eisenhower the saying that "plans are worthless, but planning is everything." That statement applies to business today as well as it did during his service in the military and government. The budgeting or planning process is a road map for organizations, and forecasting helps navigate the inevitable detours toward the firm's objectives.

The budgeting process develops pro forma financial statements such as income and cash flow statements and balance sheets. These provide benchmarks to determine if firms are on course to meet or exceed objectives and serve as a warning if firms are falling short. Budgeting should involve all departments within a firm to

determine sources and uses of funds and required funding to meet department and firm objectives. The process should look to emulate successful processes and change or eliminate ineffective ones. Budgeting is a periodic renewal and reminder of the firm's goals.

Financial forecasting often starts with the firm's budget and recommends changes based on differences between the budgeted financial statements and actual results. Forecasting adjusts management behavior in the immediate term and serves as a foundation for subsequent budgets.

1.3 Importance of Data and Technology

Learning Outcomes

By the end of this section, you will be able to:

- Describe the role of data in finance.
- List and describe the various types of corporate data available.
- Explain how the various types of corporate data can be accessed and analyzed.
- Describe the impact of data digitization.
- Explain how stakeholders use data when making decisions.

Importance of Data

Financial data is important for internal and external analysis of business firms. More accurate and timely data leads to better business and financial decision-making. Financial budgeting and forecasting rely on the creation of several types of financial statements including income statements, the statements of cash flow, and balance sheets, as well as the notes and assumptions used to create the financial statements. Insiders such as executive and middle managers use financial data to evaluate and reevaluate decision-making. Having current and accurate data is key to making consistent value-adding decisions for a firm. Data helps inform managers about how and when to finance projects, which projects to undertake, and necessary changes to make regarding physical, financial, and human resource assets. "Gut feelings" and "seat-of-the-pants" decision-making tend to be inconsistent with value maximization.

Outsiders also use publicly available data about firms to make purchasing, investment, credit, and regulatory decisions. Customers, investors, lenders, suppliers, and regulators must be able to access a firm's financial information. Investors need to determine how much they are willing to pay for a share of stock, banks need data to determine if a loan should be made, suppliers need financial information to determine if they should supply trade credit, and customers need to know that a firm has priced its products appropriately.

Basic Data Types

Financial statements provide some of the data needed for decision-making. Firms summarize data and develop at least three essential financial statements or reports.

1. The income statement summarizes the flow of revenues and expenses over a specified period. Income statements for publicly traded companies are available quarterly.
2. Statements of cash flow identify actual receipt and use of cash over a period.
3. Balance sheets show the existing assets, liabilities, and equity as of a particular date.

These statements represent book values and reflect historical costs and accounting adjustments such as accumulated depreciation. Book values often differ significantly from market values. Market values look forward and reflect expectations, whereas book values represent what has occurred.

In addition to the internal data summarized on financial statements, firms and outside stakeholders also seek external sources of information. External data gathering includes surveys of customers and suppliers, market research, new product development, statistical analysis, agreements with creditors, and discussions with government officials. Broader macroeconomic data is also valuable as it applies to expected market demand, unemployment, inflation, interest rates, and economic growth.

The Impact of Digitization

Data digitization makes the storage and transmission of data easier and more cost effective. Some data starts out as digital data, such as that from a Microsoft Suite product. The Excel files and Word documents we create are ubiquitous and easily stored and transmitted. Cloud storage and video conferencing are now the norm. Emails and Zoom meetings are quick, easy, and inexpensive ways to share and store information. Businesses now create an e-trail, or virtual paper trail, to document, verify, and share processes. Because data is now much easier to access, firms bear the added responsibility of ensuring that it is stored and secured properly so that individuals cannot inappropriately alter or delete information.

Data storage has changed significantly in the last decade as companies have moved the storage of digital data to the cloud. The advantages include only paying for the storage actually used, reduced energy consumption, access to specialized data protection services, and software and hardware maintenance. However, the risk of data hacks and the safety of data are key concerns in the storage of digitized information.

Uses of Data

Taken together and separately, the internally generated financial statements can provide managers with a wealth of information to enable superior decision-making. Harvard Business School identifies six ways managers can use financial statements.[3]

1. Measuring the impact of business decisions such as new software, marketing plan, or product line
2. Aiding in the development of budgets by creating a starting point for future expectations
3. Aiding in cost cutting or the reduction of duplicate activities
4. Providing data-supported strategic planning and visioning
5. Ensuring consistent data and content across departments
6. Motivating teams to set, meet, and exceed goals and objectives

CONCEPTS IN PRACTICE

How and Why Managers Use Financial Statements: The Case of Peloton

Should you lease a new car or buy one? Do you opt for the more expensive high-tech production equipment or reduce your upfront investment and pay higher labor costs over time? Is it better to finance a new product by borrowing money or selling new shares of stock? Should you manufacture overseas where the production costs are lower or in your own country where political and transportation costs are lower? Once you make your choice, how do you know if you've made the right decision? Understanding and applying financial principles can help.

For example, consider Peloton, the leader in social exercising with its bike, treadmill, and yoga platforms. In 2012, the principal founder, John Foley, was inspired to start the company because he lacked the time to attend bicycle exercise classes due to his demanding career and growing family. He enjoyed cycling classes, but they could be expensive and often did not fit into his schedule. He recognized that the most popular instructors had developed a bit of a cult following and that the music playlist was a critical component for many followers. His choice of the company name, Peloton, comes from the French word for a "pack of bike riders," familiar to anyone who has even loosely followed the annual Tour de France bike race. The company name evokes a measure of mystique and prestige.

Peloton started small and underwent five funding rounds in seven years before the company went public with an initial public offering in September 2019. Foley and his friends had the idea that they were a "purposeful music company" and needed to touch on all aspects of the workout experience including the

3 Catherine Cote. "How and Why Managers Use Financial Statements." *Business Insights*. June 16, 2020. https://online.hbs.edu/blog/post/how-managers-use-financial-statements

bike; video, audio, and music content; clothing design; competition among the riders; data gathering; and instructors for livestream and on-demand classes. They were selling an experience, not a bicycle. The equipment is expensive—a Peloton bike typically costs over $2,000. Peloton equips its studios with state-of-the-art camera and music systems and pays its instructors top dollar. Along the way, the founders made several critical financial decisions. They kept control of the firm by using private funding at the start.

How can we tell if Peloton has managed its resources well? The company started with $400,000 of funding to develop a prototype in 2012. By 2018, firm value increased to $4 billion with yet another round of private investor funding. As of April 2021, Peloton is a publicly traded company with a stock value of $34 billion. The executives are sacrificing profits in the short term to generate growth and long-term profitability. The firm uses its financial statements to identify sources and uses of funds, to test the effectiveness of advertising, and to forecast future profitability. Analysts like the firm, the stock price is up, and by many financial measures, Peloton has been a great success. Time will tell if the decisions made over the last several years will lead to long-term profitability or if the company has overinvested in marketing only to miss current and long-term profits.

(Sources: Viktor. "The Peloton Business Model—How Does Peloton Work & Make Money?" *Productmint*. Updated May 9, 2021. https://productmint.com/the-peloton-business-model-how-does-peloton-make-money/. Accessed May 18, 2021; John Ballard. "If You Invested $5,000 in Peloton's IPO, This Is How Much Money You'd Have Now." *The Motley Fool*. June 6, 2020. https://www.fool.com/investing/2020/06/06/if-you-invested-5000-in-pelotons-ipo-this-is-how-m.aspx. Accessed May 18, 2021; Erin Griffith. "Peloton's New Infusion Made It a $4 Billion Company in Six Years." *New York Times*. August 3, 2018. https://www.nytimes.com/2018/08/03/technology/pelotons-new-infusion-made-it-a-4-billion-company-in-6-years.html)

1.4 Careers in Finance

Learning Outcomes

By the end of this section, you will be able to:

- Describe current job opportunities in finance.
- Describe the financial analyst role.
- Describe the business analyst role.

Job Opportunities in Finance: Market Trends

There are many career opportunities in the field of finance. The Bureau of Labor Statistics (BLS) finds that as of May 2020, the median income for finance-related positions was $72,250 versus the overall median income of only $41,950. Further, the BLS predicts that close to an additional 500,000 new finance- and accounting-related jobs will be created by 2029.[4] These new employment opportunities are in addition to the many openings that will become available as baby boomers continue to retire and leave the workforce.

Several of the BLS-listed finance careers do not even have finance or associated wording in the career titles. The BLS identifies finance skills as necessary for careers such as management analysts and market research analysts and work in logistics. Of course, many careers traditionally encourage the study of finance. These include job titles and descriptions such as these:

- Financial manager: Oversees aspects of and produces reports about an organization's financial needs, uses, and related activities
- Investment relations associate: Prepares and presents company financial data to investors and other company stakeholders

4 U.S. Bureau of Labor Statistics. *Occupational Outlook Handbook*. https://www.bls.gov/ooh/business-and-financial/home.htm

- Budget analyst: Reviews, plans, and evaluates an organization's financial activities
- Credit analyst: Reviews financial and related information to determine the creditworthiness of potential clients and customers; typically works at commercial and investment banks, credit unions, and rating firms such as Moody's or Standard and Poor's
- Financial analyst: Collects and examines data to plan future activities and evaluate past decisions
- Personal financial advisor: Provides advice to clients for short-, intermediate-, and long-term financial planning
- Loan officer: Helps individuals and organizations apply for loans and typically works for depository financial institutions such as commercial banks
- Insurance underwriter: Evaluates risk and establishes prices for insurance products such as life, property, and casualty insurance
- Financial examiner: Evaluates and monitors the activities of depository institutions in an effort to assure proper practice and behavior
- Finance professor: Teaches college classes, engages in economic and financial research, and provides community service by serving on boards and providing financial expertise

LINK TO LEARNING

Best Jobs in Finance

You can read more about possible careers in finance (https://openstax.org/r/thebalancecareers) at the Balance Careers website.

Financial Analyst Roles

Many executive-level finance officers worked their way up via the role of financial analyst. Job descriptions vary across firms, industries, and government organizations. However, the role of financial analyst usually includes market research, financial forecasting, modeling, cost analysis, and comparative valuations. Financial analysts gather data and produce financial reports in conjunction with multiple departments within a business or organization. They rely on marketing and production personnel to provide accurate sales forecasts, and they work with accountants to create accurate financial reports.

As a financial analyst, you need strong spreadsheet skills, the ability to develop financial models and pro forma financial statements, outstanding analytical skills, and an overall understanding of business processes. Financial analysts possess a well-diversified collection of business and communication skills, both quantitative and qualitative. Figure 1.6 lists some tasks that financial analysts must perform on a daily basis. Some firms require an MBA or several years of business experience for their financial analysts.

Figure 1.6 Financial Analyst Tasks

Internal financial analysts are important for a successful firm or organization because their work can lead to more efficient and cost-effective use of financial and nonfinancial resources. Responsibilities include keeping current with market conditions, developing financial models, reconciling variance between forecasts and outcomes, and serving as a resource for management. Financial analysts fulfill their responsibilities through the development and analysis of financial data including ratio analysis, trend analysis, in-depth discussions with division managers, and the presentation and interpretation of information at meetings and on electronic platforms.

External financial analysts use similar resources and tools to evaluate financial instruments as an aid to investment companies, investment and commercial bankers, and individual investors who rely on their published reports. Various government agencies also use financial analysts to aid in regulatory oversight and enforcement.

A report from a 2019 BLS survey determines that financial analysts earn an average salary of $81,590, and jobs are predicted to grow at a faster-than-average rate of 5% through 2029.[5]

Business (or Management) Analyst Roles

The job description for a business analyst looks much like that for a financial analyst. However, the strong quantitative skills required for a financial analyst are less emphasized in favor of overall strategic thinking. A successful business analyst is able to evaluate business opportunities by using analytical thinking, industry best practices, process development, team building and organization, and information technology. They then communicate optimal courses of action to executive decision makers to maximize value in alignment with the vision and goals of the firm.

Business analysts can help develop strategy and tactics to move a firm forward. They aid in identifying challenges and solutions. Data-driven solutions help get products to market more quickly, evaluate performance, and optimize production and product mix. The Bureau of Labor Statistics identifies the following as typical business analyst duties:

- Gathering information about problems to be solved or procedures to be improved
- Interviewing personnel and conducting onsite observations to determine the methods, equipment, and

5 Ibid.

personnel that will be needed
- Analyzing financial data, revenues and expenditures, and employment reports, among other data
- Finding root causes for problems and proposing solutions that may include new systems, procedures, or personnel changes
- Presenting findings to decision makers
- Conferring with managers to ensure changes work

The average salary for management analysts was $85,260 in May 2019, and the BLS projects 11% growth, or about 94,000 new jobs, over the next decade.[6]

1.5 Markets and Participants

Learning Outcomes

By the end of this section, you will be able to:
- Identify primary and secondary markets.
- Identify key market players.

Primary and Secondary Markets

Simply put, the **primary market** is the market for "new" securities, and the **secondary market** is the market for "used" securities. Think of the primary market as equivalent to the sale of new cars and the secondary market as equivalent to the sale of used cars. In practice, many market locales trade both new and used securities. For example, the stock markets trade equity securities daily, and most of the trading takes place among individual and institutional investors who own shares in publicly traded companies. Trading a share of Amazon, Facebook, or Nike stock has little impact and no direct cash flow to the underlying firm. However, the information provided by such transactions is valuable, as it is a costly and public real-time statement by investors of their perceptions of firm's value and a reflection of satisfaction and expectations.

Some, though many fewer, transactions in the equity market are for the purchase and sale of new securities. Firms issue new shares of stock called seasoned equity offerings (SEOs) or initial public offerings (IPOs) into the market. These are issues of new shares of stock, previously untraded, and their issuance sends cash flows directly to the underlying firms. SEOs are new shares issued by established firms, and IPOs are new shares issued by firms going public for the very first time. Once the initial transaction takes place, purchasers of these new securities may trade them. However, the second and subsequent trades are secondary, not primary, market transactions.

Extensive primary market transactions take place weekly, when the Treasury Department auctions billions of dollars of new Treasury securities. These new securities repay maturing Treasury securities and provide for the ongoing liquidity and long-term borrowing needs of the federal government. Again, subsequent trading of this government debt occurs as secondary market transactions.

Key Market Players

Key market players in finance include dealers, brokers, financial intermediaries, and you and me. Each of these players facilitates the exchange of products, information, and capital in different ways. The presence of these players makes financial transactions, easier, faster, and safer—essentially more efficient. You and your friends might engage in direct financial transactions, such as buying a coffee or borrowing money for a movie. These are typically small transactions. However, for transactions that are larger or more complicated, you need advanced financial entities with capital, expertise, and networks. The two segments of the secondary markets are broker markets and dealer markets, as Figure 1.7 shows. The primary difference between broker and dealer markets is the way each executes securities trades.

6 Ibid.

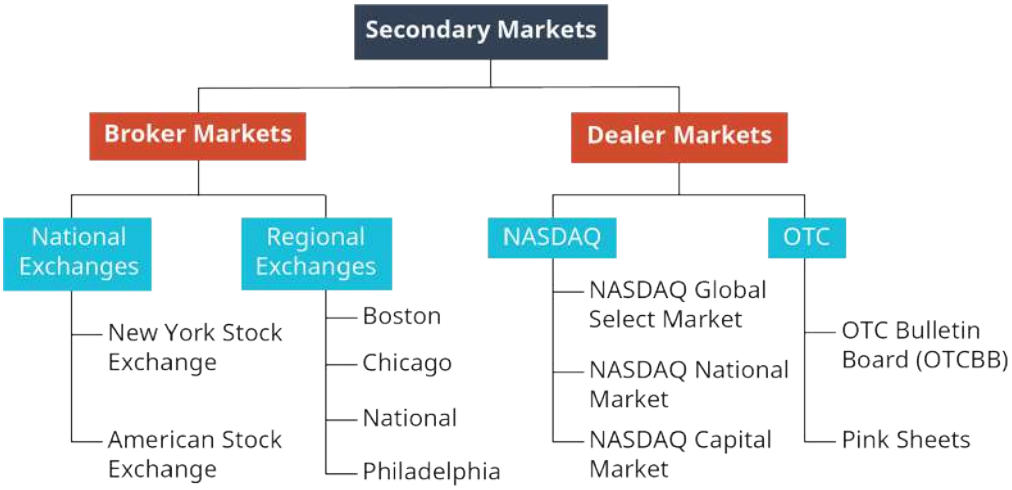


Figure 1.7 Broker and Dealer Markets

Dealers

Financial **dealers** own the securities that they buy or sell. When a dealer engages in a financial transaction, they are trading from their own portfolio. Dealers do not participate in the market in the same manner as an individual or institutional investor, who is simply trying to make their investments worth as much as possible. Instead, dealers attempt to "make markets," meaning they are willing and able to buy and sell at the current bid and ask prices for a security. Rather than relying on the performance of the underlying securities to generate wealth, dealers make money from the volume of trading and the spread between their bid price (what they are willing to pay for a security) and their ask price (the price at which they are willing to sell a security). By standing ready to always buy or sell, dealers increase the liquidity and efficiency of the market. Dealers in the United States fall under the regulatory jurisdiction of the Securities and Exchange Commission (SEC). Such regulatory oversight ensures that dealers execute orders promptly, charge reasonable prices, and disclose any potential conflicts of interest with investors.

Brokers

Brokers act as facilitators in a market, and they bring together buyers and sellers for a transaction. Brokers differ from dealers who buy and sell from their own portfolio of holdings. These firms and individuals traditionally receive a commission on sales.

In the world of stockbrokers, you may work with a discount broker or a full-service broker, and the fees and expenses are significantly different. A discount broker executes trades for clients. Brokers are required for clients because security exchanges require membership in the exchange to accept orders. Discount brokers or platforms such as Robinhood or E-Trade charge no or very low commissions on many of their trade executions, but they may receive fees from the exchanges. They also do not offer investment advice.

Full-service brokers offer more services and charge higher fees and commissions than discount brokers. Full-service brokers may offer investment advice, retirement planning, and portfolio management, as well as execute transactions. Morgan Stanley and Bank of America Merrill Lynch are examples of full-service brokers that serve both institutional and individual investors.

Financial Intermediaries

A **financial intermediary**, such as a commercial bank or a mutual fund investment company, serves as an intermediary to enable easier and more efficient exchanges among transacting parties. For instance, a commercial bank accepts deposits from savers and investors and creates loans for borrowers. An investment company pools funds from investors to inexpensively purchase and manage portfolios of stocks and bonds. These transactions differ from those of a dealer or broker. Brokers facilitate trades, and dealers stand ready to buy or sell from their own portfolios. Financial intermediaries, however, accept money from investors and may

create a completely different security all together. For example, if the borrower defaults on a mortgage loan created by the commercial bank where you have your certificate of deposit, your investment is still safely earning interest, and you are not directly affected.

Financial institutions usually facilitate financial intermediation. However, occasionally lenders and borrowers are able to initiate transactions without the help of a financial intermediary. When this occurs on a large scale, the process, known as disintermediation, can cause much turmoil in the financial markets. In the 1970s, inflation rose above 10% on an annual basis, and yet commercial banks were limited to offering maximum rates of 5% on their savings deposits.[7] Savers bypassed banks and savings and loan associations to invest directly into Treasury securities and other short-term marketable securities. This lack of deposit funds and the subsequent behavior of the industry essentially eliminated the savings and loan industry and led to significant deregulation of commercial and investment banking in the United States.

The advantages of a robust network of financial intermediaries are many. They add efficiency to the financial system through lower transaction costs. They gather and disperse information to minimize financial abuse and fraud. They provide economies of scale and specialized knowledge. Finally, financial intermediaries are critical for the functioning of a capitalist economy.

1.6 Microeconomic and Macroeconomic Matters

Learning Outcomes

By the end of this section, you will be able to:

- Define microeconomics and macroeconomics.
- Discuss the relationship between microeconomics and macroeconomics.
- Explain the importance of macroeconomic variables in finance markets.

Microeconomics

In the business setting, finance is the intersection of economics and accounting. Financial decision makers rely on economic theory and empirical evidence combined with accounting data to make informed decisions for their organization. Economics is the study of the allocation of scarce resources. Economists attempt to understand the how and why of human and financial capital allocation to governments, businesses, and consumers.

We typically separate economics into two major areas, microeconomics and macroeconomics. Microeconomics is devoted to the study of these decisions of allocation by individual businesses, persons, or organizations. Microeconomics helps us understand incentives and behavior, consumer choices and consumption, and supply and demand.

Our understanding of microeconomics aids in financial forecasting, planning, and budgeting by understanding how individuals are likely to respond to changes in product or service functionality, price, supply, quality, marketing, or other firm-induced stimulus. Empirical research by individuals, businesses, academics, and government provide evidence of what is going on and suggest what may change or stay the same.

Macroeconomics

Whereas microeconomics studies the decisions of individuals, macroeconomics examines the decisions of groups. Macroeconomic areas of study and concern include inflation, income, economic growth, and unemployment. When Bacon Signs developed a financial and operating plan to expand the business, the firm had to consider unemployment and inflation when estimating its price of labor and materials. Bacon Signs also had to consider interest rates when estimating the cost of borrowing money to expand the business.

Macroeconomic modeling is limited because models cannot capture every variable in testing and application.

7 United States President and Council of Economic Advisers. "The 1970s: Inflation, High Interest Rates, and New Competition." *Economic Report of the President*. 1991. https://fraser.stlouisfed.org/files/docs/publications/ERP/pages/6688_1990-1994.pdf

However, financial forecasting must incorporate macroeconomic assumptions and expectations into individual firm and industry forecasts. Economic Foundations expands on our discussion of micro- and macroeconomics.

Importance of Macroeconomic Variables in Financial Markets

To make financial forecasts, managers need good information to understand the relationship among several economic variables. Working from small to large, sales forecasts estimate the likely price and quantity of goods sold. In doing so, the forecaster will consider local, regional, state, national, and international economic conditions. Inflation is an important macroeconomic variable that influences prices. Every quarter, financial information hubs, such as the Wall Street Journal (WSJ), and government agencies and regulatory bodies, such as the Treasury Department and the Federal Reserve, release estimates about expected and current inflation. This information informs policy makers how to adjust the money supply to meet target objectives. Financial forecasters pay close attention to current and expected interest rates, as they have a fundamental impact on the cost of raising money and determining the required rate of return for investment.

The unemployment rate helps inform financial forecasters about the expected cost of labor and the ability of employers to hire people if a firm plans to increase the production of goods or services. The stock market is a forward-looking macroeconomic variable and measures investor expectations about future cash flows and economic growth. Political economic variables such as changes in regulation or tax policy can also affect forecasting models.

LINK TO LEARNING

Politics and Stock Markets

Politics and stock market returns make for heated conversations. Who can run the country's economic system better, Republicans or Democrats? Presidents often take the credit or blame for overall economic performance even though their actual influence is less than you might think. See this fun comparison chart (https://openstax.org/r/macrotrends-net) of political economic performance that measures stock market returns by each administration going back to President Warren Harding in 1920. Who had the highest overall increase in the market? What president in the 21st century oversaw an overall decline in the market? Just to get things going, who had better overall market returns after four years in office, Donald Trump or Barack Obama?

Each of the variables we have identified—inflation, interest rates, unemployment, economic growth, the stock market, and government fiscal policy—are macroeconomic factors. They are beyond the scope and influence of individual firms, but combined, they play a critical role in establishing the market in which firms compete. A better understanding of the interaction of these macro variables with each other and with individual micro or firm-specific variables can only strengthen financial forecasting and management decision-making.

CONCEPTS IN PRACTICE

Here, There, and Everywhere: Where Did Your iPhone Come From?

How do international macroeconomic factors affect investment decisions for businesses and individuals? Foreign investment adds risk and potential return to the decision-making process. Macroeconomic factors such as different inflation rates, unexpected changes in currency exchange rates, and mismatched economic growth all add to the uncertainty of making investments abroad. Just as important are government regulations limiting pollution, exploitation of precious minerals, labor laws, and tariffs. Toss in a pandemic, and a bottleneck or two, and suddenly international macroeconomic factors can affect almost every aspect of commerce and international trade.

For example, how far did your new iPhone travel before it got into your hands? Apple is an American company headquartered in Cupertino, California, and worth over $2 trillion.[8] However, your phone may have visited as many as six continents before it reached you. Each location touched by the Apple corporate hand requires an understanding of the financial impact on the product cost and a comparison with alternative designs, resources, suppliers, manufacturers, and shippers. This is where finance can get really fun!

(Sources: Magdalena Petrova. "We Traced What It Takes to Make an iPhone, from Its Initial Design to the Components and Raw Materials Needed to Make It a Reality." *CNBC*. December 14, 2018. https://www.cnbc.com/2018/12/13/inside-apple-iphone-where-parts-and-materials-come-from.html; Natasha Lomas. "Apple's Increasingly Tricky International Trade-offs." *TechCrunch*. January 6, 2019. https://techcrunch.com/2019/01/06/apples-increasingly-tricky-international-trade-offs/; Kif Leswing. "Here's Why Apple Is So Vulnerable to a Trade War with China." *CNBC*. May 13, 2019. https://www.cnbc.com/2019/05/13/why-is-apple-so-vulnerable-to-a-trade-war-with-china.html)

Relationship between Microeconomics and Macroeconomics

In the parable, a group of blind people happen upon an elephant for the first time, and they each touch one part—but one part only—of the elephant. Subsequently, when they each describe what they have discovered, the descriptions are vastly different. The group's members become upset, accusing one another of inaccurate descriptions or worse. The parable demonstrates how individuals can make absolute truths from their own limited and subjective information. Financial decision makers run a similar risk, if they choose to recognize only their own findings and ignore other microeconomic or macroeconomic information and the interaction of these factors.

A common view to understanding economics states that macroeconomics is a top-down approach and microeconomics is a bottom-up approach. Financial decision makers need to see both the forest and the individual trees to chart a course and move toward a strategic objective. They need both the macro data, so important for strategic thinking, and the micro data, required for tactical movement. For example, the national rate of unemployment may not have been much help when Bacon Signs was searching for skilled laborers who could form neon signs. However, the unemployment rate helped inform the company about the probability of demand for new businesses and the signs they would need.

1.7 Financial Instruments

Learning Outcomes

By the end of this section, you will be able to:

- Differentiate between money and capital markets.
- List money market instruments.
- List capital market instruments.

Money Markets and Instruments

The **money market** is the market for short-term, low-risk, highly liquid securities. "Short-term" refers to **money market securities** having maturities of less than one year–sometimes as short as overnight. "Low risk" specifically means that the probability of default by the issuer in very unlikely. Defaulting on money market instruments is not unheard of, but it is very rare. "High liquidity" means that money market instruments can generally be sold in a secondary market very quickly and at or near their current market value. Finally, money market securities are homogeneous, meaning that within an issue of securities, a single

8 Sergei Klebnikov. "Apple Becomes First U.S. Company Worth More Than $2 Trillion." *Forbes*. August 19, 2020. https://www.forbes.com/sites/sergeiklebnikov/2020/08/19/apple-becomes-first-us-company-worth-more-than-2-trillion/

instrument is not unique. For example, if you purchase 13-week T-bills issued in the first week of January, each bill is identical to any other in the issue. Compare that to the purchase of physical assets such as a car or house, where each of the assets sold has some unique feature or measure of quality.

Financial institutions, corporations, and governments that have short-term borrowing and/or lending needs issue securities in the money market. Most of the transactions are quite large, with typical amounts in excess of $100,000. These large transactions are the norm when trading federal funds, repurchase agreements, commercial paper, or negotiable certificates of deposit. Our sample company, Bacon Signs, was much too small to participate directly in the money market. However, Bacon Signs' borrowing rates were affected by changes in the money market. Treasury bills are also a very important component of the money market, and they trade in smaller amounts starting at $10,000 per T-bill.

Treasury bills (T-bills), are short-term debt instruments issued by the federal government. T-bills are auctioned weekly by the Treasury Department through the trading window of the Federal Reserve Bank of New York. The federal government uses T-bills to meet short-term liquidity needs. T-bills have very short maturities and a broad secondary market and are default-risk free. T-bills are also exempt from state and local income taxes. As a result, they carry some of the lowest effective interest rates on publicly traded debt securities. In addition to the regular auction of new T-bills, there is also an active secondary market where investors can trade used or previously issued T-bills. Since 2001, the average daily trading volume for T-bills has exceeded $75 billion.[9]

Commercial paper (CP) is a short-term, unsecured debt security issued by corporations and financial institutions to meet short-term financing needs such as for inventory and receivables. For example, credit card companies use commercial paper to finance credit card payments. Commercial paper has a maturity of one to 270 days. The short maturity reduces SEC oversight. The lesser oversight and the unsecured nature of CP means that only highly rated firms are able to issue the uninsured paper. The default rate on commercial paper is typically low, but default rates did increase into the double-digit range during the financial crisis of 2008.

Commercial paper typically carries a minimum face value of $100,000 and sells at a discount with the face value as the repayment amount. Corporations and financial institutions, not the government, issue commercial paper; thus, returns are taxable. Further, unlike T-bills, there is not a robust secondary market for CP. Most purchasers are large, such as mutual fund investment companies, and they tend to hold commercial paper until maturity.

Negotiable certificates of deposit (NCDs) are very large CDs issued by financial institutions. They are redeemable only at maturity, but they can and often do trade prior to maturity in a broad secondary market. NCDs, or *jumbo CDs*, are so called because they sell in increments of $100,000 or more. However, typical minimums amounts are $1,000,000 with a maturity of two weeks to six months.

NCDs differ in some important ways from the typical CD you may be familiar with from your local bank or credit union. The typical CD has a maturity date, interest rate, and face amount and is protected by deposit insurance. However, if an investor wishes to cash out prior to maturity, they will incur a substantial penalty from the issuer (bank or credit union). An NCD also has a maturity date and amount but is much larger than a regular CD and appeals to institutional investors. The principal is not insured. When the investor wishes to cash out early, there is a robust secondary market for trading the NCD. The issuing institution can offer higher rates on NCDs compared to CDs because they know they will have use of the purchase amount for the entire maturity of the NCD. The reserve requirements on NCDs by the Federal Reserve are also lower than for other types of deposits.

The market for **federal funds** is notable because the Federal Reserve targets the equilibrium interest rate on

9 Henrik Bessembinder, Chester Spatt, and Kumar Venkataraman. "A Survey of the Microstructure of Fixed-Income Markets." *Journal of Financial and Quantitative Analysis.* February 2020. https://www.sec.gov/spotlight/fixed-income-advisory-committee/survey-of-microstructure-of-fixed-income-market.pdf

federal funds as one of its most important monetary policy tools. The federal funds market traditionally consists of the overnight borrowing and lending of immediately available funds among depository financial institutions, notably domestic commercial banks. The participants in the market negotiate the federal funds interest rate. However, the Federal Reserve effectively sets the target interest rate range in the federal funds market by controlling the supply of funds available for use in the market. Many of the borrowing and lending rates in our economy are a direct function of the federal funds rate.

Capital Markets and Instruments

The **capital market** is the market for longer-term financial instruments. The capital market is similar to the money market. However, maturities are longer, default risk varies to a greater degree from low to high, and liquidity is less certain, as is the homogeneity of the financial instruments. Broadly, we separate capital market instruments into debt instruments traded in the bond markets and equity securities traded on the stock markets.

The federal government issues Treasury notes and bonds to raise money for current spending and to repay past borrowing. The size of the Treasury market is quite large, as the US federal government over the years has accumulated a total indebtedness of over $28 trillion.[10]

Treasury notes are US government debt instruments with maturities of 2 to 10 years. The Treasury auctions notes on a regular basis, and investors may purchase new notes from TreasuryDirect.gov in the same way they would a T-bill. T-notes differ from T-bills in that they are longer term, pay semiannual coupon interest payments, and pay the par or face value of the note at maturity. Upon issue of a note, the size, number, and timing of note payments is fixed. However, prices do change in the secondary market as interest rates change. Like T-bills, T-notes are generally exempt from state and local taxes. There is an active secondary market for Treasury notes.

Longer-term Treasury issues, **Treasury bonds**, have maturities of 20 or 30 years. T-bonds are like T-notes in that they pay semiannual coupon interest payments for the life of the security and pay the face value at maturity. They are longer term than notes and typically have higher coupon rates.

State and local governments and taxing districts can issue debt in the form of **municipal bonds ("munis")**. Local borrowing carries more risk than Treasury securities, and default or bankruptcy is unlikely but possible. Thus, munis have ratings that run a spectrum similar to that of corporate bonds in that they receive a bond rating based on the perceived default risk. The defining feature of municipal bonds is that some interest payments are tax-free. Interest on munis is always exempt from federal taxes and sometimes exempt from state and local taxes. This makes them very attractive to investors in high income brackets.

Just as governments borrow money in the long-term from investors, so do corporations. A corporation often issues bonds for longer-term financing. Bond contracts identify very specific terms of agreement and outline the rules for the order, timing, and amount of contractual payments, as well as processes for when one or more of the required activities lapse. A bond contract, known as an indenture, includes both standard "boilerplate" contract language and specific conditions unique to a particular issue. Because of these non-standardized features of a bond contract, the secondary market for trading used bonds typically requires a broker, dealer, or investment company to facilitate a trade.

An important goal of business executives is to maximize the owners' wealth. For corporations, shares of stock represent ownership. Stocks are difficult to price compared to bonds. Bonds have contracts that specify the number and amount of all payments made by the firm to the purchasers of bonds. Stock cash flows are far more uncertain than bond cash flows. Stocks might or might not have periodic dividend payments, and an investor can plan to sell the stock at some point in the future. However, no contract guarantees the size of the dividends or the time or resale price of the stock. Thus, the cash flows from stock ownership are more

10 Trading Economics. "United States Government Debt." *Trading Economics*. https://tradingeconomics.com/united-states/government-debt

uncertain and risky than cash flows from bonds.

Ownership of corporations is easily transferable if a company's stock trades in one of the organized stock exchanges or in the over-the-counter (OTC) market. Most of the trading consists of used or previously issued stocks in the over-the-counter market and organized exchanges. The two largest stock exchanges in the world are the New York Stock Exchange (NYSE) and the NASDAQ. Both exchanges are located in the United States.

1.8 Concepts of Time and Value

Learning Outcomes

By the end of this section, you will be able to:

- Explain the impact of time on saving and spending.
- Describe economic value.

Many students don't have a choice between saving and spending. College is expensive, and it is easy to spend every dollar you earn and to borrow to meet the rest of your obligations. Businesses, however, continually make decisions about when and how much money to borrow or invest. Bacon Signs established banking relationships to borrow money when needed to expand the business or a product line. Sometimes the best decision is to invest as soon as possible to grab opportunities, and other times it is better to delay new investment in order to pay dividends to the owners of the company.

LINK TO LEARNING

The Dow Jones Industrial Average Marches On!

Once you begin to save and invest, here is a "fun fact" about the Dow Jones Industrial Average (DJIA) (https://openstax.org/r/investopedia-djia), also known as the Dow 30. It first appeared on May 26, 1896, as a quick way for stock traders to assess if the stock market had gone "up or down" each day and by how much. Here we are over 100 years later, and the Dow 30 index is alive and well. Of course, the 30 companies have changed, but the index does represent a continuous yardstick to measure stock performance over time. As Table 1.1 shows, it took from 1906 to 1972, or a little over 66 years, for the Dow 30 to increase tenfold, from a value of 100 to a value of 1,000. The next tenfold increase from 1,000 to 10,000 took only a little under 27 years from 1972 to 1999. Time will tell if or when the Dow 30 will top 100,000 at the closing bell.

Closing Milestones	Date
41	5/26/1896
100	1/12/1906
1,000	11/14/1972
10,000	3/29/1999
20,000	1/25/2017
30,000	11/24/2020

Table 1.1 The Dow 30 Closing Milestones and Dates

Impact of Time on Saving and Spending

The choice to spend or save and invest is really a choice between consumption today versus consumption in

the future. Economists, investment advisers, your friends, and mine love to discuss the trade-off of consumption now or later—even if not in those words. We have all heard conversations that go something like this: "Let's go grab a beer—you can study for tomorrow's exam in the morning." Or "My father's investment adviser told me that if I invest $500 per month for the next 30 years and earn an annual rate of 10% on my investments, I will have invested $180,000 over time but accumulated an investment portfolio worth over $1.13 million!"

An important aspect of the trade-off between saving and spending involves your short-, intermediate-, and long-term goals. Delaying consumption until later comes with risks. Will your consumption choices still be available? Will the prices be attainable? Will you still be able to consume and enjoy your future purchases?

When saving for short-term objectives, the safety of the principal invested is important, and the value of compounding returns is minimal compared to longer-term investments. Most short-term investors have a low tolerance for risk and hope to beat the rate of inflation with a little extra besides. An example could be to start a holiday savings account at your local bank as a way to save, earn a small rate of return, and assure that you have funds set aside for consumption at the end of the year.

An intermediate investment may be to save for a new car or for the down payment on a house or vacation home. Again, maintaining the principal is important, but you have some time to recover from poor investment returns. Intermediate-term investments tend to earn higher average annual rates of return than short-term investments, but they also have greater uncertainty and risk.

Long-term investments have the advantage of enough time to recover from temporary poor performance and the luxury of compounded returns over a long period. Further, long-term investments tend to have greater risk and higher expected average annual rates of return. Even though this is a business finance text, sometimes a personal finance example is easier to relate to. To illustrate, Table 1.2 demonstrates four different investment scenarios. In scenario 1, you invest $5,000 annually from ages 26 through 60 into an account earning an average annual rate of return of 10% per year. Over your lifetime, you invest a total of $175,000, and at age 60, you have an estimated portfolio value of $1,490,634. This is a healthy amount that has almost certainly beaten the average annual rate of inflation. In scenario 1, by investing regularly, you accumulate roughly 8.5 times the value of what you invested. Congratulations, you can expect to become a millionaire!

Compare your results in scenario 1 with your college roommate in scenario 2, who is able to invest $5,000 per year from ages 19 through 25 and leave her investments until age 60 in an account that continues to earn an annual rate of 10%. She makes her investments earlier than yours, but they total only $35,000. However, despite a much smaller investment, her head start advantage and the high average annual compounded rate of return leave her with an expected portfolio value of $1,466,369. Her total is almost as great as the amount you would accumulate, but with a much smaller total investment.

Scenarios 3 and 4 are even more dramatic, as can be seen from a review of Table 1.2. In both scenarios, only five $5,000 investments are made, but they are made earlier in the investor's life. Parents or grandparents could make these investments on behalf of the recipients. In both scenarios, the portfolios grow to amounts greater than those of you or your roommate with smaller total investments. The common factor is that greater time leads to additional compounding of the investments and thus greater future values.

	Average Annual Rate of Return = 10%			
Assumptions	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Starting investment age	26	19	14	9
Ending investment age	60	25	18	13
Total investments	35	7	5	5

Table 1.2 Four Investment Scenarios: Assumptions and Expected Outcomes

	Average Annual Rate of Return = 10%			
Assumptions	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**
Annual investment	$5,000	$5,000	$5,000	$5,000
Total investment amount	$175,000	$35,000	$25,000	$25,000
Value at age 60	$1,490,634	$1,466,369	$1,838,858	$2,961,500

Table 1.2 Four Investment Scenarios: Assumptions and Expected Outcomes

Definition of Economic Value

Value is a term used frequently in business and especially in economics, accounting, and finance. Accountants track, record, and display value in the form of financial statements and footnotes. The numbers they present are "book values" and represent what has occurred. Financial people like to speak in terms of "market values." Market values are calculated using expected future cash flows discounted to today. Market values are the prices that consumers pay for a product. **Economic value** is what we believe consumers are actually willing to pay for a product, service, or experience. For example, the price of a movie ticket may be $10, but there are individuals who are willing to pay far more for the experience of watching a movie on the big screen.

Generally, the economic value is at least as great as the market value or current price of an asset. When Bacon Signs planned for the future, the firm attempted to determine the economic value of its products when creating an optimal mix of price and quantity sold. Firms that produce unique products for clients may have multiple prices based on the estimated economic value of their good or service to the client. One way to think about the difference between market value and economic value is that market value is what you have to pay, while economic value is what you are willing to pay.

Summary

1.1 What Is Finance?

Finance is the study of the trade-off between risk and expected return. There are three broad areas of finance: business finance, investments, and financial markets and institutions.

1.2 The Role of Finance in an Organization

The accounting department creates financial statements, and the finance department implements the firm's policy objectives, monitors results, and responds to necessary strategic and tactical changes. Finance is responsible for budgeting and forecasting. Finance aids in establishing firm objectives and is responsible for meeting with creditors, lenders, owners, regulators, and other stakeholders that provide capital to the firm or have a claim against firm assets.

1.3 Importance of Data and Technology

Much of the data used in business today has been available for many years. However, data today is more attainable than ever due to technological advancements facilitating a user's ability to gather, evaluate, and store information faster and more cost effectively than ever. Information is continually available, so the quicker and less expensively firms can adjust to the arrival of new information, the more valuable they become for their stakeholders.

1.4 Careers in Finance

Careers in finance are plentiful, fulfilling, and well compensated. Introductory positions are available in areas such as data collection and data entry. More skill and experience is required for roles such as data analysis and forecasting. Eventually, executive-level positions such as CFO present themselves to the most qualified. Finance careers are not limited to financial firms, as understanding finance is an important skill in government regulatory positions, nonprofit management, and all types of commercial business—from real estate, to retail, to manufacturing, to education.

1.5 Markets and Participants

Financial markets are where buyers and sellers of financial securities come together to trade. The trading of securities allows markets to value assets and signal value as new information arrives. Brokers operate to bring buyers and sellers together and receive commissions. Dealers trade from their own portfolios and are often willing to make markets for specific securities by agreeing to buy or sell at the current bid and ask prices. Financial intermediaries actually change or create new financial products.

1.6 Microeconomic and Macroeconomic Matters

Economics is the study of the allocation of scarce resources. Economists attempt to understand the how and why of human, physical, and financial capital allocation. Microeconomics is the study of factors affecting an individual's consumption, and macroeconomics is the study of all the aggregate factors affecting an economy. Economics is important in finance due to the number of economic variables critical to good financial forecasting.

1.7 Financial Instruments

Maturity is one method to differentiate among financial instruments. Using this methodology, we have money markets and capital markets. Money markets consist of short-term marketable securities, and capital markets focus on longer-term securities such as bonds and stocks.

1.8 Concepts of Time and Value

The concepts of time and value involve the resolution of conflict between consumption now versus consumption later. Time and value represent the trade-off between risk and expected return. Many financial

exercises examine the relationships among time, interest rates, risk, cash flows now, and cash flows in the future. You can expect to solve several "time value of money" problems before you complete this book.

Key Terms

brokers individuals or a firm that brings together potential buyers and sellers of a product and receives a commission at transaction

business finance the study and application of how managers can apply financial principles to maximize the value of a firm in a risky environment

capital budgeting the process of determining which long-term or fixed assets to acquire in an effort to maximize shareholder value

capital market market for longer-term financial instruments, such as stocks and bonds, used to finance long-term projects for organizations

capital structure the mix of financing, usually debt and equity, used by a firm

chief financial officer (CFO) an executive-level officer who sets policy for working capital management, determines optimal capital structure for the firm, and makes the final decision in matters of capital budgeting

commercial paper (CP) short-term, unsecured financial obligations issued by firms as a means of short-term financing for items such as inventory or payables

comptroller also referred to as *controller,* individual in charge of financial reporting and the oversight of the accounting activities necessary to develop financial reports

dealers facilitate a market and the trading of securities by holding a portfolio of the underlying asset for easy purchase and sale; earn money on the spread between ask and bid prices for the asset

default risk the risk that the issuer of a financial security will be unable to make payments as specified in the terms of a financial contract

diversifiable risk also called *unsystematic risk*, a risk that can be eliminated without the loss of expected return by holding a portfolio of securities

economic value the amount a consumer is willing to pay for a particular asset or service, usually greater than or equal to the current market price or present value of the asset

federal funds rate the rate targeted by the Federal Reserve in the implementation of monetary policy

financial industry regulatory authority (FINRA) an independent, nongovernmental organization that writes and enforces the rules governing registered brokers and broker-dealer firms in the United States

financial intermediary a commercial bank or a mutual fund investment company that serves as an intermediary to enable easier and more efficient exchanges among transacting parties, often accepting one form of financial asset from which they create another, such as taking demand deposits to create mortgage loans

financial markets and institutions one of the three main areas of the field of finance; firms and regulatory agencies that oversee our financial system

inflation risk the risk of reduced purchasing power of goods and services due to rising prices

investments one of the three main areas of finance; products and processes used to create individual and institutional portfolios with the intent of growing wealth

money market the market for short-term, low-risk, highly liquid, homogeneous financial securities; common money market securities include T-bills, NCDs, and commercial paper

money market mutual funds created by investment companies to pool the money of many investors to purchase and then manage short-term, low-risk, liquid financial portfolios of securities

municipal bonds (munis) long-term debt obligations issued by state or local governments that often have important tax advantages relative to corporate bonds

negotiable certificate of deposit very large CDs issued by financial institutions, redeemable only at maturity but can and often do trade prior to maturity in a broad secondary market; also called *jumbo CDs* because they sell in increments of $100,000 or more

non-diversifiable risk risk that cannot be eliminated by simply holding a portfolio of securities; also known as systematic risk

political risk the risk of local, state, or national governments "changing the rules" and disrupting firm cash flows

primary market a term used in financial markets to identify the market for the purchase and sale of new securities

secondary market a term used in financial markets to represent the purchase or sale of used securities that trade after the initial sale by the offering firm

Securities Investor Protection Corporation (SIPC) a nonprofit corporation that provides brokerage customers up to $500,000 coverage for cash and securities held by the firm

treasurer position responsible for monitoring cash flow at a firm and frequently is the contact person for bankers, underwriters, and other outside sources of financing

Treasury bills (T-bills) short-term debt obligations of one year or less issued by the US government

Treasury bonds long-term debt obligations issued by the US government characterized by having maturities of greater than 10 years and making periodic interest payments as well as principal payment at maturity

Treasury notes long-term debt obligations issued by the US government characterized by having maturities of 2 to 10 years and making periodic interest payment as well as principal payment at maturity

working capital management the development, oversight, and management of a firm's short-term assets and liabilities

Multiple Choice

1. Which of the following was NOT identified by your authors as one of the three main areas of financial study?
   a. business finance
   b. capital budgeting
   c. investments
   d. financial markets and institutions

2. What is the process of determining which long-term or fixed assets to acquire in an effort to maximize shareholder value?
   a. Business finance
   b. Capital budgeting
   c. Investments
   d. Financial markets and institutions

3. In an organization with each of these financial positions, which title is most likely to be associated with a job description that is less of a "hands-on" manager and that engages more in visionary and strategic planning?
   a. comptroller (or controller)
   b. treasurer
   c. vice president of finance
   d. chief financial officer (CFO)

4. Which of the following statements is false?
   a. Financial planning is an important tool of for-profit organizations such as corporations and partnerships but is not important for not-for-profit enterprises such charitable organizations or governments.
   b. Good financial planning considers past, present, and pro forma income statements.
   c. Balance sheets are critical elements of the financial planning process and help demonstrate expected

sources and uses of funds.

d. Forecasting in the form of expected sales, cost of funds, and micro- and macroeconomic conditions are essential elements of financial planning.

5. Which of the following statements regarding data is generally NOT true?

a. Financial data is important for internal and external analysis of business firms.
b. Outsiders use publicly available data about firms to make investment and regulatory decisions.
c. "Gut feelings" decision-making tends to be more consistent with value maximization.
d. Suppliers need financial information to determine if they should supply trade credit, and customers need to know if a firm's products are reliable and appropriately priced.

6. Which of the following is generally NOT true about cloud data storage versus on-site data storage?

a. Cloud data storage provides storage cost advantages.
b. Cloud data storage causes increased energy consumption.
c. Cloud data storage comes with specialized data protection services.
d. Cloud data storage comes with specialized maintenance services.

7. Which of the following describes United States Bureau of Labor Statistics (BLS) expectations of jobs using financial skills in the next decade?

a. plentiful but low paying
b. few and low paying
c. plentiful and high paying
d. few and high paying

8. Which of the following organizations would be unlikely to hire a financial analyst?

a. Government agencies may hire financial analysts to aid in regulatory oversight and enforcement.
b. Investment companies may hire financial analysts to produce financial reports.
c. Corporations may hire financial analysts to develop financial forecasts.
d. All of the above organizations are likely to hire and develop financial analysts.

9. The _____ market is the market for _____ securities, and the _____ is the market for _____ securities.

a. primary; used; secondary; new
b. primary; new; secondary; used
c. secondary; new; primary; new
d. secondary; used; primary; used

10. _____ own the securities that they buy or sell; when they engage in a financial transaction, they are trading from their own portfolio.

a. Dealers
b. Brokers
c. Advisers
d. Comptrollers

11. _____ act as facilitators in a market, and they bring together buyers and sellers for a transaction.

a. Dealers
b. Brokers
c. Advisers
d. Comptrollers

12. _____ is the study of the allocation of scarce resources, _____ is devoted to the study of these decisions of allocation by small or individual entities, and _____ examines decisions taken together or in the aggregate.
a. Macroeconomics; microeconomics; economics
b. Microeconomics; economics; macroeconomics
c. Economics; microeconomics; macroeconomics
d. Economics; macroeconomics; microeconomics

13. Which of the following is NOT an economy-wide macroeconomic variable used in macro-forecasting models?
a. inflation
b. unemployment
c. economic growth
d. CEO turnover

14. _____ is the market for short-term, low-risk, highly liquid, homogeneous securities.
a. The capital market
b. The financial market
c. The stock market
d. The money market

15. _____ are short-term debt instruments issued by the federal government.
a. Treasury bills
b. Treasury notes
c. Treasury bonds
d. Federal Reserve notes

16. _____ is a short-term, unsecured security issued by corporations and financial institutions to meet short-term financing needs such as inventory and receivables.
a. A Treasury bill
b. Commercial paper
c. A negotiable certificate of deposit
d. A Treasury note

17. _____ are US government debt instruments with maturities of 2, 3, 5, 7, or 10 years.
a. Federal funds
b. Federal Reserve notes
c. Treasury notes
d. Treasury bonds

18. _____ investments tend to have _____ risk and _____ expected returns.
a. Long-term; less; smaller
b. Long-term; greater; greater
c. Short-term; greater; smaller
d. Short-term; less; greater

19. _____ value is what a consumer pays for a product. _____ value is what a consumer is willing to pay for a product.
a. Market; Economic
b. Economic; Market

c. Book; Market
d. Economic; Book

Review Questions

1. Identify and briefly define the three areas of study in finance.
2. Identify the three focal areas in *business finance.*
3. Define each of the following types of risk:
   - inflation risk
   - diversifiable risk
   - non-diversifiable risk
   - political risk
4. Identify three common components of good financial planning.
5. The Concepts in Practice feature in Section 1.3 discusses the importance of data for decision-making. List at least three of the ways the article suggests managers can use financial statements.
6. Describe the role of a financial analyst in a financial institution such as a bank or investment company.
7. Is a dealer or a broker more likely to be a market maker? In your answer, define the activities of a market maker.
8. How can an understanding of micro- and macroeconomic factors aid in small business decision-making?
9. We measure market capitalization by multiplying the number of shares of stock outstanding by the current price per share. Go to finance.yahoo.com and determine the market capitalization of Nike, Tesla, and Walmart. Which company has the greatest market capitalization? Which company has the highest level of sales? If these are not the same companies, why do you think the company with the lower sales level has greater market capitalization?

Video Activity

Why Climate Change Means New Risk for US Financial Markets

Click to view content (https://openstax.org/r/player-pbs)

1. Cite some examples that the video used to demonstrate the effect of climate change on the value of property and businesses. Now, identify examples of environmental disasters that you are personally familiar with. How have businesses in your community adapted in response to climate change?
2. Do you agree or disagree with the following statement: “The young people of today are the investors of tomorrow, and they will prioritize environmental impact in their investment choices.” How do you think your investing future will be altered by climate change? Do you agree that environmental changes are a legitimate and measurable investment risk?

Markets and Participants

Click to view content (https://openstax.org/r/robinhood)

Robinhood is a mobile trading platform for stocks, bonds, and options. The company has transformed the security trading industry by introducing commission-free trades and simplifying the trading process with its intuitive mobile app. However, as this *Wall Street Journal* video about Robinhood explains, the company and its products are not without controversy.

3. Have you ever traded financial securities? If so, which trading platform(s) have you used? If you have

traded using another platform, how does your trading experience compare to that described in the video? If you have not traded securities, discuss how the Robinhood app affects your willingness to try trading.

4. At the end of the video, one interviewee viewed Robinhood as a gateway trading platform, but not a platform for serious traders. The other saw Robinhood as a means to level the playing field for all interested investors. What are your thoughts on the Robinhood trading app? Do you agree that option trading should be more restricted than the video implies?

2

Corporate Structure and Governance

Figure 2.1 The legal structure of any business will have a substantial impact on its operations. (credit: modification of work "New Board Room at 2 Broadway" by Metropolitan Transportation Authority/Patrick Cashin/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

When someone opens a business, it is because they want to fulfill important personal financial goals. In publicly traded companies, managers and employees work on behalf of the shareholders, who own the business through their ownership of company stock. These managers and employees have an ongoing obligation to pursue projects, policies, and corporate investments that will increase or promote stockholder value over the long term. Although many companies focus on financially related goals, such as growth, earnings per share, and market share, the main financial goal is to create value for investors.

Keep in mind that a company's stockholders are not just an abstract group. Like the sole business owner, they are individuals who have chosen to invest their hard-earned cash in a company. They are looking for a return on their investment in order to meet their own personal long-term financial goals, which might be saving for retirement, a new home, or college education for their children.

In addition to increasing value, it is also important to realize that a firm has important nonfinancial goals. Some examples of these might include the following:

- Expanding sales to existing customers
- Increasing customer loyalty to the weaker brands
- Developing new products for current and potential customers
- Becoming international by setting up an online ordering service

- Improving customer satisfaction with customer services

If managers are to help stockholders maximize their wealth, they must know how that wealth is determined in the first place. One of the main concepts in finance is that the value of any asset is determined by the present value of the stream of cash flows that the asset will provide to its owners over the course of time. In subsequent chapters, we will also be covering stock valuation in depth, and we will see that stock prices are based on cash flows expected in future years, not only on those coming in at the present time.

For these reasons, stock price maximization, which leads directly to maximizing shareholder wealth, requires us to take a long-term view of company operations. It is also important to realize that managerial actions that affect a company's value may not immediately be reflected in the price of a company's stock but rather will become evident in the long-term prospects of the organization.

In the case of privately held companies, smaller firms, and sole proprietorships, there are no shareholders. However, attention to long-term growth and maximizing the value of a firm is just as important a goal to the owners, who are also usually senior management with the company.

2.1 Business Structures

Learning Outcomes

By the end of this section, you will be able to:

- Identify the business form created by most organizations.
- Contrast the advantages and disadvantages that the corporate form has over sole proprietorships.
- Contrast the advantages and disadvantages that the corporate form has over partnerships.
- List and describe characteristics associated with a hybrid business structure.

The Most Common Types of Business Organization

The functions of most executive management teams are very similar for most businesses, and they will not differ in any significant manner based on how they may be structured or organized. However, the legal structure of any company will have a substantial impact on its operations, and it therefore deserves a significant amount of analysis and discussion. The four most common forms of business organizations are the following:

1. Sole proprietorships
2. Partnerships
3. Corporations
4. Hybrids, such as limited liability companies (LLCs) and limited liability partnerships (LLPs)

The vast majority of businesses take the form of a proprietorship. However, based on the total dollar value of combined sales, more than 80 percent of all business in the United States is conducted by a **corporation**.[1] Because corporations engage in the most business, and because most successful businesses eventually convert into corporations, we will focus on corporations in this chapter. However, it is still important to understand the legal differences between different types of firms and their advantages and disadvantages.

Sole Proprietorships

A proprietorship is typically defined as an unincorporated business owned by a single person. The process of forming a business as a **sole proprietor** is usually a simple matter. A business owner merely decides to begin conducting business operations, and that person is immediately off and running. Compared to other forms of business organizations, proprietorships have the following four important advantages:

1. They have a basic structure and are simple and inexpensive to form.

1 Aaron Krupkin and Adam Looney. "9 Facts about Pass-Through Businesses." Brookings. The Brookings Institution, May 15, 2017. https://www.brookings.edu/research/9-facts-about-pass-through-businesses

2. They are subject to relatively few government rules and regulations.
3. Taxation on sole proprietorships is far simpler than on other organizational forms. There are no separate taxes associated with a sole proprietorship, as there are with corporations. Sole proprietors simply report all their business income and losses on their personal income tax returns.
4. Controlling responsibilities of the firm are not divided in any way. This results in less complicated managerial decisions and improved timeliness of necessary corrective actions.

However, despite the ease of their formation and these stated advantages, proprietorships have four notable shortcomings:

1. A sole proprietor has unlimited personal liability for any financial obligations or business debts, so in the end, they risk incurring greater financial losses than the total amount of money they originally invested in the company's formation. As an example, a sole proprietor might begin with an initial investment of $5,000 to start their business. Now, let's say a customer slips on some snow-covered stairs while entering this business establishment and sues the company for $500,000. If the organization loses the lawsuit, the sole proprietor would be responsible for the entire $500,000 settlement (less any liability insurance coverage the business might have).
2. Unlike with a corporation, the life of the business is limited to the life of the individual who created it. Also, if the sole proprietor brings in any new equity or financing, the additional **investor**(s) might demand a change in the organizational structure of the business.
3. Because of these first two points, sole proprietors will typically find it difficult to obtain large amounts of financing. For these reasons, the vast majority of sole proprietorships in the United States are small businesses.
4. A sole proprietor may lack specific expertise or experience in important business disciplines, such as finance, accounting, taxation, or organizational management. This could result in additional costs associated with periodic consulting with experts to assist in these various business areas.

It is often the case that businesses that were originally formed as proprietorships are later converted into corporations when growth of the business causes the disadvantages of the sole proprietorship structure to outweigh the advantages.

Partnerships

A **partnership** is a business structure that involves a legal arrangement between two or more people who decide to do business as an organization together. In some ways, partnerships are similar to sole proprietorships in that they can be established fairly easily and without a large initial investment or cost.

Partnerships offer some important advantages over sole proprietorships. Among them, two or more partners may have different or higher levels of business expertise than a single sole proprietor, which can lead to superior management of a business. Further, additional partners can bring greater levels of investment capital to a firm, making the process of initial business formation smoother and less risky.

A partnership also has certain tax advantages in that the firm's income is allocated on a pro rata basis to the partners. This income is then taxed on an individual basis, allowing the company to avoid corporate income tax. However, similar to the sole proprietorship, all of the partners are subject to unlimited personal liability, which means that if a partnership becomes bankrupt and any partner is unable to meet their pro rata share of the firm's liabilities, the remaining partners will be responsible for paying the unsatisfied claims.

For this reason, the actions of a single partner that might cause a company to fail could end up bringing potential ruin to other partners who had nothing at all to do with the actions that led to the downfall of the company. Also, as with most sole proprietorships, unlimited liability makes it difficult for most partnerships to raise large amounts of capital.

Corporations

The most common type of organizational structure for larger businesses is the corporation. A corporation is a legal business entity that is created under the laws of a state. This entity operates separately and distinctly from its owners and managers. It is the separation of the corporate entity from its owners and managers that limits stockholders' losses to the amount they originally invest in the firm. In other words, a corporation can lose all of its money and go bankrupt, but its owners will only lose the funds that they originally invested in the company.

Unlike other forms of organization, corporations have unlimited lives as business entities. It is far easier to transfer shares of stock in a corporation than it is to transfer one's interest in an unincorporated business. These factors make it much easier for corporations to raise the capital necessary to operate large businesses. Many companies, such as Microsoft and Hewlett-Packard, originally began as proprietorships or partnerships, but at some point, they found it more advantageous to adopt a corporate form of organization as they grew in size and complexity.

An important disadvantage to corporations is income taxes. The earnings of most corporations in the United States are subject to something referred to as double taxation. First, the corporation's earnings are taxed; then, when its after-tax earnings are paid out as dividend income to **shareholders (stockholders)**, those earnings are taxed again as personal income.

It is important to note that after recognizing this problem of double taxation, Congress created the **S corporation**, designed to aid small businesses in this area. S corporations are taxed as if they were proprietorships or partnerships and are exempt from corporate income tax. In order to qualify for S corporation status, a company can have no more than 100 stockholders. Thus, this corporate form is useful for relatively small, privately owned firms but precludes larger, more diverse organizations. A larger corporation is often referred to as a **C corporation**. The vast majority of small corporations prefer to elect S status. This structure will usually suit them very well until the business reaches a point where their financing needs grow and they make the decision to raise funds by offering their stock to the public. At such time, they will usually become C corporations. Generally speaking, an S corporation structure is more popular with smaller businesses because of the likely tax savings, and a C corporation structure is more prevalent among larger companies due to the greater flexibility in raising capital.

Hybrids: Limited Liability Corporations and Partnerships

Another form of business organization is the **limited liability corporation (LLC)**. This type of business structure has become a very popular type of organization. The LLC is essentially a **hybrid form of business** that has elements of both a corporation and a partnership. Another form of organizational structure is something called a **limited liability partnership (LLP)**, which is quite similar to the LLC in structure and in use. It is very common to see LLPs used as the organizational form for professional services firms, often in such fields as accounting, architecture, and law. Conversely, LLCs are typically used by other forms of businesses.

Similar to corporation structures, LLCs and LLPs will provide their principals with a certain amount of liability protection, but they are taxed as partnerships. Also, unlike in limited partnerships, where a senior general partner will have overall control of the business, investors in an LLC or LLP have votes that are in direct proportion to their percentage of ownership interest or the relative amount of their original investment.

A particular advantage of a limited liability partnership is that it allows some of the partners in a firm to limit their liability. Under such a structure, only designated partners have unlimited liability for company debts; other partners can be designated as limited partners, only liable up to the amount of their initial contribution. Limited partners are typically not active decision makers within the firm.

Some important differences between LLCs and LLPs are highlighted in Table 2.1.

Limited Liability Corporation		Limited Liability Partnership	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
Fewer restrictions on eligibility (only one member allowed; can be professional, although some states disallow professionals)			Only certain professions eligible
Usually more personal liability protection	Limited protection from partners' actions	Personal protection as well as protection from negligence of other partners	
Flexibility in taxation	Earnings included in members' personal taxes	Earnings taxed just once	Must file taxes as pass-through entity

Table 2.1 Advantages and Disadvantages of LLCs and LLPs

LLCs and LLPs have gained great popularity in recent years, but larger companies still find substantial advantages in being structured as C corporations. This is primarily due to the benefits of raising capital to support long-term growth. It is interesting to note that LLC and LLP organizational structures were essentially devised by attorneys. They generally are rather complicated, and the legal protection offered to their ownership principals may vary from state to state. For these reasons, it is usually necessary to retain a knowledgeable lawyer when establishing an organization of this type.

Obviously, when a company is choosing an organizational structure, it must carefully evaluate the advantages and disadvantages that come with any form of doing business. For example, if an organization is considering a corporation structure, it would have to evaluate the trade-off of having the ability to raise greater amounts of funding to support growth and future expansion versus the effects of double taxation. Yet despite such organizational concerns with corporations, time has proven that the value of most businesses, other than relatively small ones, is very likely to be maximized if they are organized as corporations. This follows from the idea that limited ownership liability reduces the overall risks borne by investors. All other things being equal, the lower a firm's risk, the higher its value.

Growth opportunities will also have a tremendous impact on the overall value of a business. Because corporations can raise financing more easily than most other types of organizations, they are better able to engage in profitable projects, make investments, and otherwise take superior advantage of their many favorable growth opportunities.

The value of any asset will, to a large degree, depend on its liquidity. *Liquidity* refers to asset characteristics that enable the asset to be sold or otherwise converted into cash in a relatively short period of time and with minimal effort to attain fair market value for the owner. Because ownership of corporate stock is far easier to transfer to a potential buyer than is any interest in a business proprietorship or partnership, and because most investors are more willing to invest their funds in stocks than they are in partnerships that may carry unlimited liability, an investment in corporate stock will remain relatively liquid. This, too, is an advantage of a corporation and is another factor that enhances its value.

LINK TO LEARNING

Amazon

Most people are surprised to learn than Amazon, the largest online retailer, is set up as an LLC.

Amazon.com Services LLC is set up as a subsidiary of the larger Amazon.com Inc. Take a look at the Amazon LLC company profile provided by Dun & Bradstreet (https://openstax.org/r/company-profiles-amazon). Why do you think such a large corporation is set up as an LLC?

Incorporating a Business

Many business owners decide to structure their business as a corporation. In order to begin the process of incorporation, an organization must file a business registration form with the US state in which it will be based and carry on its primary business activities. The document that must be used for this application is generally referred to as the **articles of incorporation** or a corporate charter. Articles of incorporation are the single most important governing documents of a corporation. The registration allows the state to collect taxes and ensure that the business is complying with all applicable state laws.

The exact form of the articles of incorporation differs depending on the type of corporation. Some types of articles of incorporation include the following:

- **Domestic corporation** (in state)
- **Foreign corporation** (out of state or out of country)
- **Close (closely held) corporation**
- **Professional corporation**
- **Nonprofit corporation** (several different types of nonprofits)
- **Stock corporation**
- **Non-stock corporation**
- **Public benefit corporation**

It is important to note that articles of incorporation are only required to establish a regular corporation. Limited liability corporations require what are referred to as *articles of organization* (or similar documents) to register their business with a state. Some types of limited partnerships must also register with their state. However, sole proprietorships do not have to register; for this reason, they are often the preferred organizational structure for a person who is just starting out in business, at least initially.

Articles of incorporation provide the basic information needed to legally form the company and register the business in its state. The state will need to know the name of the business, its purpose, and the people who will be in charge of running it (the **board of directors**). The state also needs to know about any stock that the business will be selling to the public. The websites of various **secretaries of state** will have information on the different types of articles of incorporation, the requirements, and the filing process.

2.2 Relationship between Shareholders and Company Management

Learning Outcomes

By the end of this section, you will be able to:

- Explain the difference between principals and agents.
- List and discuss various stakeholders associated with a company and its operations.
- Explain how management impacts the operations and future of a company.

Stakeholders

A **stakeholder** is any person or group that has an interest in the outcomes of an organization's actions. Stakeholders include employees, customers, shareholders, suppliers, communities, and governments. Different stakeholders have different priorities, and companies often have to make compromises to please as many stakeholders as possible.

Shareholders' Roles and Composition

A shareholder or stockholder can be a person, company, or organization that holds stock in a given company. Shareholders typically receive dividends if the company does well and succeeds. They are entitled to vote on certain company matters and to be elected to a seat on the board of directors. One advantage of being a shareholder is that creditors cannot compel shareholders to pay for any of the company's financial obligations or debts. However, being a shareholder includes responsibilities such as appointing the company's directors, deciding on director compensation, setting limits on directors' power, and monitoring and approving the company's financial statements.

Types of Shareholders

There are two types of shareholders: common shareholders and preferred shareholders. Common shareholders are any persons who own a company's common stock. They have the right to control how the company is managed, and they have the right to bring charges if management is involved in activities that could potentially harm the organization. Preferred shareholders own a share of the company's preferred stock and have no voting rights or involvement in managing the company. Instead, they receive a fixed amount of annual dividends, apportioned before the common shareholders are paid. Though both common shareholders and preferred shareholders see their stock value increase with the positive performance of the company, common shareholders experience higher capital gains and losses.

Shareholders and directors are two different entities, although a director can also be shareholder. The shareholder, as already mentioned, is a part owner of the company. A director, on the other hand, is the person hired by the shareholders to perform oversight and provide strategic policy direction to company management.

The Differences between a Shareholder and a Stakeholder

The terms *shareholder* and *stakeholder* mean different things. A shareholder is an owner of a company because of the shares of stock they own. Stakeholders may not own part of the company, but they are in many ways equally dependent on the performance of the company. However, their concerns may not be financial. For example, a chain of hotels in the United States that employs thousands of people has several classes of stakeholders, including employees who rely on the company for their jobs and local and national governments that depend on the taxes the company pays.

Before a company becomes public, it is a private company that is run, formed, and organized by a group of people called *subscribers*. A **subscriber** is a member of the company whose name is listed in the memorandum of association. Even when the company goes public or they depart from the company, subscribers' names continue to be written in the public register.

Role of Management

Corporations are run at the highest level by a group of senior managers referred to as the board of directors (BOD). The BOD is ultimately responsible for providing oversight and strategic direction as well as overall supervision of the organization at its highest managerial level. From an operational standpoint, the practical day-to-day management of a company comprises of a team of several mid-level managers, who are responsible for providing leadership to various departments in the company. Such managers may often have different functional roles in a business organization. The primary roles of any management group involve setting the objectives of the company; organizing operations; hiring, leading, and motivating employees; and overseeing operations to ensure that company goals are continually being met.

It is also important that managers have a long-term focus on meeting growth targets and corporate objectives. Unfortunately, there have been many examples of companies where the managerial focus was shifted to short-term goals—quarterly or fiscal year earnings estimates or the current price of the company stock—for personal reasons, such as increased bonuses and financial benefits. Such short-term thinking is

often not in the best interest of the long-term health and objectives of companies or their shareholders.

2.3 Role of the Board of Directors

Learning Outcomes

By the end of this section, you will be able to:

- Describe the oversight functions performed by boards.
- Define an independent board member.
- Compare arguments for and against having independent board members.
- Describe ways boards can become diverse.

Functions of a Board of Directors

A board of directors is a group of people who are elected to represent shareholders, and these directors are then ultimately responsible for running the company. Every public company is legally required to install a board of directors. Nonprofit organizations and many private companies often establish a board of directors as well, even if they are not legally required to do so.

The board is responsible for protecting shareholders' interests, establishing management policies, overseeing the corporation or organization, and making decisions about important issues. The board of directors acts as a fiduciary for shareholders. The board is also tasked with a number of other responsibilities, including setting company goals, creating dividend and stock option policies, hiring and firing chief executive officers (CEOs), and ensuring that the company has the resources it needs to perform well.

Basic Structure of a Board of Directors

The bylaws of a company or organization determine the structure, responsibilities, and powers given to a board of directors. The bylaws also determine how many board members there are, how the members are elected, and how frequently the board members meet.

The board must represent shareholder and management interests, so it is best for the board to include both internal and external members. Usually, there is an internal director and an external director. The internal director is a member of the board who is involved with the daily workings of the company and manages the interests of shareholders, officers, and employees. The external director represents the interests of those who function outside of the company. The CEO often serves as the chairman of the company's board of directors.

Figure 2.2 Corporate Boardroom (credit: "495 Express Lanes Board Room" by Fairfax County Chamber of Commerce/flickr, CC BY 2.0)

International Structure of a Board of Directors

The structure of a board of directors varies more outside of the United States. In Asia and the European Union, there are commonly executive and supervisory boards. The executive board is made up of company insiders who are elected by employees and shareholders. In most cases, the executive board is headed by the company CEO or a managing officer. The supervisory board oversees daily business operations and acts much like a typical US board of directors. The chair of the board varies, but the board is always led by someone other than the prominent executive officer.

Oversight: Corporate Governance

Corporate governance is a discipline that focuses on how a company conducts its business and the various controls that are implemented to ensure proper procedures and ethical behavior.

Although many companies and managers do operate with a fair and honest philosophy, others will try to exploit the temporary benefits of actions that fall outside ethical behavior. Companies do not always adhere to laws. You may have seen or read news stories about false reporting of earnings, failure to reveal financial information, or payments of large bonuses to top executives shortly after a company files for bankruptcy.

In one infamous example, the insurance giant AIG paid for a lavish trip to California for top employees of the company immediately after declaring that the company was insolvent. It asked for and received financial support from the US government in the bailout of 2008.[2]

At other times, a company may cross the line between legal and illegal and violate the law in order to increase profits. Because of the potential for human self-interest and greed, governments have enacted laws and regulations that require specific actions of a company or restrict its activities in an effort to ensure fair competition and ethical behavior.

Often, Congress enacts laws and regulations in response to major economic or other highly visible events. Following the great market crash of 1929, the US government created a new set of rules and regulations governing the issuing and trading of securities, the Securities Act of 1933 and the Securities Exchange Act of 1934. The government also created the **Securities and Exchange Commission (SEC)** to oversee these laws and regulations.

The new laws required that firms make available specific financial information to current owners and prospective owners and that the SEC approve the initial sale of securities to the public. More recently, following a series of major ethical lapses at some firms, the US government enacted new legislation in 2002. One of the most sweeping acts is the Sarbanes-Oxley Act (SOX), which requires, among other things, the following:

- That the CEO and chief financial officer (CFO) must attest to the fairness and accuracy of the company's financial reporting
- That the company implements and maintains an effective structure of internal controls responsible for the reporting of financial results
- That the company and an external public accounting firm confirm the effectiveness of the controls over the most recent fiscal year

In addition, SOX created the Public Company Accounting Oversight Board, outlining the prohibited activities of auditors. It also set a requirement that the SEC issue new rulings that establish compliance with the act.

Board of Directors Oversight and Corporate Governance

Because of the widely publicized control breakdowns at Wells Fargo Bank and recent regulatory actions, boards of directors of public companies and financial institutions have been directed to improve oversight and

2 Scott Vogel. "You Paid for It: AIG's Retreat Destination, Up Close." *Washington Post*. October 9, 2008. http://voices.washingtonpost.com/travellog/2008/10/disaster_tourism_comes_to_cali.html

corporate governance. Boards are evolving from focusing primarily on the needs of top key individuals to considering broader aspects of ethics, values, and corporate culture. Boards now oversee the monitoring systems being put in place and may take on direct responsibilities related to senior management.

The Role of the Audit Committee

A strong independent audit committee (AC) is an important part of the corporate governance efforts of any firm. The AC is formed by the board of directors as a separately chartered subcommittee of the board of directors. It reports regularly to the BOD and assists the board by assuming responsibilities for critical corporate financial matters, such as reviewing audit plans and findings, approving external public accountants, and coordinating the efforts of both internal and external financial reviews and audits. The audit committee provides expertise in all financial and accounting matters for a company, and it is therefore a critical part of a company's corporate governance efforts.

Some important functions of the audit committee include

- confirming the accuracy of the firm's financial reporting;
- verifying that systems of internal control and risk management are operating effectively;
- ensuring compliance with legal and regulatory requirements;
- verifying the qualifications, independence, and performance of the external public auditing firm; and
- coordinating the activities and performance of the internal audit function.

The role of the audit committee has significantly expanded over the years, and it has become exceedingly important with the enactment of the Sarbanes-Oxley Act. Due to this increase in importance and recognition, several boards have shifted some of the audit committee's responsibilities to separately chartered committees in order to create a balance of duties and ensure that those duties are effectively focused on and efficiently executed. Some of these additional committees have been known to include a compensation committee, a disclosure committee, and a governance committee, and they all have related objectives that need to be documented within the charter of each of the individual committees. It is important for the different committees to have close working relationships so that the audit committee can help each one fulfill its responsibilities to senior management, the greater board of directors, shareholders, and other stakeholders.

The audit committee performs an internal audit to review the organization's corporate governance process and to communicate any recommendations for changes. The audit committee will usually follow up and monitor the process put in place to implement any changes or necessary improvements. As with any other corporate function, the audit committee's role is greatly affected by the legal, institutional, financial, cultural, and political circumstances that impact the company.

Importance of Improving Oversight and Governance

It is crucial to today's corporate environment that firms do not lose sight of achieving and maintaining strong and efficient oversight and governance. This is true despite the litany of other important items on the busy agendas of most boards.

Keeping a focus on the critical ethics of management, as well as the traditional focus on the importance of ethics to the overall organization, is not only timely in this day and age but also sound business practice. The importance of establishing a comprehensive system of checks and balances cannot be overemphasized. Beginning with the chief executive officer, these checks and balances need to progress through senior management, and they ultimately include the board of directors itself. Similar checks and balances need to then filter down though the rest of the entire firm. By taking the appropriate steps to improve corporate oversight and governance, overall business risk can be mitigated and future operational problems reduced. Additionally, such steps can lead to the positive effects of achieving sustainable operational and financial benefits for a company and its shareholders.

LINK TO LEARNING

PepsiCo

PepsiCo is a global leader in the food and beverage industry. It has also been noted for its excellence in corporate governance. Take a look at the PepsiCo website (https://openstax.org/r/pepsico). Why do you think the company has won numerous awards and was featured in Fortune's annual Blue Ribbon Companies list for 2021?

The Importance of Independence in Boards of Directors

An independent board of directors is composed of individuals who have no material interest in the company other than their directorship. They maintain their independence by only accepting compensation from the company for their BOD services. They also have their own information sources, instead of relying on information provided by senior management of the company. It is considered a corporate governance best practice to have independent members serve on boards of directors for both publicly and privately held companies.

In most cases, board members have no affiliation with activities or organizations that could result in conflicts of interest. An example of this might be a scenario in which a board is considering the formation of a partnership or alliance with an organization that is directly associated with one of its board members. In such an instance, a director might be excused from participating in that decision process, particularly if it is clear that it would lead to potential conflict.

A board with a majority of independent directors can bring expertise and objectivity, which

- helps assure ownership that the company is being run legally, ethically, and in the best interest of shareholders;
- allows for both independence and objectivity regarding senior managerial representatives and limits situations in which a key decision maker might have a vested interest or an "ax to grind"; and
- enables board members to advance discussions with no hidden agendas for self-advancement or other self-profiting motives.

The Importance of Diversity in Boards of Directors

As mentioned earlier, diversity can be an important quality for any board of directors. Increasingly over recent years, corporate management has begun to appreciate the value of diversity in boards of directors. This has resulted in a significant increase in the total number of women and people of color in boardrooms in the United States. However, many business observers believe that corporate governance practices have a long way to go in this respect. Increasing representation has now grown to become a high priority for most businesses and organizations around the world.

Board members face many challenges in making decisions effectively and efficiently as possible. Because of such challenges, the potential objective of diversifying the boardroom competes with other worthy topics and objectives such as improving cybersecurity, advancing customer service, identifying and reducing risk, improving community relations, and positioning strategically within an industry. This has left corporate governance experts and researchers in a situation where they find themselves "playing catch-up" to adequately diversify.

2.4 Agency Issues: Shareholders and Corporate Boards

Learning Outcomes

By the end of this section, you will be able to:

- Define the concept of agency costs.
- Discuss conflicts of interest between board members, company management, and employees.
- Define each component of ESG.
- Discuss the findings indicating how ESG policies impact stock returns.

Agency Problems and Issues

Agency problems refers to conflicts that occur when an **agent** (manager) who is entrusted with following the interests of the **principal** (shareholder or owner) of an organization abuses their position to further their own personal goals. In the field of corporate finance, agency problems are often related to a conflict of interest between the management of a company and its shareholders.

For many years, this has been a very common problem that has been seen in nearly every kind of organization, irrespective of it being a church, a club, a not-for-profit organization, a multinational corporation, or any other government agency or institution. As with most problematic issues in business, agency problems can be resolved, but only if organizations are willing to take the appropriate steps to resolve them.

Every company has its own set of goals and objectives, but it is important to note that the employee and personal goals of managers may differ and may not align with the goals and objectives of stockholders (ownership). Because these differences exist, and because all parties have a desire to maximize their own wealth, agency problems can often arise, having a negative impact on company profits, stock price, and the goodwill of the shareholder base.

There are three primary types of agency problems, discussed below.

CONCEPTS IN PRACTICE

Example of an Agency Problem

ABC Co. used to sell organic shampoo for $15, but the stockholders of ABC lobbied for an increase in the selling price of the shampoo from $15 to $18. This was to increase earnings and, ultimately, their own personal wealth through an uptick in stock price. However, as a result of this unnecessary rise in the price of the shampoo, customers were disappointed, and a majority of them wound up boycotting the product. Additionally, some of the consumers who continued to purchase the product noticed a decline in the overall quality of the shampoo and were also very disappointed. In this scenario, agency problems surfaced between stockholders and loyal customers of the company.

Stockholders versus Management

Large corporations typically have a substantial number of stockholders forming their ownership. It is essential for an organization to separate the management of a company from this ownership in order to avoid this type of agency problem.

Segregating ownership from management can be advantageous for an organization. Doing so will usually not have any effects on normal business operations. At the same time, the company can employ different experts and professionals to manage key operations of the business.

However, a drawback to this is that hiring outsiders may eventually become troublesome for shareholders. External managers who are brought into a company may end up making self-serving decisions or even

misusing company funds. This could eventually result in declining bottom line results and company share prices, which would then lead to conflicts of interests between stockholders and company management.

An example of an agency problem between management and shareholders occurred at WorldCom in 2001, when their CEO used company assets to underwrite several personal loans.[3] As a result of these inappropriate actions, the company took on additional debt that negatively impacted WorldCom's capital structure, liquidity, and ultimately its stock price. From this example, we can see how individual greed on the part of agents, executives, or corporate management can lead to significant agency problems.

Investors versus Creditors

If a company decides to engage in risky investments and projects in order to drive organizational profitability, these increased risk levels could threaten the company's ability to service (repay) their debts, leading to possible default.

This additional risk could also result in creditors taking steps to devalue such debts, which in most cases refers to company bond issues. In the end, if these riskier projects end up failing and the company loses money, investors (bondholders) may also experience financial risk as bonds go into default or otherwise lose market value. This then becomes a potential agency problem between bondholders (investors) and creditors.

Stockholders versus Other Stakeholders

Situations may arise in which stockholders of a firm find themselves in conflicts of interest with other stakeholders of the company. For example, employees of a firm might be asking for a general wage increase. If such a wage increase were voted down by stockholders, this could result in key employees departing the organization, eventually leading to poorer business results and the dissatisfaction of other stakeholders in the company as company profits decline. In such an example, we see the agency problem of stockholders versus other stakeholders.

A more specific example of such an agency problem occurred in 2011, when Oregon-based food and gift basket company Harry & David was forced to file for bankruptcy.[4] This was a direct result of the company being purchased through a leveraged buyout that left the company saddled with a tremendous amount of debt. However, the most important factor leading to the company's failure was the actions of Steven Heyer, who was a friend of the new owners and had been hired as CEO. Heyer, who was awarded an exorbitant executive salary, was also allowed to sink the company into further debt. Harry & David has since emerged from bankruptcy under new leadership. But this example should serve as a cautionary tale of what can happen when stockholders are able to put their interests ahead of those of other stakeholders in a corporate environment.

CONCEPTS IN PRACTICE

Infamous Agency Problems

Enron

Enron is one particularly infamous example of an agency problem. Enron's directors were responsible for protecting and promoting investor interests, but they failed to carry out their regulatory and oversight responsibilities, enabling the company to venture into illegal activity. The company's resulting accounting scandal resulted in billions of dollars in losses to its investors.

At one time, Enron had been one of the largest companies in the United States. Despite being a multibillion-

3 Anshita Kohli. "Worldcom Scam: The Fall of the Biggest US Telecommunication Company." The Company Ninja. JD Learning Ventures, May 26, 2020. https://thecompany.ninja/worldcom-scam/

4 Beth Kowitt. "Harry & David's Failed Mr. Fix-It." *Fortune*. April 1, 2011. https://fortune.com/2011/04/01/harry-davids-failed-mr-fix-it/

dollar company, Enron began losing money in 1997. It had also started incurring a tremendous amount of debt. Fearing a drop in stock prices, Enron's management team tried to disguise the problems by misrepresenting them through inappropriate accounting methods, which resulted in confusing and misleading financial statements.

Disaster started to unfold in 2001, when common stock prices fell from $90 to under $1 per share. The company filed for bankruptcy in December 2001, and criminal charges were brought against several key Enron employees, including former CEO Kenneth Lay and former CFO Andrew Fastow. Jeffrey Skilling was subsequently named CEO in February 2001, but he ended up resigning six months later.

Bernard L. Madoff Investment Securities LLC

Ponzi schemes are common examples of the agency problem. **Agency theory** claims that a lack of oversight and incentive alignment greatly contributes to these problems. Many investors fall into Ponzi schemes thinking that taking fund management outside a traditional banking institution reduces fees and saves money.

Even though established financial institutions reduce risk by providing oversight and enforcing legal practices, some Ponzi schemes simply involve taking advantage of consumer suspicions about the banking industry and financial markets. In this type of environment, the consumer cannot ensure that an agent is acting in their best interest. Investments are made under limited or, in many cases, completely nonexistent oversight.

Bernie Madoff's scam is probably one of the most infamous examples of a Ponzi scheme. Madoff's fraud started with friends, relatives, and acquaintances in New York, but it ultimately grew to encompass major charities such as Hadassah, universities such as Tufts and Yeshiva, institutional investors, and wealthy families in Europe, Latin America, and Asia. The cash losses of Madoff's scheme were recently estimated to be between $17 billion and $20 billion. The returns he promised were higher than what most investment firms and banks were offering—so promising that almost all of his investors ignored any concerns they may have had and basically looked the other way. Madoff paid for any redemption requests with money that had been newly invested.

Madoff's Ponzi scheme fell apart when he could no longer pay his investors. He was criminally charged, convicted, and given a 150-year prison sentence. Madoff died in April 2021 while serving his prison term.

(Sources: Diana B. Henriques. "Bernard Madoff, Architect of Largest Ponzi Scheme in History, Is Dead at 82." *New York Times*. April 14, 2021. https://www.nytimes.com/2021/04/14/business/bernie-madoff-dead.html; Chase Peterson-Withorn. "The Investors Who Had to Pay Back Billions in Ill-Gotten Gains from Bernie Madoff's Ponzi Scheme." *Forbes*. April 14, 2021. https://www.forbes.com/sites/chasewithorn/2021/04/14/the-investors-who-had-to-pay-back-billions-in-ill-gotten-gains-from-bernie-madoffs-ponzi-scheme/; Adam Hayes. "The Agency Problem: Two Infamous Examples." Investopedia. Dotdash, updated April 15, 2021. https://www.investopedia.com/ask/answers/041315/what-are-some-famous-scandals-demonstrate-agency-problem.asp)

How to Resolve Agency Problems

Ultimately, agency problems result from the differences among the interests of a company's management, other stakeholders of the firm, and its ownership or stockholders. When perpetuated, these differences may eventually result in lasting conflicts of interest. In order for companies to avoid such problems, it is imperative that they address the underlying problems of these differences. This will help ensure that normal business operations are not being adversely impacted by the agency problem.

While there is no surefire way to resolve all conflicts of interest and agency problems, some measures that can

help mitigate such issues include the following:

- Offering incentives to management for strong performance and ethical behavior
- Awarding decision makers with stock packages, commissions, and other long-term compensation packages to encourage long-term thinking and matching of company objectives with shareholders' priorities
- Penalizing poor performance, shortsightedness, and unethical behavior

The prevailing belief in agency theory is that when a business creates organizational incentives that encourage hard work on projects that will benefit the company in both the short and long term, more employees will be encouraged to act in the business's best interest.

Another means of resolving agency problems is through a hostile takeover of the organization. Even the threat of such a takeover may be effective in reducing or eliminating these conflicts of interest. A hostile corporate takeover tends to unify and discipline a management or agent group, thus fostering a union of agent and shareholder interests. When such a potential threat or outright ownership change is introduced to a company, its managers are more likely to act in the best long-term interests of the shareholders in order to maintain their leadership positions within the company.

By better aligning *agent* (management) and *principal* (ownership) goals, agency theory attempts to bridge any gulfs among employees, employers, and stakeholders that are created by the principal-agent problem. While it is recognized as being nearly impossible for companies to eliminate the ongoing agency problem, it is also recognized that it is possible to minimize its negative effects.

Impact of ESG Ratings

In recent years, many publicly traded companies, as well as many that are privately owned, are being evaluated and rated according to environmental, social, and governance **(ESG)** factors. These ratings and evaluations are primarily conducted by third-party organizations. As a result, the investment community is using these reports and ratings to an ever-increasing degree in order to measure and assess corporate ESG factors and performance.

Environmental, social, and governance issues have become an important part of the investment community's evaluation of publicly traded companies. Each component of what is now referred to as ESG has equal importance in ongoing corporate evaluations, as per Figure 2.3 below. It is critical for the senior management of any corporation to stay abreast of any and all ESG issues as they arise and take immediate corrective action when necessary.

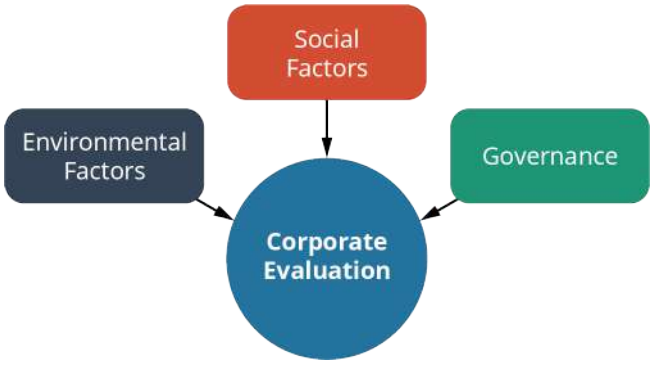


Figure 2.3 Importance of ESG Factors to a Business Concern

ESG measurements and assessments have become very important to firms, as they often become the basis of formal and informal buy recommendations by investment professionals. ESG ratings were originally developed to assist in determining the general risk of ESG factors for any public company, but they have since grown to become unique scores used by investors to gauge the potential attractiveness of investment in the subject company. Because of the nature of these factors, firms that are rated with high ESG metrics are believed to

represent superior investments and to have proactive management teams focused on creating long-term value of company stock.

Thus, with investors increasingly using ESG scores to form their investment strategies, the consequences of a poor rating can have a negative impact on a firm's share price and result in substantial problems. In any case, it is important to note that ESG is only a starting point from which it is possible to gather indicators on a business and its direction. In the end, it does not present the entire story of a firm. Any investment decisions about the company in question should include a significant amount of additional data.

2.5 Interacting with Investors, Intermediaries, and Other Market Participants

Learning Outcomes

By the end of this section, you will be able to:

- Define the investor relations function.
- Discuss how the investor relations office interacts with investors, regulators, and other corporate stakeholders.
- Describe the topics most often discussed during a quarterly conference call.
- Explain how press release information impacts company stock prices.

Investor Relations

Within the general field of corporate public relations is a specific subdivision referred to as **investor relations (IR)**. IR involves elements of communication, marketing, and finance and is designed to control the flow of information from the management of a public corporation to its investors and stakeholders.

Because the investment community plays such a critical role in the overall growth and success of any corporation, it is imperative that firms maintain strong and open relationships with their shareholder or potential investor audience. IR was developed to take responsibility for achieving and maintaining these crucial relationships.

Investor relations are quite different from typical public relations practices. A firm's IR group must work very closely with the accounting and legal departments, as well as with members of the senior management team, such as the CEO and CFO.

As might be expected, IR has far more regulatory obligations than standard public relations functions, largely due to corporate reporting requirements enforced by the SEC and the **International Financial Reporting Standards (IFRS)**. IR became significantly more important in 2002, when the United States Congress passed the Sarbanes-Oxley Act (SOX), also known as the Public Company Accounting Reform and Investor Protection Act. This legislation resulted in requirements that dramatically increased the extent of financial reporting for any publicly traded company. SOX was enacted in an attempt to prevent the occurrence of corporate financial scandals such as the one notoriously committed by the Enron Corporation that we discussed earlier.

In summary, investor relations functions have responsibilities including, but not limited to,

- coordinating live shareholder meetings and press conferences;
- disseminating financial information to the investment community;
- conducting briefings to the financial analyst community;
- publishing the **quarterly report** and **annual report**; and
- addressing any issues that arise as a result of financial disclosure.

The best time to form an internal IR function or to engage an IR firm is when a company begins the process of becoming publicly traded through an initial public offering, or IPO.

Quarterly Earnings Conference Calls

As a result of the Securities Exchange Act of 1934, all publicly traded companies are required to file certain

financial reports with the SEC. The underlying purpose of these requirements is to provide shareholders and the investment community with important operational and financial information on a regular basis and in a transparent manner. Reports filed with the SEC include the annual Form 10-K, quarterly Form 10-Qs, and current periodic Form 8-Ks, in addition to proxy reports and certain shareholder and affiliate reporting documents. Quarterly 10-Qs are an ongoing and regular reporting requirement of publicly traded companies and are to be filed within 45 days following the end of each fiscal quarter.

Depending on a company's size and the complexity of its operation, a firm is likely to issue an earnings **press release** and conduct a **conference call** with the investment community within this same 45-day period. There is no legal requirement for companies to do either of these things, but experts in IR view these communications tools as best practice. They can add context and commentary to the reported financial results.

It is important for companies to do their planning and not enter a quarterly earnings conference call unprepared. There is a multitude of available resources for companies to analyze and review in preparation. Among such resources are industry reports prepared by government agencies; the financial reports and earnings calls of competing organizations, both within and outside of a company's primary industry; and financial research reports prepared by various covering analysts, who follow the specific company and are employed by financial brokerage firms.

Investment Meetings and Conferences

Organizing the **annual meeting** of shareholders, investor roadshows, and investment conferences is no easy task for any corporation, though all of these audience-facing events are critical to maintaining strong relations with shareholders and the investment community. It is important to reach shareholders and investors on an almost personal basis by crafting a successful and interesting investment story. For effective investor relations, key messages supporting any ownership or potential investment case should be clear and consistent. These key messages should be embedded within the company's materials and should form the basis of presentations, the corporate website, and annual reports. They should also be reinforced via concrete examples during annual meetings, roadshows, and investor presentations.

Figure 2.4 Quarterly Investor Relations Presentation (credit: "MAPFRE" by Castilla y León Económica/flickr, CC BY 2.0)

Corporations have found that using senior management's time efficiently is also important to investor relations. By targeting the ownership and potential investing audience, senior executives can make the best use of their time and improve their interactions with the investing public during these events. If smaller companies outsource the investor meeting planning process, the third-party firm should be thoroughly grounded in the client's corporate culture.

The most productive investor and shareholder meetings begin with a strong, understandable corporate introduction and continue by delivering an engaging story that demonstrates the company's successes, a track record of growth, and the high probability of favorable future prospects. Additionally, it is important for a company's senior management to end any meeting with feedback from the investor audience and set timelines for follow-up. There will always be times when something unexpected may happen and the addition of information or impromptu changes to scheduled agendas may occur. It is at times like these when understanding the body language and facial expressions of an audience can be critical in producing a favorable outcome of the meeting.

It is unlikely that the decision to invest or to remain an investor will be made based on a single corporate event, but impressions, good or bad, will certainly factor into such decisions over a period of time. Thus, it is important for IR officers to understand the importance of follow-up communication with their audience.

Purposes of Corporate Press Releases

Press releases have always been a vital tool in the communications toolkit of an IR professional. Various social media channels are also becoming increasingly popular for delivering company information and news. However, the press release remains a standard medium for most companies to communicate corporate news, results, and ideas.

Press releases can be written with various intentions. Whether to release financial information, unveil new products or services, announce changes in management, or a host of other reasons, all communications have a different objective. Not all press releases are created equally, and they have varying degrees of effectiveness. Any press release should contain information in easy-to-understand language that is free of corporate jargon and as concise as possible. Press releases may be viewed by multiple audiences, such as customers, stakeholders, investors, potential investors, and the general public, which is vital to consider when drafting a press release.

According to PR Newswire statistics, press releases that contain multimedia content have been known to substantially increase press release views.[5] Using infographics and charts where possible and relaying the key messages in short, easy-to-digest points make a press release easier for the reader to take in. Quotes from senior management can provide valuable insight, but they should not provide any new information; they should simply extend or expand on a subject already mentioned and further back up a claim.

LINK TO LEARNING

Press Releases Approved by PR Newswire

Take a look at this press release on mobile drive-in movies during the COVID-19 pandemic (https://openstax.org/r/mobile-drive-in-movies).

How would you judge this press release? Is it effective? Why or why not?

2.6 Companies in Domestic and Global Markets

Learning Outcomes

By the end of this section, you will be able to:

- Explain why corporations expand beyond domestic borders.
- Determine how different strategic decisions may influence corporate performance.

5 "Multimedia Content Distribution." PR Newswire. Cision, accessed August 27, 2021. https://www.prnewswire.com/products/multimedia-distribution-options.html

Important Differences among Domestic, International, and Global Organizations

If a company becomes global or multinational in scope, fundamental analysis of the organization by the investment community can become more complex. In order to better understand a company, it is important to determine what laws affect the company's governance process and which set of accounting rules is used to fashion its financial reports.

Domestic companies operate completely or for the most part within the borders of the United States. While such organizations may import raw materials and supplies from other nations or end up exporting their finished products to other countries around the world, in the end, these international activities represent only a very small portion of their overall business activities.

Domestic companies are typically governed by US accounting and securities laws that have been established by the SEC. Further, financial reporting for these domestic organizations is to be completed using **Generally Accepted Accounting Principles (GAAP)**.

International firms, while based in the United States, will typically maintain significant levels of international investment and conduct operations that may be quite diverse, both geographically and culturally. For such international firms, parent company accounting will usually adhere to GAAP standards. Conversely, non-US subsidiaries of such international firms may be regulated by laws dictated by their host countries. These will often differ significantly from those in the United States.

In recent years, accounting regulations in countries outside the United States have come under the jurisdiction of International Financial Reporting Standards (IFRS). It should be noted that guidelines and regulations under IFRS and those under GAAP can differ significantly. As a result of these regulatory differences, any specific divergences in accounting or governance practices between foreign subsidiaries and a US parent company should be clearly stated and disclosed in the parent company's financial reports.

Global firms have substantial operations and investments in different countries (**global markets**), and they may have no single center or basis of operational activity. In such cases, regulations for corporate governance are usually determined by the laws of the country in which the parent company has been established. While there are some global firms that report their financial statements according to GAAP standards, usually to satisfy the informational needs of US investors, most global parent companies' financials will adhere to IFRS reporting standards.

Difference in Financial Reporting: GAAP versus IFRS

Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS) were designed with similar objectives in mind: to provide a common and structured set of guidelines to assist in the preparation of accurate and unbiased financial reporting for public corporations.

Yet despite these commonalities in purpose, there are important differences between them. Among these are differences in inventory accounting and reporting, guidelines for consolidation of subsidiaries, and the accounting and reporting of minority interests.

LINK TO LEARNING

GAAP and IFRS

Learn more about US GAAP reporting from the SEC website (https://openstax.org/r/corpfin-manual), and learn about international standards from the IFRS website (https://openstax.org/r/ifrs-org).

SEC Reporting and EDGAR

EDGAR (Electronic Data Gathering, Analysis, and Retrieval system) is the primary system for collecting and

indexing documents submitted by companies to the SEC under the Securities Act of 1933, the Securities Exchange Act of 1934, the Trust Indenture Act of 1939, and the Investment Company Act of 1940.

LINK TO LEARNING

EDGAR System

The SEC's EDGAR system (https://openstax.org/r/edgar-html) contains millions of corporate and individual filings. It benefits investors, corporations, and the US economy overall by increasing the efficiency, transparency, and fairness of the securities markets. The system processes about 3,000 filings per day, serves up 3,000 terabytes of data to the public annually, and accommodates 40,000 new filers per year on average.[6]

6 "About EDGAR." US Securities and Exchange Commission. Modified March 23, 2021. https://www.sec.gov/edgar/about

Summary

2.1 Business Structures

The most common forms of business organizations are sole proprietorships, partnerships, corporations, and hybrids. There are advantages and disadvantages to each type of organization involving ease of formation, tax requirements, and personal liabilities. The most common type of organization for larger businesses is the corporation, the establishment of which involves filing articles of incorporation.

2.2 Relationship between Shareholders and Company Management

A stakeholder is any individual or group that has an interest in the outcomes of an organization's actions. Shareholders are relevant to a corporation form of business because they own stock in the corporation. The board of directors of a company is ultimately responsible to shareholders for effectively running the business.

2.3 Role of the Board of Directors

The board of directors acts as a fiduciary for shareholders. The board is also tasked with a number of other responsibilities, including setting company goals, creating dividend and stock option policies, hiring and firing CEOs, and ensuring that the company has the resources it needs to perform well. Diversity and experience play important roles in corporate governance and in the strength and effectiveness of a board of directors.

2.4 Agency Issues: Shareholders and Corporate Boards

Issues and conflicts of interest might arise between shareholders (public ownership) and senior management, including C-level executives and the board of directors. Although there is no definite way to resolve all conflicts of interest, some measures that can help mitigate problems include offering incentives for strong performance and ethical behavior and awarding decision makers with stock packages to encourage long-term thinking.

2.5 Interacting with Investors, Intermediaries, and Other Market Participants

Investor relations are important to a company's overall corporate governance strategy. Effective communication that is straightforward, open, and free of potentially confusing corporate jargon has become a critical component of a company's image, overall message, and long-term success.

2.6 Companies in Domestic and Global Markets

Companies sometimes expand internationally, and there are advantages and disadvantages of such growth. International or global expansion efforts require careful and efficient communication, planning, and financing.

Key Terms

agency theory a principle that is used to explain and resolve issues in the relationship between business principals and their agents, most commonly between shareholders (principals) and company executives (agents)

agent a person who acts on behalf of another person or group

annual meeting a meeting of the general membership and shareholders of a corporation; also known as an annual general meeting (AGM)

annual report a document describing a public corporation's operations and financial condition that must be provided to shareholders once per year; also known as Securities and Exchange Commission (SEC) Form 10-K

articles of incorporation a set of formal documents filed with a government body to legally document the creation of a corporation

board of directors (BOD) a group of people who jointly supervise the activities of an organization

C corporation a legal structure for a corporation in which the owners, or shareholders, are taxed separately

from the entity

close (closely held) corporation a company that has only a limited number of shareholders

conference call a meeting or presentation conducted via telephone or internet to relay company information to all interested parties, including institutional and individual investors, as well as buy-and-sell side analysts; also known as an earnings conference call

corporate governance the system of rules, practices, and processes by which a firm is directed and controlled

corporation a legal entity that is separate and distinct from its owners

domestic corporation (in state) a corporation incorporated under the laws of the country or state in which it does business

Electronic Data Gathering, Analysis, and Retrieval system (EDGAR) the primary system for collecting and indexing documents submitted by companies and others under the Securities Act of 1933, the Securities Exchange Act of 1934, the Trust Indenture Act of 1939, and the Investment Company Act of 1940

ESG environmental, social, and governance (ESG) standards for a company's operations that socially conscious investors use to screen potential investments

foreign corporation (out of state or out of country) an existing corporation that conducts business in a state or jurisdiction other than where it was originally incorporated

Generally Accepted Accounting Principles (GAAP) a common set of accounting principles, standards, and procedures issued by the Financial Accounting Standards Board (FASB)

global markets economies or markets that are multinational in nature, spanning several different countries or jurisdictions

hybrid form of business a limited liability company (LLC) or limited liability partnership (LLP) that combines the characteristics of a corporation with those of a sole proprietorship or partnership

International Financial Reporting Standards (IFRS) accounting standards used by international corporations, issued by the IFRS Foundation and the International Accounting Standards Board

investor a person or an entity, such as a firm or mutual fund, that invests capital with the expectation of receiving financial returns

investor relations (IR) a strategic management responsibility that is capable of integrating finance, communication, marketing, and securities law compliance to enable the most effective two-way communication between a company and the financial community or other constituencies, which ultimately contributes to a company's securities achieving fair valuation

limited liability corporation (LLC) a US-specific form of a private limited company; a business structure that can combine the pass-through taxation of a partnership or sole proprietorship with the limited liability of a corporation

limited liability partnership (LLP) a partnership in which some or all partners have limited liabilities; can exhibit elements of both partnerships and corporations

non-stock corporation a corporation that does not have owners represented by shares of stock but typically has members who are the functional equivalent of stockholders in a stock corporation (having the right to vote, etc.); describes the vast majority of not-for-profit corporations

nonprofit (not-for-profit) corporation a legal entity that has been incorporated under the law of its jurisdiction for purposes other than making profits for its owners or shareholders

partnership a formal arrangement by two or more parties to manage and operate a business and share its profits and liabilities equally

press release an official statement delivered to members of the news media for the purpose of making an announcement or otherwise providing information

principal the person with the highest authority or most important position in a company, organization, institution, or group

professional corporation a form of corporate entity used by licensed professionals such as attorneys, architects, engineers, public accountants, and physicians, which is regulated by special provisions in many corporation statutes

public benefit corporation a specific type of Delaware general corporation that is owned by shareholders who expect the company to make a profit and return some of that money to them in the form of dividends

quarterly report a document describing a public corporation's operations and financial condition that must be provided to shareholders four times per year; also known as Securities and Exchange Commission (SEC) Form 10-Q

S corporation a closely held corporation that makes a valid election to be taxed under Subchapter S of Chapter 1 of the Internal Revenue Code, which does not require such corporations to pay income taxes and instead taxes owners as individuals

secretaries of state the state officials who head the agencies responsible for, among other functions, the chartering of businesses (usually including partnerships and corporations) that wish to operate within their state and, in most states, for maintaining all records on business activities within the state; also known as secretaries of the commonwealth in Massachusetts, Pennsylvania, and Virginia

Securities and Exchange Commission (SEC) a large, independent agency of the United States federal government whose primary purpose is to enforce laws against market manipulation; created following the stock market crash of 1929 to protect investors and the national banking system

shareholder (stockholder) an individual or institution that legally owns one or more shares of the share capital of a public or private corporation; may be referred to as members of a corporation

sole proprietor (and sole proprietorship) a form of business that is operated and run by a single individual, known as the sole trader, with no legal distinction between the owner and the business entity

stakeholder a person with an interest or concern in a business

stock corporation a for-profit organization that issues shares of stock to shareholders (also known as stockholders) to raise capital, with each share representing partial ownership of the corporation and granting shareholders certain ownership rights to shape company policies

subscriber an initial shareholder of a company at the time of its incorporation whose name appears on the memorandum of association, a legal document prepared in the formation and registration process of a company to define its relationship with shareholders

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/cfa-institute-org). Reference with permission of CFA Institute.

Multiple Choice

1. An S corporation _____.
   a. is taxed in the same manner as a C corporation
   b. is eligible for more efficient financing in the face of company growth than a C corporation
   c. is usually more difficult to form than a C corporation
   d. is not taxed at the corporate level, unlike a C corporation

2. An important advantage of a sole proprietorship is that _____.
   a. it is easier to raise capital under such a structure than under other organizational forms
   b. it allows for an unlimited life of the business
   c. it is relatively easy to create
   d. Both a and b are correct.

3. A shareholder is someone who _____.
   a. sits on the audit committee of a firm
   b. is an ex-employee of a company
   c. profits from the favorable results of a company

d. follows the company for an investment firm

4. Effective corporate governance includes all of the following EXCEPT _____.
a. fairness
b. accountability
c. objectivity
d. higher share price

5. A stakeholder is someone who _____.
a. is required to read a company's annual report
b. answers to a board of directors
c. has a vested interest in a company's success
d. is hired to do a specific job

6. "An effective business leader will recognize the social and environmental responsibilities of their business as well as the eventual goal of achieving long-term, sustainable global development." This statement refers to _____.
a. employing an experienced environmental consulting firm
b. the advantages of having an audit committee
c. having a diversified and well-experienced board of directors
d. practicing strong corporate governance

7. An important component of a strong board of directors (BOD) is having members who are _____.
a. former employees of the company
b. able to write a strong corporate press release
c. culturally diverse and experienced in the industry
d. new to the industry and without preconceptions

8. Which of the following is NOT a reason why a company needs good corporate governance?
a. to avoid mismanagement of the company
b. to enable the company to raise capital more efficiently and mitigate financial and operational risk to stakeholders
c. to analyze the company's operations and systems of internal control in order to detect and prevent various forms of fraud and other accounting irregularities
d. to increase the company's overall accountability and prevent significant organizational problems

9. Who ultimately runs the company operations for a large corporation?
a. shareholders
b. board of directors
c. external auditors
d. stakeholders

10. One of the ways in which companies attempt to mitigate short-term managerial focus is by offering managers _____.
a. increased vacation time
b. increased paid sick leave
c. stock options
d. comprehensive health insurance

11. Which of the following are used to ensure fiduciary responsibility?

a. audits
b. press releases
c. end-of-year financial ledgers
d. a letter from the board of directors

12. Which of the following is NOT one of the roles of an audit committee?
a. reviewing the work of the internal audit
b. reviewing systems of internal control.
c. ensuring that appropriate resources are used in company operations
d. launching special investigations of employees, company practices, or procedures

13. Which of the following is a major issue addressed in corporate governance?
a. improving banking relations
b. ethics and its implementation
c. improving profits for shareholders
d. expanding operations internationally

14. Agency problems are essentially _____.
a. conflicts of interest
b. problems with the IRS
c. fraudulent business activities
d. nepotism

15. The term ESG, when used in the context of corporate governance, refers to which of the following?
a. earnings, shareholders, and governance
b. earnings, social, and general profit
c. environmental, social, and goals
d. environmental, social, and governance

16. Which of the following is the best method to ensure that shareholders are well informed of corporate policies and financial results?
a. self-evaluation and training for members of the board of directors
b. hiring a prestigious independent public accounting firm
c. ensuring cultural diversity and public speaking eloquence of the senior management team
d. conducting well-organized shareholder meetings and conference calls with the investment community

17. The Securities and Exchange Commission (SEC) requires that public corporations file which of the following financial reports on a quarterly basis?
a. Form 10-K
b. Form 8-Q
c. Form 10-Q
d. Form Q

18. Investor relations has substantially more _____.
a. regulatory obligations than standard public relations because of government-mandated financial and legal requirements
b. personnel within a company dedicated to its function compared to other corporate departments
c. interpretations regarding its effective implementation and use than other managerial and financial disciplines

d. documented historical cases of corporate failure than other managerial and financial disciplines

19. The corporate press release is _____.
a. no longer an important component of modern investor relations strategy
b. not yet a thing of the past, though it is highly likely to be replaced by social media in the near future
c. written by the chief financial officer in conjunction with the audit committee
d. best written to be easy to understand, free of corporate jargon, and as concise as possible

20. International firms are _____.
a. headquartered in a non-US country but have homogeneous profit centers with little differentiation in product or service
b. based in the United States but operate through the use of heavy investments outside the country via multinational profit centers
c. larger and more complex than their domestic counterparts
d. more likely to be formed as partnerships or sole proprietorships than as corporations

Review Questions

1. What are the key differences between the potential life of a business that is formed as a sole proprietorship and that of a business set up as a corporation?

2. What are the most common types of firms that are organized as limited liability partnerships?

3. What advantages does a sole proprietorship offer?

4. What are major disadvantages of a sole proprietorship?

5. If a company wishes to limit the liability of some of its investing partners, what form of business might it consider? Explain briefly.

6. In order to form a corporation, what is the most important document required?

7. What is the difference between a shareholder and a stakeholder?

8. What group within a corporation has the primary responsibility for protecting the interests of shareholders?

9. What is corporate governance?

10. What role does a corporation's board of directors play in corporate governance?

11. Briefly explain the concept of corporate governance.

12. What is the key component of agency theory, and why might this be more important to a public company than to one that is privately held?

Video Activity

Corporate Governance (Introduction)

Click to view content (https://openstax.org/r/corporate_governance)

1. a. Describe the five key responsibilities of the board of directors of a company. Why are each of these responsibilities important to the operation of the organization as a whole?
b. Discuss important related concepts, such as establishing corporate objectives, determining strategies to reach those objectives, providing leadership, supervising management of the business, and reporting to shareholders on the status and operations of the business.

c. Discuss why these responsibilities of the board of directors may be more important for a public corporation than for a privately held company.

2. a. What are three essential best practices in corporate governance? Discuss important relevant concepts, such as separation of duties, the need for non-executive directors, the importance of board member independence from other executives, company operations, and financial ties, as well as the importance of a non-executive audit committee.
b. Discuss why corporate governance is an ongoing process that must continuously be evaluated by a company even after separation of duties, independence, and audit committees have been established.

The Basics of Corporate Governance

Click to view content (https://openstax.org/r/the-basics-of-corporate-governance)

3. What is meant by LEARR in the context of governance codes? Discuss the various components that are referred to in the LEARR acronym and why they are important to a company's continuing operations.

4. Discuss the role of corporate governance in attempting to minimize agency problems and ensuring that a company's directors and management act in the best interest of the shareholders.

3

Economic Foundations: Money and Rates

Figure 3.1 Every company is impacted by the global economy. (credit: "World Currency" by Kari/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

American Airlines is one of the largest airlines in the world, flying to 350 destinations in 50 countries.[1] The managers of American Airlines are running a complex company. They have to be familiar with aeronautical science, they have to know the laws and regulations impacting commercial air travel, and they must keep abreast of global weather conditions. There is a lot to know about the airline industry itself.

However, operating a company such as American Airlines requires more than knowledge of the science and technology of the industry. American Airlines does not operate in a vacuum. Like every company, it is impacted by the economic environment in which it operates. American Airlines has to be familiar with how supply and demand will impact fuel costs and other expenses. It must also be familiar with macroeconomic trends. During periods of high unemployment, it may be difficult for the company to sell tickets to people wanting to travel to vacation getaways. During periods of low unemployment, American Airlines may find it difficult to hire quality workers at a wage rate it considers reasonable. Global economic conditions will also impact American Airlines; as the economies of Europe expand rapidly, the euro will increase in value and impact the cost of items that American Airlines purchases along its European routes.

In "Item 1A. Risk Factors," beginning on page 16 of the 2019 annual report for American Airlines (https://openstax.org/r/2019-annual-report-for-american-airlines), the company lists some of the ways that it

1 American Airlines. "American Airlines Group." AA.com. Accessed October 25, 2021. https://www.aa.com/i18n/customer-service/about-us/american-airlines-group.jsp

is impacted by macroeconomic and microeconomic conditions and the risks that these conditions place on the company. In this chapter, we explore some of the economic concepts that managers should use as part of their strategic plan.

3.1 Microeconomics

Learning Outcomes

By the end of this section, you will be able to:

- Identify equilibrium price and quantity.
- Discuss how changes in demand will impact equilibrium price and quantity.
- Discuss how changes in supply will impact equilibrium price and quantity.

Demand

Microeconomics focuses on the decisions and actions of individual agents, such as businesses or customers, within the economy. The interactions of the decisions that businesses and customers make will determine the price and quantity of a good or service that is sold in the marketplace. Financial managers need a strong foundation in **microeconomics**. This foundation helps them understand the market for the company's products and services, including pricing considerations. Microeconomics also helps managers understand the availability and prices of resources that are necessary for the company to create its products and services.

A successful business cannot just create and manufacture a product or provide a service; it must produce a product or service that customers will purchase. **Demand** refers to the quantity of a good or service that consumers are willing and able to purchase at various prices during a given time period, **ceteris paribus** (a Latin phrase meaning "all other things being equal").

Let's consider what the demand for pizza might look like. Suppose that at a price of $30 per pizza, no one will purchase a pizza, but if the price of a pizza is $25, 10 people might buy a pizza. If the price falls even lower, more pizzas will be purchased, as shown in Table 3.1.

Price ($)	Quantity
30	0
25	10
20	20
15	30
10	40
5	50

Table 3.1 Demand Schedule for Pizza

The information in Table 3.1 can be viewed in the form of a graph, as in Figure 3.2. Economists refer to the line in Figure 3.2 as a *demand curve*. When plotting a demand curve, price is placed on the vertical axis, and quantity is placed on the horizontal axis. Because more pizzas are bought at lower prices than at higher prices, this demand curve is downward sloping. This inverse relationship is referred to as the **law of demand**.

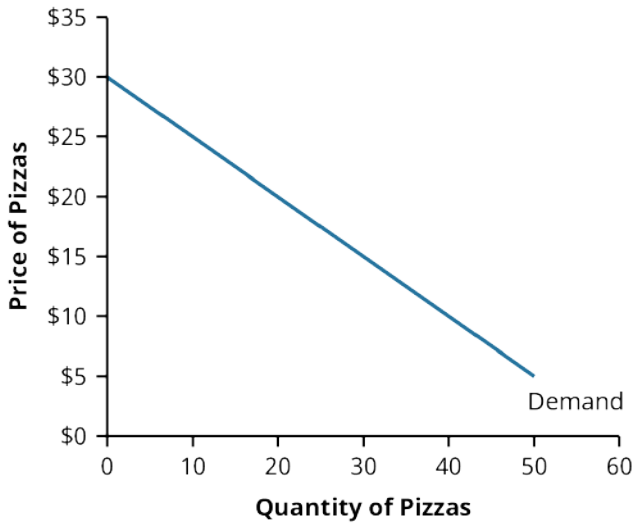


Figure 3.2 Demand Curve for Pizzas

The inverse relationship between the price of a good and the quantity of a good sold occurs for two reasons. First, as you consume more and more pizza, the amount of happiness that one more pizza will bring you diminishes. If you have had nothing to eat all day and you are hungry, you might be more willing to pay a high price for a pizza, and that pizza will bring you a great deal of satisfaction. However, after your hunger has been somewhat satisfied, you may not be willing to pay as much for a second pizza. You may only be willing to purchase a third pizza (to freeze at home) if you can get it at a fairly low price. Second, demand depends not only on your willingness to pay but also on your ability to pay. If you have limited income, then as the price of pizza rises, you simply cannot buy as much pizza.

The demand curve is drawn as a relationship between the price of the good and the quantity of the good purchased. It isolates the relationship between price and quantity demand. A demand curve is drawn assuming that no relevant factor besides the price of the product is changing. This assumption is, as mentioned above, ceteris paribus.

If another relevant economic factor changes, the demand curve can change. Relevant economic factors would include consumer income, the size of the population, the tastes and preferences of consumers, and the price of other goods. For example, if the price of hamburgers doubled, then families might substitute having a pizza night for having a hamburger cookout. This would cause the demand for pizzas to increase.

If the demand for pizzas increased, the quantities of pizza purchased at every price level would be higher. The demand schedule for pizzas might look like Table 3.2 after an increase in the price of hamburgers.

Price ($)	Quantity
30	9
25	19
20	29
15	39
10	49
5	59

Table 3.2 Demand Schedule for Pizzas after the Price of Hamburgers Doubles

This change leads to a movement in the demand curve—outward to the right, as shown in Figure 3.3. This is known as an increase in demand. Now, at a price of $25, people will purchase 19 pizzas instead of 10; and at a price of $15, people will purchase 39 pizzas instead of 30.

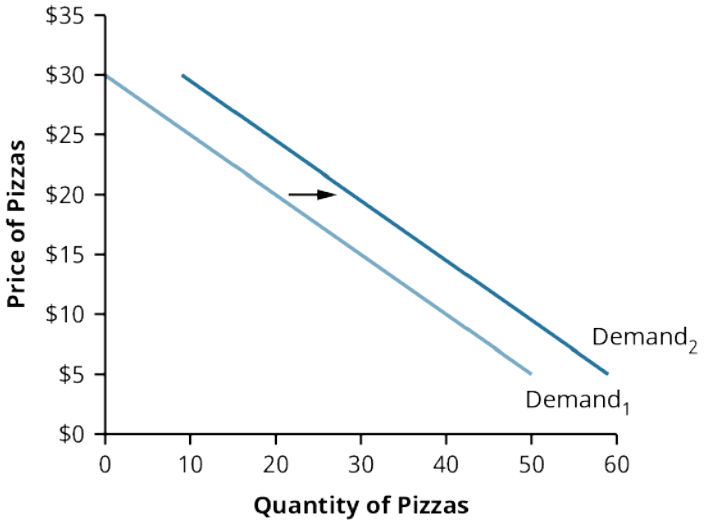


Figure 3.3 An Increase in Demand Represented as a Movement of the Demand Curve to the Right

A decrease in demand would cause the demand curve to move to the left. This could happen if people's tastes and preferences changed. If there were, for example, increased publicity about pizza being an unhealthy food choice, some individuals would choose healthier alternatives and consume less pizza.

LINK TO LEARNING

Demand Curve Shifts

If any of the items that are assumed not to change when a demand curve is drawn do change, then the demand curve can shift. To learn more about these changes in demand, watch the MRU video on demand curve shifts (https://openstax.org/r/mru-video).

Supply

Supply is the quantity of a good or service that firms are willing to sell at various prices, during a given time period, ceteris paribus. Table 3.3 is a fictional example of a supply schedule for pizzas. In some cases, higher prices encourage producers to provide more of their product for sale. Thus, there is a positive relationship between the price and quantity supplied.

Price ($)	Quantity
30	60
25	50
20	40
15	30
10	20
5	10

Table 3.3 Supply Schedule for Pizzas

The data from the supply schedule can be pictured in a graph, as is shown in Figure 3.4. Because a higher price encourages suppliers to sell more pizzas, the supply curve will be upward sloping.

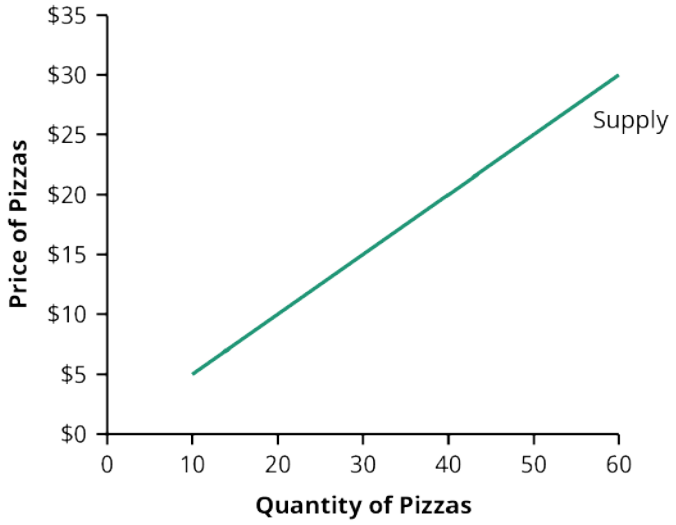


Figure 3.4 Supply Curve for Pizzas

The supply curve isolates the relationship between the price of pizzas and the quantity of pizzas supplied. All other relevant economic factors are assumed to remain unchanged when the curve is drawn. If a factor such as the cost of cheese or the salaries paid to workers changes, then the supply curve will move. A shift to the right indicates that a greater quantity of pizzas will be provided by firms at a particular price; this would indicate an increase in supply. A decrease in supply would be represented by a shift in the supply curve to the left.

LINK TO LEARNING

Supply Curve Shifts

The ceteris paribus assumption is made when drawing a supply curve, just as it is when drawing a demand curve. If a relevant economic variable other than the price of the good for which the supply curve is drawn changes, the supply curve will shift. For more information about how changes in these variables will move the supply curve, watch the MRU video on supply curve shifts (https://openstax.org/r/mru-video-on-supply).

Equilibrium Price

Demand represents buyers, and supply represents sellers. In the market, these two groups interact to determine the price of a good and the quantity of the good that is sold. Because both the demand curve and the supply curve are graphed with price on the vertical axis and quantity on the horizontal axis, these two curves can be placed in the same graph, as is shown in Figure 3.5.

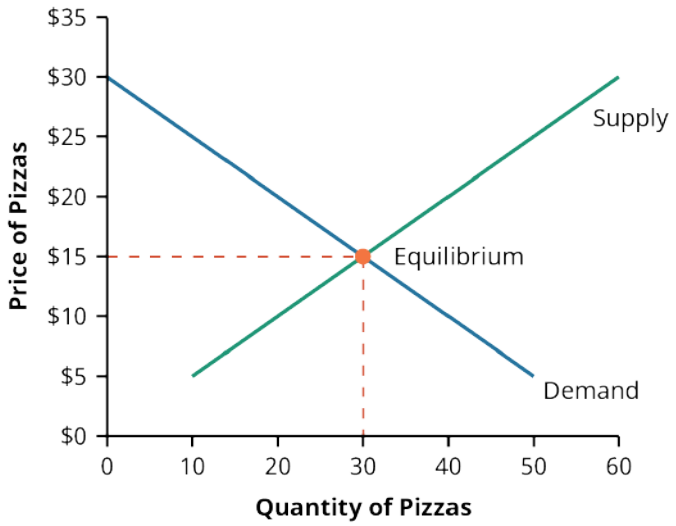


Figure 3.5 Graph of Demand and Supply Showing Equilibrium Price and Quantity

The point at which the supply and demand curves intersect is known as the **equilibrium**. At the **equilibrium price**, the quantity demanded will equal exactly the quantity supplied. There is no shortage or surplus of the product. In the example shown in Figure 3.5, when the price is $15, consumers want to purchase 30 pizzas and sellers want to make 30 pizzas available for purchase. The market is in balance.

A price higher than the equilibrium price will not be sustainable in a competitive marketplace. If the price of a pizza were $20, suppliers would make 40 pizzas available, but the quantity of pizzas demanded would be only 20 pizzas. This would be a surplus, or excess quantity supplied, of pizzas. Restaurant owners who see that they have 40 pizzas to sell but can only sell 20 of those pizzas will lower their prices to encourage more customers to purchase pizzas. At the same time, the restaurant owners will cut back on their pizza production. This process will drive the pizza price down from $20 toward the equilibrium price.

The opposite would occur if the price of a pizza were only $5. Customers may want to purchase 50 pizzas, but restaurants would only want to sell 10 pizzas at the low price. Quantity demanded would exceed quantity supplied. At a price below the equilibrium price, a shortage would occur. Shortages drive prices up toward the equilibrium price.

LINK TO LEARNING

The Equilibrium Price

A competitive market will drive prices to equilibrium. For a more in-depth understanding of this process, watch the MRU video on equilibrium price and quantity (https://openstax.org/r/mru-video-on-equilibrium).

THINK IT THROUGH

Graphing Demand and Supply

Consider the demand and supply schedules for sweatshirts shown below. Sketch a graph of demand and supply, placing quantity on the horizontal axis and price on the vertical axis. What will the equilibrium price for sweatshirts be? Table 3.4 provides the demand and supply schedules for the sweatshirts.

Demand Schedule for Sweatshirts		Supply Schedule for Sweatshirts	
Price ($)	Quantity	Price ($)	Quantity
55	0	55	45
50	4	50	40
45	8	45	35
40	12	40	30
35	16	35	25
30	20	30	20
25	24	25	15
20	28	20	10
15	32	15	5
10	36	10	0
5	40		

Table 3.4 Demand and Supply Schedules for Sweatshirts

Solution:

The demand curve for sweatshirts is the downward-sloping curve in Figure 3.6, showing the inverse relationship between price and quantity demanded. The upward-sloping curve is the supply curve for sweatshirts. The equilibrium price will be $30. At a price of $30, the quantity demanded of 20 sweatshirts equals the quantity supplied of 20 sweatshirts.

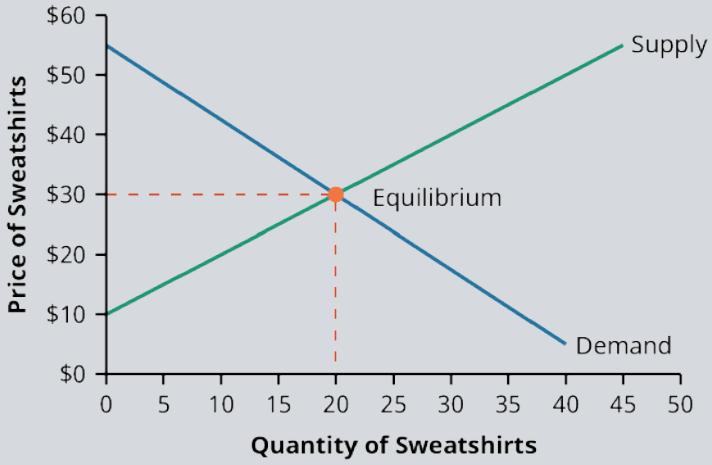


Figure 3.6 Graph of Demand and Supply for Sweatshirts

Changes in Equilibrium Price

A price that is either too high (above the equilibrium price) or too low (below the equilibrium price) is not sustainable in a competitive market. Market forces pull prices to the equilibrium, where they stay until either supply or demand changes.

If supply increases and the curve moves outward to the right, as in Figure 3.7, then the equilibrium price will fall. With the original supply curve, $Supply_1$, the equilibrium price was $15; quantity demanded and quantity supplied were both 30 pizzas at that price. If a new pizza restaurant opens, increasing the supply of pizzas to

$Supply_2$, the equilibrium will move from $Equilibrium_1$ (E_1) to $Equilibrium_2$ (E_2). The new equilibrium price will be $10. This new equilibrium is associated with a quantity demanded of 40 pizzas and a quantity supplied of 40 pizzas.

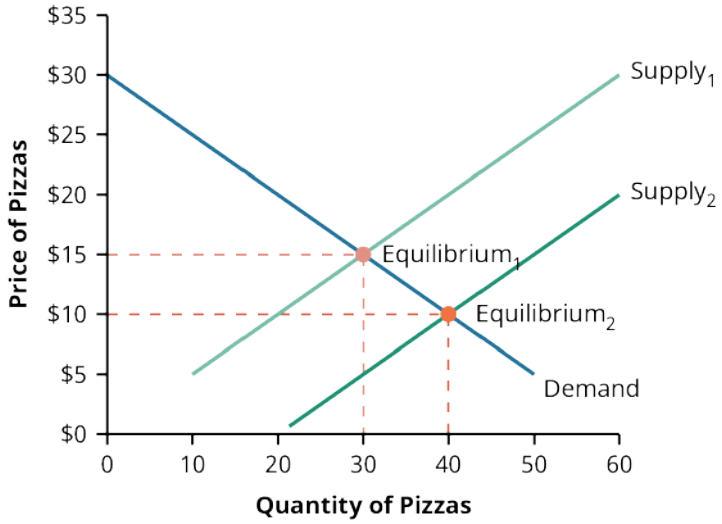


Figure 3.7 Supply Curve Changes When Supply Increases An increase in supply leads to a lower equilibrium price and an increase in quantity demanded.

It is important to note that the demand curve in Figure 3.7 does not move. In other words, demand does not change. As the equilibrium price falls, consumers move along the demand curve to a point with a combination of a lower price and a higher quantity. Economists call this movement an *increase in quantity demanded*. Distinguishing between an increase in quantity demanded (a movement along the demand curve) and an increase in demand (a shift in the demand curve) is critical when analyzing market equilibriums.

Equilibrium price will also fall if demand falls. Remember that a decrease in demand is represented as a shift of the demand curve inward to the left. In Figure 3.8, you can see how a decrease in demand causes a change from E_1 to E_2.

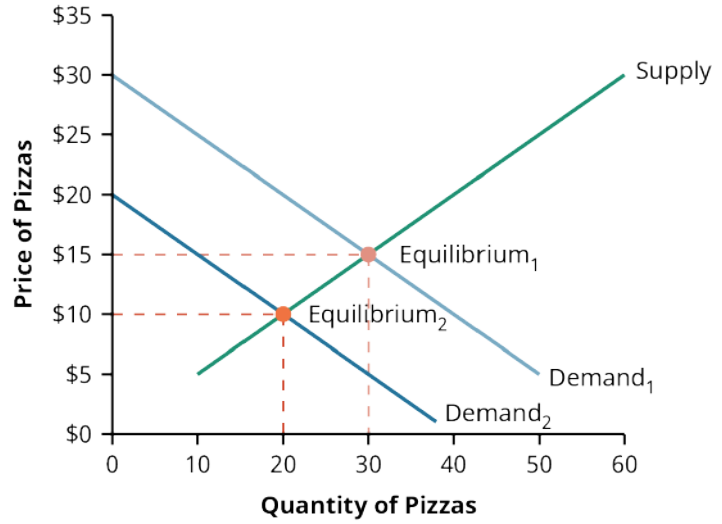


Figure 3.8 A Decrease in Demand

At the new equilibrium, E_2, the price of a pizza is $10. The new equilibrium quantity is 20 pizzas. Note that the supply curve has not moved. Producers moved along their supply curve, producing fewer pizzas as the price dropped; this is known as a *decrease in quantity supplied*.

THINK IT THROUGH

Graphing Demand

Suppose that the demand for sweatshirts in our previous example changes, and the demand schedule becomes the data shown in Table 3.5.

Price ($)	Quantity
55	18
50	22
45	26
40	30
35	34
30	38
25	42
20	46
15	50
10	54
5	58

Table 3.5 Demand Schedule for Sweatshirts

Has the demand for sweatshirts increased or decreased? Show this movement in a graph. What happens to the equilibrium? What are some reasons you can think of that may have caused this change in demand?

Solution:

This is an increase in demand. At every price, consumers now want to purchase more sweatshirts than they did before. This is shown in the graph as a movement of the demand curve outward to the right. Both the equilibrium price and the equilibrium quantity will rise because of this increase in demand. The equilibrium price will now be $40, and the equilibrium quantity of sweatshirts will be 30. Note that there is not an increase in supply; the supply curve does not move. There is simply an increase in quantity supplied (see Figure 3.9).

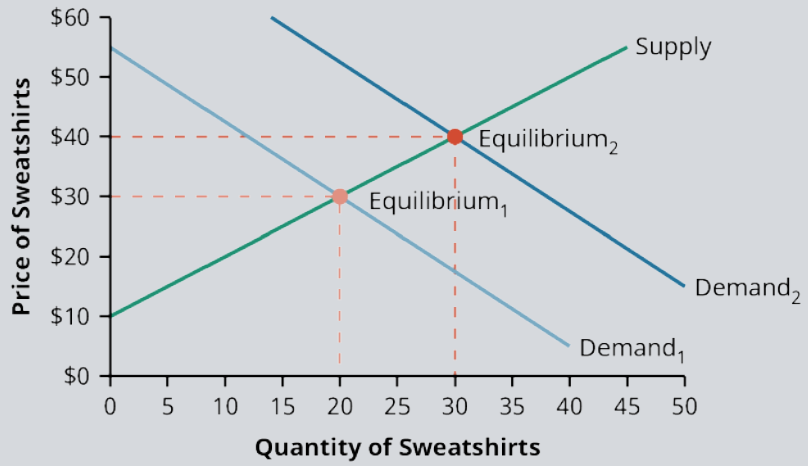


Figure 3.9 Graph Showing Increase in Sweatshirt Supply

A change in any of the factors that are assumed to be held constant under the ceteris paribus assumption could have caused the demand curve to shift to the right. Perhaps a rise in consumers' incomes led them to purchase more clothing, including sweatshirts. Or an unseasonably cool fall could result in more people purchasing sweatshirts. If a popular TV personality indicates that their favorite weekend wardrobe consists of jeans and a sweatshirt and the tabloids run pictures of the celebrity wearing sweatshirts, the tastes and preferences of consumers may change. Another possibility is that the price of sweaters may have risen, causing people to substitute sweatshirts for sweaters.

3.2 Macroeconomics

Learning Outcomes

By the end of this section, you will be able to:

- Define inflation and describe historical trends in inflation.
- Define unemployment and describe how unemployment is measured.
- Define gross domestic product and describe historical trends in gross domestic product.

Inflation

Macroeconomics looks at the economy as a whole. It focuses on broad issues such as inflation, unemployment, and growth of production. When the managers of an automotive company look at the market for steel and how the price of steel impacts the company's production costs, they are looking at a microeconomic issue. Rather than being concerned about individual markets or products, macroeconomics is the branch of economic theory that considers the overall environment in which businesses operate.

Perhaps you have heard your parents talk about how much they paid for their first automobile. Or maybe you have heard your grandparents reminisce about spending a quarter to purchase a Coke. These conversations often turn to a discussion of how a dollar just doesn't go as far as it used to. The reason for this is **inflation**, or a general increase in price levels.

It is not that just the price of an automobile has increased or that the price of a Coke has increased. Over time, the prices of many other things, from the salt on your table to college tuition, have increased. Also, you were paid a higher hourly wage at your first job than your parents and grandparents were paid; the price of labor has risen.

When economists talk about inflation, they are discussing this phenomenon of the price of many things rising. Instead of tracking the price of one particular item, they consider the price of purchasing a basket of goods.

Inflation means that the purchasing power of currency falls. Whenever there is inflation, a $100 bill will not purchase as much as it did before.

LINK TO LEARNING

CPI Inflation Calculator

According to the US Bureau of Labor Statistics, $100 in January 1913 had the same purchasing power as $1,722.45 in January 2000 and $2,699.20 in January 2021. If you would like to compare the purchasing power of a dollar amount in two different time periods, you can use the CPI Inflation Calculator (https://openstax.org/r/cpi-inflation-calculator). You can enter a current dollar amount and calculate its value in an earlier period. Alternatively, you can calculate the current value of dollar amounts from years ago.

How Is Inflation Measured

Each month, the US Bureau of Labor Statistics (BLS) collects price data and publishes measures of inflation. The measure most commonly cited is the **consumer price index (CPI)**. The CPI is based on the cost of buying a fixed basket of goods and services comprising items a typical urban family of four might purchase. The BLS divides these purchases into eight major categories: food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services.

Sometimes you will hear a **core inflation index** being quoted. This index is calculated by excluding volatile economic variables, such as energy and food prices, from the CPI measure. Energy and food prices can jump around from month to month because of weather or other short-lived events. A drought can cause food prices to spike; a temporary rise in gasoline prices can occur as a hurricane approaches the coastline. These types of shocks are transitory in nature and do not represent underlying economic conditions.

While the CPI and the core inflation index are based on the prices that households pay, the **producer price index (PPI)** is based on prices that producers of goods and services pay for their supplies and raw materials. The PPI captures price changes that occur prior to the retail level. Because it indicates rising costs to producers, increases in the PPI can foreshadow increases in the CPI.

Both the CPI and the PPI are calculated by the BLS. The Bureau of Economic Analysis (BEA) also calculates a measure of inflation known as the **GDP deflator**. The calculation of the GDP, or gross domestic product, deflator follows a different approach than that used to calculate the CPI and the PPI. Instead of using a fixed basket of items and measuring the price change of that fixed basket, the GDP deflator includes all of the components of the gross domestic product. Prices are taken from a base year and used to calculate what the GDP would have been in a given year if prices were identical to those in the base year.

LINK TO LEARNING

The Billion Prices Project

Although the concept of inflation as a rise in the general price level is simple, measuring and documenting this increase is complicated. The CPI is designed to measure the cost of a market basket of goods that a typical urban family purchases. But what the typical family purchases over time changes. As an item in the basket becomes more expensive, families tend to substitute and replace the item with similar goods. Also, the quality of goods changes over time. Think of how purchases in a typical household have changed over the last two decades. Today, few families purchase answering machines, CDs, DVDs, or alarm clocks; smartphones have replaced many such products. Smartphones are even used to make purchases for

delivery from an online retailer. Although keeping the items in the market basket constant allows economists to focus on price changes, the market basket quickly becomes outdated and does not reflect a typical family's purchases.

In an attempt to provide new measures of inflation that better represent the changing basket of goods purchased and the purchasing habits of families, Alberto Cavallo and Roberto Rigobon founded the Billion Prices Project. Through this academic initiative at the Massachusetts Institute of Technology, prices are collected daily from online retailers around the world. The Billion Prices Project website (https://openstax.org/r/billion-prices-project) provides measures for inflation using this data as well as research papers regarding macroeconomic research.

Historical Trends in the Inflation Rate

Inflation, as measured by the CPI for 1947–2020, is displayed in Figure 3.10. The graph shows that for the past 70 years, inflation has been the norm. Although inflation dipped into negative territory several times, each period of negative inflation was short-lived. Also, you will notice that during the 1970s and early 1980s, inflation was abnormally high; the inflation rate remained above 5% for approximately a decade. This was also the only time period in which the US economy experienced double-digit inflation. By the mid-1980s, inflation had fallen below 5%, and it has remained below 5% for much of the past 35 years.

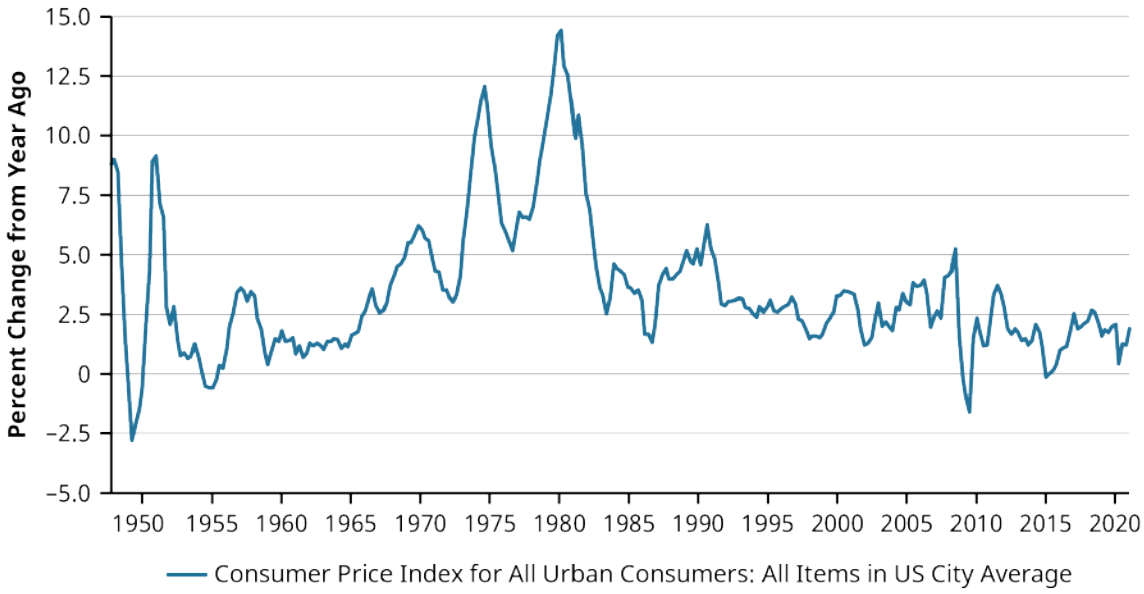


Figure 3.10 Rate of Inflation Measured by the Consumer Price Index, 1947–2020[2]

The Consumer Price Index for All Urban Consumers: All Items (CPIAUCSL) is a measure of the average monthly change in the price for goods and services paid by urban consumers between any two time periods. It can also represent the buying habits of urban consumers. This particular index includes roughly 88% of the total population, accounting for wage earners, clerical workers, technical workers, self-employed workers, short-term workers, unemployed workers, retirees, and those not in the labor force.

The CPIs are based on prices for food, clothing, shelter, fuels, transportation fares, service fees (e.g., water and sewer service), and sales taxes. Prices are collected monthly from about 4,000 housing units and approximately 26,000 retail establishments across 87 urban areas. To calculate the index, price changes are averaged with weights representing their importance in the spending of a particular group. The index measures price changes (as a percent change) from a predetermined reference date. In addition to the original unadjusted index distributed, the BLS also releases a seasonally adjusted index. The unadjusted series reflects all factors that may influence a change in prices. However, it can be very useful to look at the

seasonally adjusted CPI, which removes the effects of seasonal changes such as weather, the school year, production cycles, and holidays.

The CPI can be used to recognize periods of inflation and deflation. Significant increases in the CPI within a short time frame might indicate a period of inflation, and significant decreases in CPI within a short time frame might indicate a period of deflation. However, because the CPI includes volatile food and oil prices, it might not be a reliable measure of inflationary and deflationary periods. For more accurate detection, the core CPI, or CPILFESL (https://openstax.org/r/fred-stlouisfed-org)—the CPIAUCSL minus food and energy—is often used. When using the CPI, please note that it is not applicable to all consumers and should not be used to determine relative living costs. Additionally, the CPI is a statistical measure vulnerable to sampling error because it is based on a sample of prices and not the complete average.

Unemployment

Unemployment is a measure of people who are not working. For the individuals who find themselves without a job, unemployment causes financial hardship. From a macroeconomics standpoint, unemployment means that society has labor resources that are not being fully utilized.

Not everyone who is without a job is **unemployed**. To be considered unemployed, a person must be (1) jobless, (2) actively seeking work, and (3) able to take a job. The official unemployment rate is the percentage of the labor force that is unemployed. It is calculated as

$$\begin{aligned}\text{Unemployment Rate} &= \frac{\text{Number Unemployed}}{\text{Labor Force}} \\ &= \frac{\text{Number Unemployed}}{\text{Number Employed} + \text{Number Unemployed}}\end{aligned}$$

Note that the unemployment rate is calculated as the percentage of the labor force that is unemployed, rather than the percent of the total population. Only those who are currently employed or who meet the definition of being unemployed are counted in the labor force. In other words, someone who is retired or a stay-at-home parent and is not seeking employment is not counted as unemployed and is not part of the labor force.

The Bureau of Labor Statistics (BLS) of the US Department of Labor reports the unemployment rate each month. These figures are attained through an interview process of 60,000 households conducted by the Census Bureau. (See Figure 3.11 for a graphic representation of historical trends in unemployment from 1950 to early 2021.)

2 Data from US Bureau of Labor Statistics. "Consumer Price Index for All Urban Consumers: All Items in US City Average (CPIAUCSL)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/CPIAUCSL

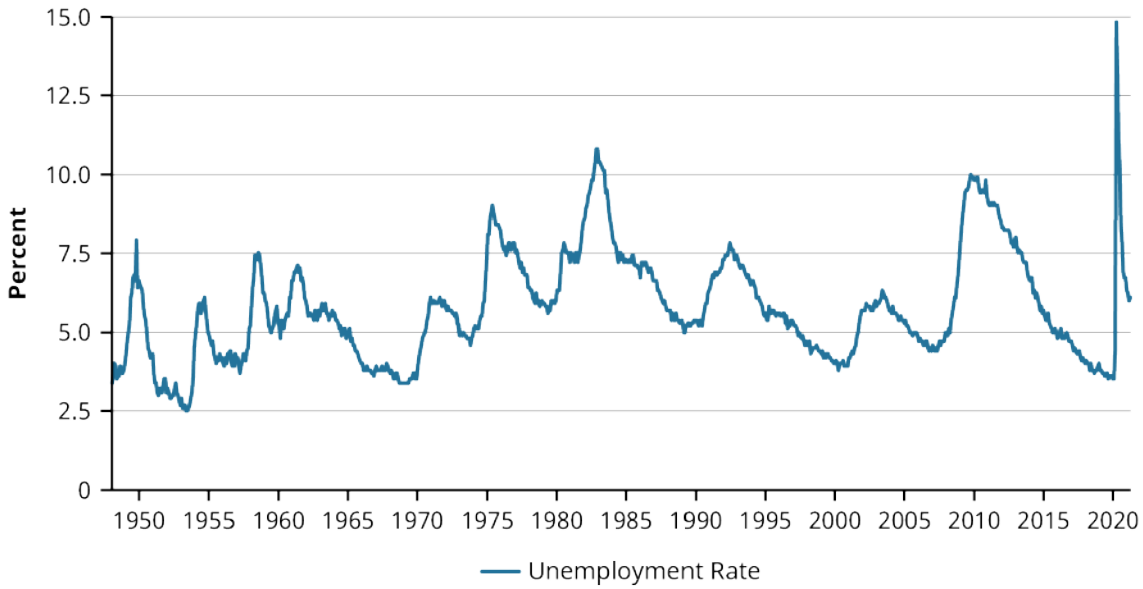


Figure 3.11 Historical Trends in the Unemployment Rate by Year, 1950–2021[3] The unemployment rate represents the number of unemployed as a percentage of the labor force. Labor force data are restricted to people 16 years of age and older who currently reside in one of the 50 US states or the District of Columbia, who do not reside in institutions (e.g., penal or mental facilities, homes for the aged), and who are not on active duty in the US Armed Forces.

LINK TO LEARNING

Unemployment around the World

The World Bank publishes unemployment figures for countries around the world. In 2020, the World Bank figures showed that Cambodia had the lowest unemployment rate at 0.3% and that South Africa has the highest unemployment rate at 28.7%. To compare the rates in various countries, visit the unemployment statistics section (https://openstax.org/r/data-world-bank) of the World Bank website.

Gross Domestic Product

Gross domestic product (GDP) is a measure of the size of an economy. A country's GDP is the dollar value of all of the final goods and service produced within that country during a year. GDP measures the value of all of the automobiles produced, apples grown, heart surgeries performed, students educated, and all other new goods and services produced in a current year.

How Is GDP Measured?

GDP can be measured by adding up all of the items that are purchased in the economy. Purchases are divided into four broad expenditure categories: consumption spending, investment, government spending, and net exports. Consumption spending measures the items that households purchase, such as movie theater tickets, cups of coffee, and clothing. Consumption expenditure accounts for about two-thirds of the US GDP.[4]

Investment spending refers primarily to purchases by businesses. It is important to note that in this context, the term *investment* does not refer to purchasing stocks and bonds or trading financial securities. Instead, the term refers to purchasing new capital goods, such as buildings, machinery, and equipment, that will be used to produce other goods. Residential housing is also included in the investment-spending category, as are inventories. Products that producers make but do not sell this year (and so are not included in consumption

3 Data from US Bureau of Labor Statistics. "Unemployment Rate (UNRATE)." FRED. Federal Reserve Bank of St. Louis, accessed July 6, 2021. https://fred.stlouisfed.org/series/UNRATE
4 US Bureau of Economic Analysis. "GDP and the Economy: Advance Estimates for the First Quarter of 2020." Survey of Current Business 100, no. 5 (May 2020): 1–11. https://apps.bea.gov/scb/2020/05-may/0520-gdp-economy.htm

spending) are included in this year's GDP calculation through the investment component. The investment spending category is roughly 15% to 18% of the US GDP.

Government spending includes spending by federal, state, and local governments. Federal spending would include purchases of items such as a new military fighter jet and services such as the work of economists at the BLS. State governments purchase products such as concrete for a new highway and services such as the work of state troopers. Local governments purchase a variety of goods and services, such as books for the city library, playground equipment for the community park, and the services of public school teachers. In the United States, government spending accounts for nearly 20% of the GDP.

Some items that are produced in the United States are sold to individuals, businesses, or government entities outside of the United States. For example, a bottle of Tabasco sauce produced in Louisiana may be sold to a restaurant in Vietnam, or tires produced in Ohio may be sold to an auto producer in Mexico. Because these items represent production in the United States, these exports should be included in the US GDP. Conversely, some of the items that US consumers, businesses, and government entities purchase are not produced in the United States. A family may purchase maple syrup from Canada or a Samsung television that was produced in South Korea. A business may purchase a Toyota vehicle that was produced in Japan. These items are imported from other countries and represent production in the country of origin rather than the United States. Because we already counted these items when adding consumption, investment, and government spending, we must subtract the value of imports in our GDP calculation. Net exports equals exports from the United States minus imports from other countries. Including net exports in the GDP calculation adjusts for this international trade.

Historical Trends in GDP

US GDP over the past 70 years is represented by the blue line in Figure 3.12. At the turn of the millennium, the yearly GDP of the United States was approximately $10 trillion. By 2020, the GDP exceeded $21 trillion, indicating that the US economy had more than doubled in size in the first 20 years of the 21st century.[5]

Because GDP is the market value of all goods and services produced, it can increase either because more goods and services are being produced or because the market value of these goods and services is rising. If 100 cars were produced and sold for $30,000 each, that would contribute $3,000,000 to the GDP. If, instead, the cars were sold for $33,000 each, the same 100-car production would contribute $3,300,000 to the GDP. The $300,000 increase in GDP would be due simply to higher prices, or inflation.

Multiplying the current price of goods by the number of goods produced results in what is known as nominal GDP. In order to determine what the actual increase in production is, nominal GDP must be adjusted for inflation. This adjustment results in a calculation known as real GDP. To calculate real GDP, the amounts of goods and services produced are multiplied by the price levels in a base year. Thus, real GDP will rise only if more goods and services are being produced. The red line in Figure 3.12 represents the real GDP. Although its growth has not been as large as that of nominal GDP, real GDP has also grown significantly over the past 70 years.

5 "GDP (Current US$): United States." The World Bank. 2020. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=US

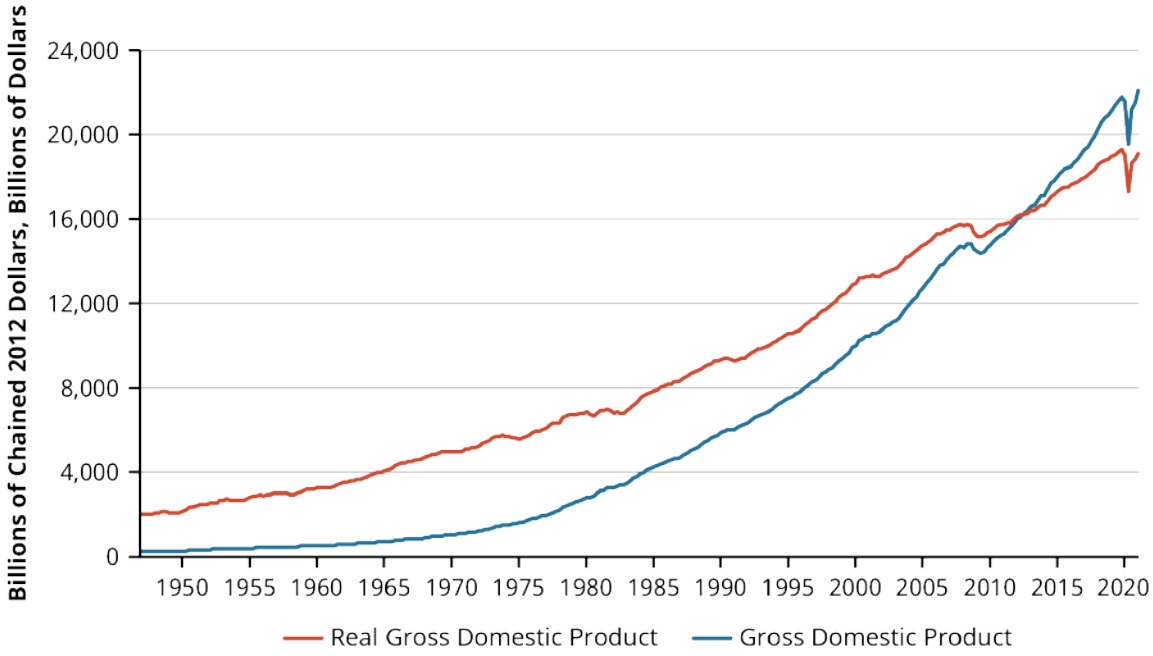


Figure 3.12 Growth of the US GDP[6] Gross domestic product (GDP), the featured measure of US output, is the market value of the goods and services produced by labor and property located in the United States. Real gross domestic product is the inflation-adjusted value of the goods and services produced by labor and property located in the United States. For more information, see the *NIPA Handbook: Concepts and Methods of the US National Income and Product Accounts* and the US Bureau of Economic Analysis.

LINK TO LEARNING

US Bureau of Economic Analysis

The US Bureau of Economic Analysis, an agency of the Department of Commerce, produces economic accounting statistics, including GDP. The agency's economists and statisticians also produce measures of state and local economies, foreign trade statistics, and industry data. To learn more about the US Bureau of Economic Analysis and how it measures economic activity, visit the BEA website (https://openstax.org/r/bea-website). You can find data regarding the GDP and economic growth in your state, as well as international trade and industry statistics.

3.3 Business Cycles and Economic Activity

Learning Outcomes

By the end of this section, you will be able to:

- Outline the stages of the business cycle.
- Identify recessionary and expansionary periods.

What Is the Business Cycle?

Although the US economy has grown significantly over time, as seen in Figure 3.12, the growth has not occurred at a constant, consistent pace. At times, the economy has experienced faster-than-average growth, and occasionally the economy has experienced negative growth.

The percentage change in real GDP for each quarter is shown in Figure 3.13. For any quarter in which real GDP is growing, the percentage change will be positive. When the growth rate of real GDP is negative, the economy

6 Data from US Bureau of Economic Analysis. "Gross Domestic Product (GDP)." FRED. Federal Reserve Bank of St. Louis, accessed July 27, 2021. https://fred.stlouisfed.org/series/GDP

is shrinking.

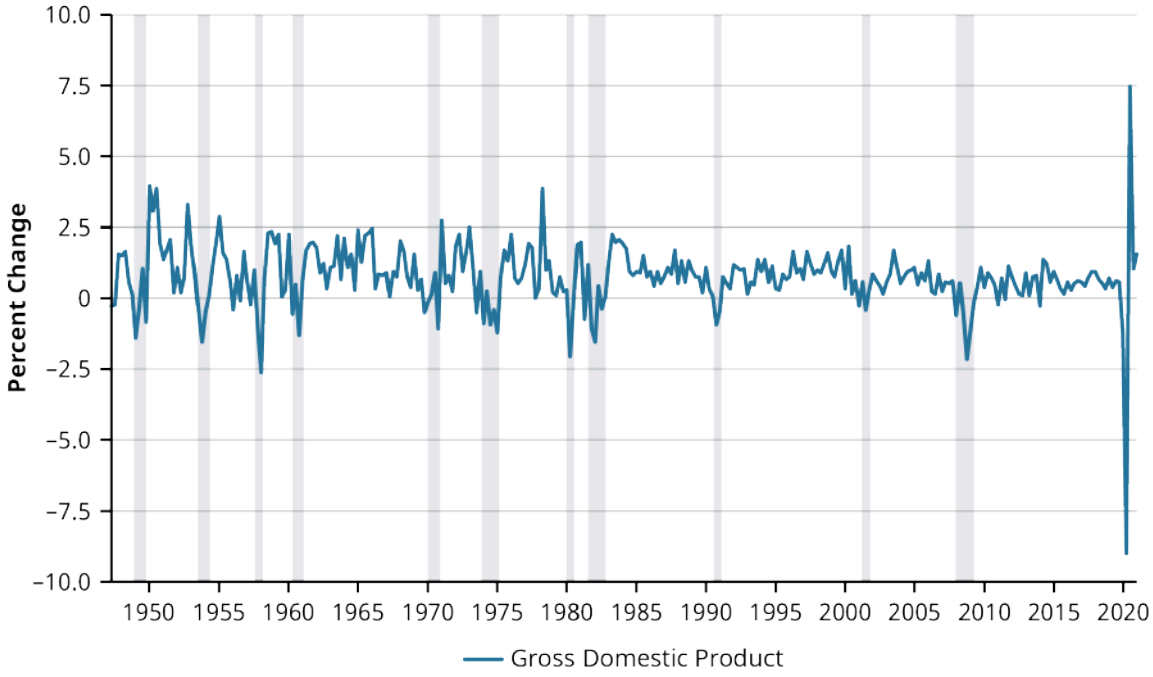


Figure 3.13 Quarterly Percentage Change in US Real GDP with Shading Representing Recessions[7]

Figure 3.14 is an illustration of the growth of GDP over time. There has been a definitive long-term upward trend in GDP, but it has not been in a straight line. Instead, the economy has expanded much like the curve; periods of quick growth are followed by slower or even negative growth. These alternating growth periods are known as the **business cycle**.

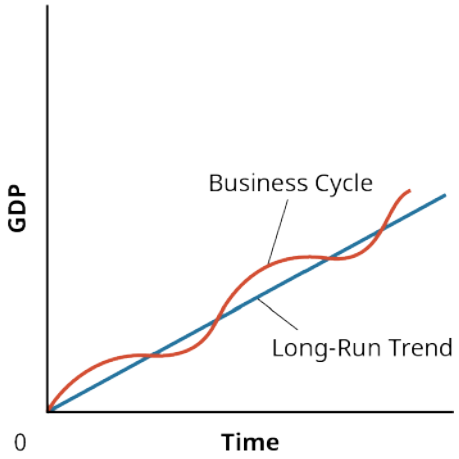


Figure 3.14 Growth of GDP and the Business Cycle

Stages of the Business Cycle

The business cycle consists of a period of economic expansion followed by a period of economic contraction. During the period of economic **expansion**, GDP rises. Employment expands as businesses produce more; conversely, unemployment falls. Other measures of economic growth may include increased new business starts and new home construction. The economy is said to be "heating up." As the expansion continues, inflation often becomes a concern.

7 Data from US Bureau of Economic Analysis. "Gross Domestic Product (GDP)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/GDP

Fast-paced economic expansion is not sustainable. Eventually, growth slows and unemployment rises. The economy has moved from expansion to contraction when this occurs. The point at which the business cycle turns from expansion to contraction is known as the *peak*. The point at which the contraction ends and the economy begins to expand again is known as the *trough*. The length of one business cycle is measured by the time from one trough to the trough of the next cycle, as shown in Figure 3.15.

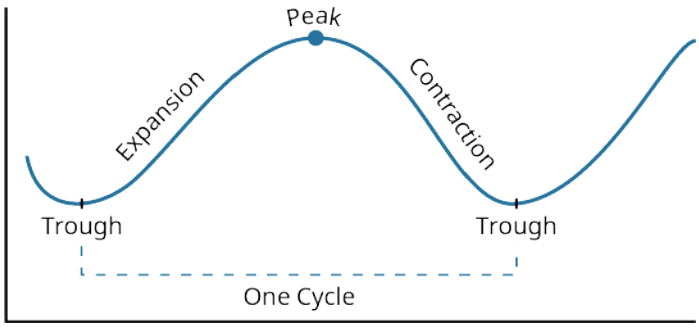


Figure 3.15 Stages of the Business Cycle

Often, the contraction is referred to as a **recession**. A private think tank, the National Bureau of Economic Research (NBER), tracks the business cycle in the United States. The NBER is the entity that officially declares recessions in the United States. Historically, a recession was defined as two consecutive quarters of declining GDP. Today, the NBER defines a recession in a broader, less precise manner; it will declare a recession when there is a significant decline in economic activity that is spread across the economy and lasts for at least a few months.[8] Measures of real income, employment, industrial production, and wholesale and retail sales are considered in addition to real GDP.

LINK TO LEARNING

National Bureau of Economic Research

The National Bureau of Economic Research was founded in 1920 to create measures of economic activity that could be used in public policy discussions. It is a private, nonpartisan organization that conducts research that is followed by businesses and the public sector. You can find out more about the NBER and view many of its research papers by visiting its website (https://openstax.org/r/nber-website).

Historical Trends

The NBER has identified business cycle peaks and troughs in data going back to the mid-19th century. Figure 3.16 lists each of these cycles, denoting the months of peaks and troughs. We see a repetition of the economic behavior—an expansion, a peak, a recession, and a trough, followed by yet another expansion, peak, recession, and trough. The cycles are events that repeatedly occur in the same order.

8 National Bureau of Economic Research. "Business Cycle Dating Committee Announcements." July 19, 2021. https://www.nber.org/research/business-cycle-dating/business-cycle-dating-committee-announcements

Business Cycle Reference Dates				Contraction	Expansion	
Peak Month	Peak Year	Trough Month	Trough Year	Peak to Trough (Months)	Previous Trough to This Peak (Months)	Trough from Previous Trough (Months)
-	-	December	1854	-	-	-
June	1857	December	1858	18	30	48
October	1860	June	1861	8	22	30
April	1865	December	1867	32	46	78
June	1869	December	1870	18	18	36
October	1873	March	1879	65	34	99
March	1882	May	1885	38	36	74
March	1887	April	1888	13	22	35
July	1890	May	1891	10	27	37
January	1893	June	1894	17	20	37
December	1895	June	1897	18	18	36
June	1899	December	1900	18	24	42
September	1902	August	1904	23	21	44
May	1907	June	1908	13	33	46
January	1910	January	1912	24	19	43
January	1913	December	1914	23	12	35
August	1918	March	1919	7	44	51
January	1920	July	1921	18	10	28
May	1923	July	1924	14	22	36
October	1926	November	1927	13	27	40
August	1929	March	1933	43	21	64
May	1937	June	1938	13	50	63
February	1945	October	1945	8	80	88
November	1948	October	1949	11	37	48
July	1953	May	1954	10	45	55
August	1957	April	1958	8	39	47
April	1960	February	1961	10	24	34
December	1969	November	1970	11	106	117
November	1973	March	1975	16	36	52
January	1980	July	1980	6	58	64
July	1981	November	1982	16	12	28
July	1990	March	1991	8	92	100
March	2001	November	2001	8	120	128
December	2007	June	2009	18	73	91
February	2020	-	-	-	128	-

Figure 3.16 Peak and Trough Months of Historical Business Cycles (source: National Bureau of Economic Research)

However, the cycles are not identical; the lengths of the cycles vary greatly. On average, the contractions have lasted about 17 months and expansions have lasted about 41 months. The typical business cycle has been about 4.5 years long.

At the time of this writing, the United States is in an economic recession.[9] The previous trough was in June 2009. From the summer of 2009 through February 2020, the US economy was in the expansionary phase of the business cycle. This expansion peaked in February 2020, when the economy fell into a contractionary period associated with the COVID-19 pandemic. This 128-month expansion is the longest expansion in US history. Only two other expansions have lasted for over 100 months: the 120-month expansion that ran through the 1990s and the 106-month expansion that ran during the 1960s. The longest recessionary period on record is the 65-month recession that occurred during the 1870s. The recession that began in 1929 was the second-longest recession in US history. At 43 months long, this recession that ended in 1933 was so severe that it has been called the Great Depression.[10]

9 National Bureau of Economic Research. "Business Cycle Dating Committee Announcements." July 19, 2021. https://www.nber.org/research/business-cycle-dating/business-cycle-dating-committee-announcements

3.4 Interest Rates

Learning Outcomes

By the end of this section, you will be able to:

- Explain the relationship between the nominal interest rate and inflation.
- Calculate the real rate of interest.
- Explain the relationship between interest rates and risk.

Market for Loanable Funds

An interest rate is the rental price of money. The concepts of supply, demand, and equilibrium apply in this market just as they do in other markets. This market is referred to as the *market for loanable funds*.

In the market for loanable funds, the suppliers of funds are economic entities that currently have a surplus in their budget. In other words, they have more income than they currently want to spend; they would like to save some of their money and spend it in future time periods. Instead of just putting these savings in a box on a shelf for safekeeping until they want to spend it, they can let someone else borrow that money. In essence, they are renting that money to someone else, who pays a rental price called the *interest rate*.

The suppliers of loanable funds, also known as lenders, are represented by the upward-sloping curve in Figure 3.17. A higher interest rate will encourage these lenders to supply a larger quantity of loanable funds.

The demanders of funds in the loanable funds market are economic entities that currently have a deficit in their budget. They want to spend more than they currently have in income. For example, a grocery store chain that wants to expand into new cities and build new grocery stores will need to spend money on land and buildings. The cost of buying the land and buildings exceeds the chain's current income. In the long run, its business expansion will be profitable, and it can pay back the money that it has borrowed.

The downward-sloping curve in Figure 3.17 represents the demanders of loanable funds, also known as borrowers. Higher interest rates will be associated with lower quantities demanded of loanable funds. At lower interest rates, more borrowers will be interested in borrowing larger quantities of funds because the price of renting those funds will be cheaper.

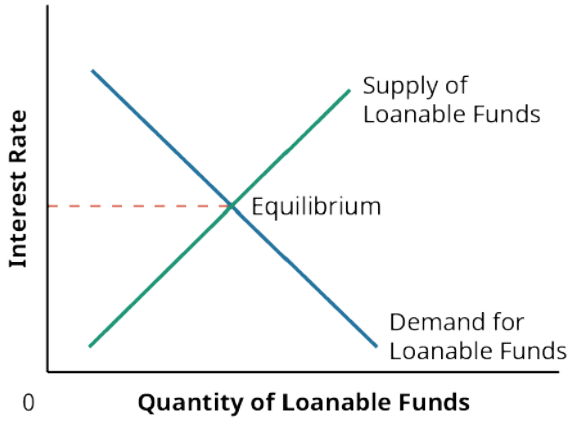


Figure 3.17 Equilibrium in the Loanable Funds Market

The equilibrium interest rate is determined by the intersection of the demand and supply curves. At that interest rate, the quantity supplied of loanable funds exactly equals the quantity demanded of loanable funds. There is no shortage of loanable funds, nor is there any surplus.

10 National Bureau of Economic Research. "US Business Cycle Expansions and Contractions." Last updated July 19, 2021. https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions

Nominal Interest Rates

The **nominal interest rate** is the stated, or quoted, interest rate. If you want to borrow money to purchase a car and the bank quotes an interest rate of 5.5% on a four-year auto loan, the 5.5% is the nominal interest rate.

Or suppose you have $1,000 you would like to place in a savings account. If the bank quotes an interest rate of 6% on its savings accounts, the 6% is a nominal interest rate. This means that if you place your $1,000 in a savings account for one year, you will receive $60 in interest for the year. At the end of the year, you will have a balance of $1,060 in your savings account—your original $1,000 plus the $60 in interest that you earned.

Real Interest Rates

Suppose you are deciding between saving your $1,000 for the year and using it to purchase a flat-screen TV. The advantage of spending the money on the TV today is that you can enjoy watching programs on it over the next year. The advantage of saving the money is that you will earn 6% nominal interest; in one year, you will have $1,060 to spend.

If there is a 2% inflation rate, you would expect the TV that costs $1,000 today to cost $1,020 in one year. If you save the $1,000, you will have $1,060 in one year. You could purchase the TV for $1,020 and have $40 left over; then you could use the $40 to order pizza to celebrate the first big game you are watching on the new TV.

Your choice comes down to enjoying a TV today or enjoying a TV and $40 in one year. The $40 is your reward for delaying consumption. It is your real return for saving money. The remaining $20 of the interest you earned just covered the rate of inflation. This reward for delaying consumption is known as the **real interest rate**. The real interest rate is calculated as

$$\text{Real Interest Rate} = \text{Nominal Interest Rate} - \text{Inflation Rate}$$

The real interest rate, rather than the nominal interest rate, is the true determinant of the cost of borrowing and the reward for lending. For example, if a business had to pay 15% nominal interest rate in 1980, when the inflation rate was 12%, the real cost of borrowing for the firm was 3%. The company would have had to pay $15 in interest each year for each $100 it borrowed, but $12 of that was simply compensating the lender for inflation. In real terms, the business was only paying $3 to borrow $100.

In recent years, a business may have paid 6% interest to borrow money. This nominal rate is half of what it was in 1980. However, inflation has been much lower. If inflation is 1% and the company pays 6% nominal interest, that results in a 5% real interest rate. For every $100 the company borrows, it pays $6 in interest; $1 is compensating for inflation, and the remaining $5 is the real cost of borrowing.

Risk Premiums

As we have discussed interest rates, we have talked about how the interest rate is determined by the demand and supply of loanable funds. This tells us the underlying interest rate in the economy. You will notice, however, if you look at the financial news, that there is more than one interest rate in the economy at any given time.

Figure 3.18 shows the interest rates that three different types of borrowers have paid over the past 20 years. The bottom line shows the interest rate that the US government paid to borrow money for a three-month period. This rate is often referred to as the risk-free rate of interest. While theoretically it would be possible for the US government to default and not pay back those people who have loaned money to it, the chances of that are occurring are extremely low.

When someone borrows money, they enter into a contract to repay the money and the interest owed. However, sometimes, certain circumstances arise such that the lender has a difficult time collecting the money, even though the lender has the legal right to the money. For example, if a company goes bankrupt after borrowing the money and before paying back the loan, the lender may not be able to collect what is due. The chance that the lender may not be able to collect all of the money due at the time it is due is considered

credit risk. Lenders want to be rewarded for taking on this risk, so they charge a premium to borrowers who are higher risk.

Companies are more likely to go bankrupt and not be able to pay their bills on time than is the US government. So, corporations have to pay a higher interest rate than the US government. If a lender can earn 1% lending to the US government, the lender will only be willing to lend to the riskier corporation if they can earn more than 1%. In Figure 3.18, the interest rates paid by very creditworthy companies is shown. The prime rate is the interest rate that banks charge their very best customers—large companies that are financially very strong and have a very low risk of default.

It is generally riskier for a lender to make a loan to an individual than to a corporation. Individuals are more likely to become ill, lose their job, or experience some other financial setback that makes it difficult for them to repay their loans. In Figure 3.18, the interest rate on credit card loans is much higher than the interest rate charged to corporate borrowers. That is because credit card loans are a high risk to the lender. Unlike other loans made to an individual, such as a car loan, the credit card company has no collateral if a consumer cannot pay back the loan. With car loans, if the borrower fails to repay the borrowed money, the lender can repossess the automobile and sell it to recoup some of the money it is owed. If you use a credit card to buy groceries and do not repay the loan, the credit card company cannot repossess the groceries that you purchased. Therefore, credit card loans have notoriously high interest rates to compensate the lender for the high risk.

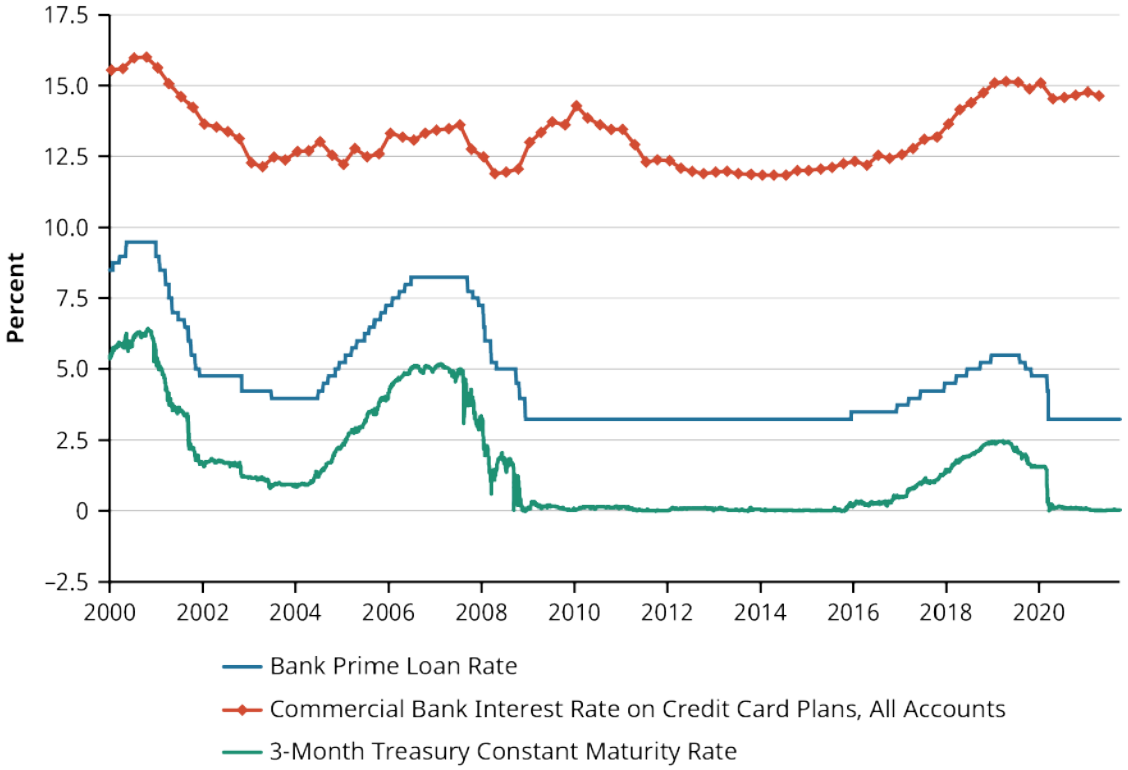


Figure 3.18 Interest Rate on US Treasury Bills and Credit Cards[11] This graph shows the rates posted by a majority of top 25 (by assets in domestic offices) insured US-chartered commercial banks. The prime rate is one of several base rates used by banks to price short-term business loans. For further information regarding Treasury constant maturity data, please refer to the Board of Governors and the Treasury.

11 Data from Board of Governors of the Federal Reserve System (US). "Bank Prime Loan Rate (DPRIME)." FRED. Federal Reserve Bank of St. Louis, accessed July 8, 2021. https://fred.stlouisfed.org/series/DPRIME; Board of Governors of the Federal Reserve System (US). "3-Month Treasury Constant Maturity Rate (DGS3MO)." FRED. Federal Reserve Bank of St. Louis, accessed July 8, 2021. https://fred.stlouisfed.org/series/DGS3MO; Board of Governors of the Federal Reserve System (US). "Commercial Bank Interest Rate on Credit Card Plans, All Accounts (TERMCBCCALLNS)." FRED. Federal Reserve Bank of St. Louis, accessed July 8, 2021. https://fred.stlouisfed.org/series/TERMCBCCALLNS

3.5 Foreign Exchange Rates

Learning Outcomes

By the end of this section, you will be able to:

- Explain what it means for a currency to appreciate or depreciate.
- Define spot exchange rate.
- Explain the risks involved in translation exposure.

Spot Exchange Rate

An exchange rate is simply the price of a currency. If you live in the United States and are going on a trip to Mexico, you will need pesos to pay for your food, hotel, and other items. You will need to purchase pesos. Suppose that you go to your bank to purchase pesos. Suppose the bank tells you that it will cost $0.0625 to purchase one Mexican peso. If you want to take 10,000 Mexican pesos with you on your trip, it will cost you $625 to purchase the desired pesos.

In this example, the price of one peso is six and one-quarter cents. This price will often be written in the form of

$$\text{MXN}\,1 = \text{USD}\,0.0625$$

MXN is an abbreviation for the Mexican peso, and USD is an abbreviation for the US dollar. This price is known as a currency exchange rate, or the rate at which you can exchange one currency for another currency. Because this is the price you would pay to purchase Mexican pesos right now, it is known as the **spot exchange rate**.

If you know the price of Mexican pesos in dollars, you can easily find the price of US dollars in Mexican pesos. Simply divide both sides of the equation by 0.0625, or the price of a peso:

$$\begin{gathered}\text{MXN}\,1 = \text{USD}\,0.0625 \\ \frac{\text{MXN}\,1}{0.0625} = \frac{\text{USD}\,0.0625}{0.0625} \\ \text{MXN}\,16 = \text{USD}\,1\end{gathered}$$

If you have Mexican pesos and you want to exchange them for dollars, you will be using the pesos to buy dollars. Each US dollar will cost you MXN 16.

LINK TO LEARNING

Currency Conversion

Do you want to know how many British pounds your $100 would buy? Or would you like to see how much that 10,000-yen-per-night hotel room will cost you in your home currency? You can enter the amount of one currency in the MSN Money currency converter (https://openstax.org/r/currencyconverter) to see what the equivalent amount is in another currency.

Currency Appreciation

Just as the price of gasoline changes, resulting in it costing more to purchase gasoline on some visits to the gas station than on other visits, the price of a currency also changes. Currency appreciation occurs when it costs more to purchase a currency than it did before.

If the next time you go to the bank to purchase pesos, the bank quotes an exchange rate of $\text{MXN}\,1 = \text{USD}\,0.0800$, it means that it now costs $0.0800 (up from $0.0625) to purchase a Mexican peso. Hence, the price of a peso has risen, or the peso has appreciated.

Currency prices are determined in the marketplace through the same types of supply-and-demand forces we discussed earlier in this chapter. What would cause the peso to appreciate? Either an increase in the demand for pesos or a decrease in the supply of pesos.

Currency Depreciation

Just as a currency can appreciate, it can depreciate. If the quote at the bank was $\text{MXN}\,1 = \text{USD}\,0.0500$, it would only cost $0.0500 to purchase a Mexican peso. When it costs fewer dollars to purchase a peso, the peso has depreciated. Either a decrease in demand for pesos or an increase in supply of pesos will cause the peso to depreciate.

Because an exchange rate is the price of one currency expressed in terms of another currency, if one of the currencies depreciates, the other currency must, by definition, appreciate. If it costs $0.0500 to purchase a Mexican peso, the price of a US dollar, in terms of a Mexican peso would be calculated as

$$\begin{gathered}\text{MXN}\,1 = \text{USD}\,0.0500 \\ \frac{\text{MXN}\,1}{0.0500} = \frac{\text{USD}\,0.0500}{0.0500} \\ \text{MXN}\,20 = \text{USD}\,1\end{gathered}$$

So, the price of one US dollar would be 20 Mexican pesos.

Exchange Rate Risk

Businesses that engage in international business face currency exchange rate risk. As exchange rates change, a business can be impacted in a number of ways. One of these risks, **transaction exposure**, is the risk that the value of a business's expected receipts or expenses will change as a result of a change in currency exchange rates. A pottery-making business that has sold merchandise to a company in the United States for $20,000, for example, will need to exchange the $20,000 for pesos to be able to pay its workers and other expenses in pesos. How many pesos it will receive for $20,000 will change depending on the exchange rate. If the exchange rate is $\text{MXN}\,16 = \text{USD}\,1$, the company will receive 320,000 pesos for the $20,000. If the exchange rate is $\text{MXN}\,20 = \text{USD}\,1$, the company will receive 400,000 pesos for the $20,000. Thus, as the peso depreciates (and the US dollar appreciates), the same number of dollars will provide more pesos. Conversely, as the peso appreciates (and the US dollar depreciates), the same number of dollars will provide fewer pesos.

Firms that hold assets in a foreign country also face **translation exposure**. When a company creates its financial statements, items are reported using one currency. As foreign exchange rates change, the value of how items are reported on these financial statements can change. This type of risk is an accounting risk.

Economic exposure is the risk that a change in exchange rates will impact a business's number of customers and sales. For example, tourists have the option of spending a week-long vacation at a resort in the United States or in Mexico. As the dollar appreciates, US citizens can exchange their dollars for more pesos, resulting in their purchasing power going further at a Mexican resort. Because an appreciating dollar also means a depreciating peso, it would mean that Mexicans who earn pesos will receive fewer dollars when they exchange their pesos. A Mexican who wants to stay at a $200-per-night hotel in Colorado will need more pesos to pay for the room when the peso depreciates. The depreciating peso will likely mean that more Mexicans will spend their vacation week in Mexico, and fewer will vacation in the United States.

Even businesses that do not view themselves as involved in international business can face economic exposure. The ski lodge in Colorado will find that its customers from Mexico decrease when the dollar appreciates. Likewise, when the dollar appreciates, some of the ski lodge's US-based customers may choose instead to visit a resort in Mexico, where their purchasing power is strong.

3.6 Sources and Characteristics of Economic Data

Learning Outcomes

By the end of this section, you will be able to:

- Interpret economic data.
- Compute the percent change for economic variables.

FRED: Federal Reserve Economic Data

One of the largest sources of economic data is the Federal Reserve Economic Data (FRED) database.[12] This database is maintained by the Federal Reserve Bank of St. Louis and contains more than 765,000 economic time series. These time series are compiled by the Federal Reserve and come from a number of sources, including the Bureau of Labor Statistics and the US Census.

LINK TO LEARNING

FRED

Data included in the FRED database is divided into these broad categories:

- Money, Banking, and Finance
- Population, Employment, and Labor Markets
- National Accounts
- Production and Business Activity
- Prices
- International Data
- US Regional Data
- Academic Data

Watch this FRED introduction video (https://openstax.org/r/what-is-fred) to learn more information about how to use FRED.

You can find statistics on employment, inflation, exchange rates, gross domestic product, interest rates, and many other economic variables in the FRED database. Although much of the data is about the US markets, macroeconomic data from other countries is also available. In addition to being viewable in graphical and text form on the FRED site, the data is easily downloaded into an Excel spreadsheet for analysis.

LINK TO LEARNING

Creating a Stacked Area Graph

Not only does FRED provide an excellent source for economic data, but it allows users to create custom graphs that can be used in presentations and reports. To learn more about how to create these graphs, read this article on using stacking (https://openstax.org/r/fred-gdp-stacking). This tutorial provides step-by-step instructions for creating a stacked area graph of real GDP and its separate components and a real GDP area graph showing the percent that each of these components contributes to the total value of real GDP.

12 Federal Reserve Bank of St. Louis. Economic Resources & Data. Accessed October 25, 2021. https://www.stlouisfed.org/

Levels versus Percentage Changes

The same information can be presented in graphs several different ways. The particular format you choose will depend on how you are using the data.

Figure 3.19 shows the real GDP of Japan for 2010–2020. This chart is created showing the level of real GDP. The steep drop in 2020 highlights the economic decline associated with the COVID-19 pandemic. Looking at the chart, it is easy to see that after 10 years of a general upward trend, Japan's GDP quickly fell to a level not seen in the previous decade as COVID-19 began spreading in early 2020.

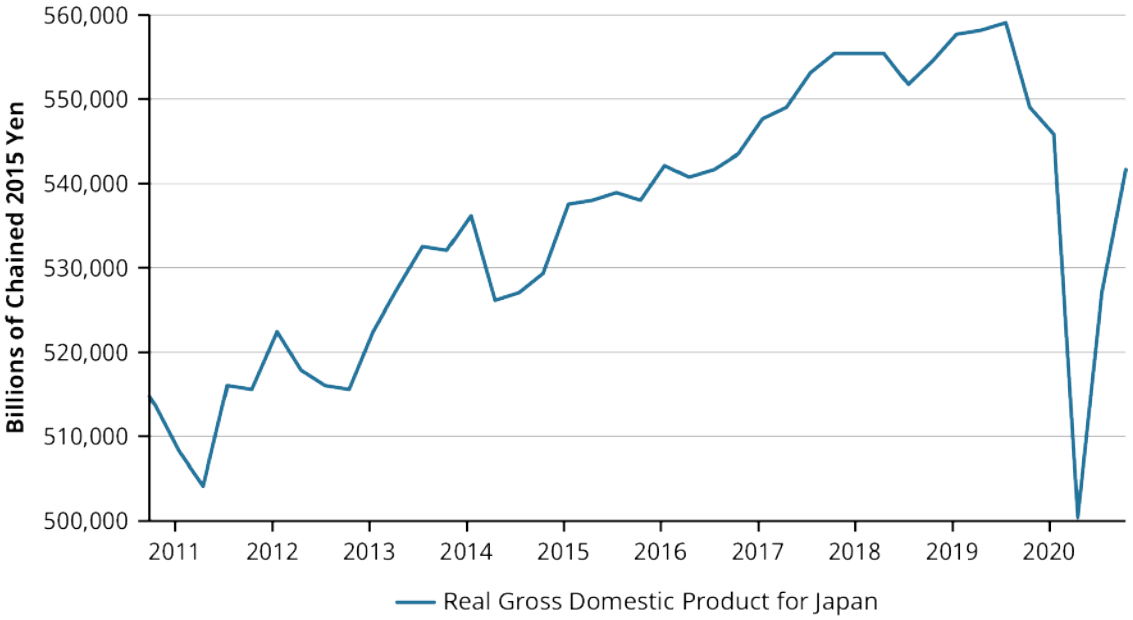


Figure 3.19 Real Gross Domestic Product for Japan, 2010–2020[13]

The vertical axis in Figure 3.19 is measured in yen. Over the time period shown, the real GDP ranged from 500 trillion yen to 560 trillion yen. The general trend (until COVID-19) was upward, indicating growth in the Japanese economy. However, the growth was not consistent from year to year.

Figure 3.20 also contains information about Japanese real GDP from 2010 to 2020. This chart measures the percent change for each quarter on the vertical axis. It is created using the same underlying data as Figure 3.19. Figure 3.20 demonstrates a way of highlighting the growth (or contraction) of an economy at a particular point in time.

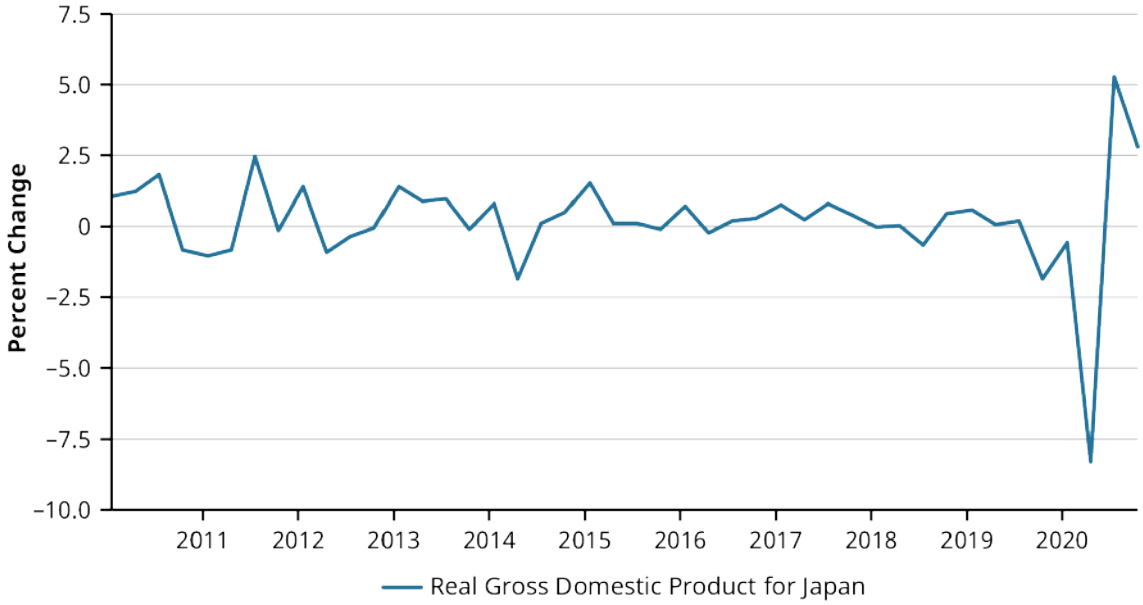


Figure 3.20 Percent Change for Gross Domestic Product for Japan, 2010–2020[14]

The formula to calculate the percentage change from one quarter to the next is

$$\text{Percentage Change} = \frac{\text{Quarter}_2 - \text{Quarter}_1}{\text{Quarter}_1}$$

In the first quarter of 2013, the real GDP for Japan was 522,594.2 billion yen. In the second quarter of 2013, the real GDP had risen to 527,277.0 billion yen. Thus, the percentage change in real GDP from quarter one to quarter two was

$$\text{Percentage Change} = \frac{\text{Quarter}_2 - \text{Quarter}_1}{\text{Quarter}_1} = \frac{527{,}277.0 - 522{,}594.2}{522{,}594.2} = 0.00896 = 0.896\%$$

As long as the percentage change for a quarter is positive, the real GDP in Figure 3.20 will rise; this indicates that the economy is growing. If the percentage change shown in Figure 3.20 is negative, then real GDP will fall; this indicates that the economy is contracting. Looking at the percentage change in Figure 3.20 is helpful for detecting when the economy is growing but the growth is slowing. If the percentage change is positive but lower than it was for the previous quarter, then GDP is growing, but the growth rate is slowing.

Indexes

An index is created to track the performance of a particular aspect of the economy or the financial markets. An index helps compare the level of a variable at one point in time relative to another point in time. Indexes are often used when movement over time is more important than the absolute level of the variable at any one point in time.

Earlier in this chapter, we looked at the rate of change in the CPI to measure the rate of inflation. In its raw form, the CPI is an index. Remember that the CPI is a measure of the cost of a market basket of goods. When the index is created, the total cost of the market basket, whether it is $300 or $950, is irrelevant. What economists are interested in is the magnitude of the difference in cost of the same market basket at a later date.

In order to focus on the change over time, a base year is identified. The cost of the market basket in the base

13 Data from JP, Cabinet Office. "Real Gross Domestic Product for Japan (JPNRGDPEXP)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/JPNRGDPEXP
14 Data from JP, Cabinet Office. "Real Gross Domestic Product for Japan (JPNRGDPEXP)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/JPNRGDPEXP

year is given an index level of 100. Let's assume that the market basket costs $300 in the base year. If the same basket of goods costs $330 the following year, then the index level the following year would be 110. The index level increases by 10% when the cost of the market basket increases by 10%. This makes it easy to compare different measures of inflation.

For example, suppose a market basket costs 40,000 yen in the first year and 42,000 yen in the second year. In the base year, the CPI in Japan would be set at 100; the following year, the index would rise to 105 (because of the 5% rise in the market basket cost). Comparing the levels of the index in Japan with the index in the United States allows you to compare inflation trends in the two countries.

Table 3.6 contains the CPI for the United States, Japan, and Switzerland for each decade since 1970. A base year of 1970 is used for all three countries, so the index level is 100 for all three countries in 1970. You can see that Japan has experienced virtually no inflation for the last several decades. If the index level remains the same from one year to the next, there is a zero rate of inflation. Negative rates of inflation, or deflation, would be associated with a falling index level.

Year	United States	Switzerland	Japan
1970	100.0	100.0	100.0
1980	212.3	162.3	232.5
1990	336.5	226.4	291.2
2000	443.5	278.2	322.1
2010	561.6	304.3	313.6
2020	666.6	302.3	331.8

Table 3.6 CPI Levels for the United States, Switzerland, and Japan[15]

Using an index level helps us compare the impact that inflation has had on the cost of living in the three countries. Prices were rising rapidly in Japan in the 1970s, outpacing price increases in both the United States and Switzerland. By the mid-1980s, however, price increases in Japan tapered off. Although prices in Switzerland rose much more slowly in the 1970s, the price level continued to rise over the next couple of decades. Even though the price increases have followed different patterns in Switzerland and Japan, the overall price level today is about three times what it was in 1970 in both of those countries. However, the price level in the United States has continued to rise; today, the price level in the United States is about seven times higher than it was in in the 1970s.

15 Data from US Bureau of Labor Statistics. "Consumer Price Index for All Urban Consumers: All Items in US City Average (CPIAUCNS)." FRED. Federal Reserve Bank of St. Louis, accessed July 31, 2021. https://fred.stlouisfed.org/series/CPIAUCNS; Organization for Economic Co-operation and Development. "Consumer Price Index: All Items for Switzerland (CHECPIALLMINMEI)." FRED. Federal Reserve Bank of St. Louis, accessed July 31, 2021. https://fred.stlouisfed.org/series/CHECPIALLMINMEI; Organization for Economic Co-operation and Development. "Consumer Price Index of All Items in Japan (JPNCPIALLMINMEI)." FRED. Federal Reserve Bank of St. Louis, accessed July 31, 2021. https://fred.stlouisfed.org/series/JPNCPIALLMINMEI

Summary

3.1 Microeconomics

Microeconomics is the study of individual economic decision makers. In the marketplace, buyers and sellers come together. The buyers are represented by a downward-sloping demand curve; lower prices are associated with a larger quantity demanded. The sellers are represented by an upward-sloping supply curve; higher prices are associated with a large quantity supplied. The point of intersection of the supply and demand curves determines the equilibrium price and quantity.

3.2 Macroeconomics

Macroeconomics looks at the economy as a whole. It focuses on broad issues such as inflation, unemployment, and growth of production. The consumer price index is a common measure of inflation. Unemployment equals the percent of the labor force that is without a job but looking for work. Gross domestic product is a measure of the growth of production and growth of the economy.

3.3 Business Cycles and Economic Activity

The business cycle is the repeated pattern of the economy experiencing expansion, a peak, contraction, and a trough. During the expansion, the economy is growing and real GDP is rising. During a contraction, also known as a recession, the economy is slowing down.

3.4 Interest Rates

The interest rate is the rental price of money. The nominal interest rate is the quoted, or stated, rate of interest. The real rate of interest equals the nominal interest rate minus the inflation rate. Lenders charge a risk premium to compensate them for lending to higher-risk borrowers.

3.5 Foreign Exchange Rates

A foreign exchange rate is the price of a currency in terms of another currency. If a currency will purchase more of a foreign currency than it would previously, the purchasing currency is said to have appreciated. If a currency will purchase less of a foreign currency than it would previously, the purchasing currency is said to have depreciated.

3.6 Sources and Characteristics of Economic Data

One of the most comprehensive sources of economic data is the FRED database, maintained by the Federal Reserve Bank of St. Louis. Over 765,000 time series of data are available. In addition to being viewable in graphical and text form on the FRED site, the data is easily downloaded into an Excel spreadsheet for analysis.

Key Terms

business cycle a period of economic expansion followed by economic contraction
ceteris paribus holding all other things constant
consumer price index (CPI) a measure of inflation based on the cost of a market basket of goods that a typical urban family of four might purchase
core inflation index a measure of inflation that removes food and energy prices from the CPI
demand the quantity of a good or service that consumers are willing and able to purchase during a given time period, ceteris paribus
economic exposure the risk that a change in exchange rates will impact a business's sales and number of customers
equilibrium the point at which the demand and supply curves for a good or service intersect
equilibrium price the price at which quantity demanded equals quantity supplied
expansion the part of the business cycle in which GDP is growing

GDP deflator a measure of inflation tracked by the Bureau of Economic Analysis, intended to measure what GDP would be if prices did not change from one year to the next
gross domestic product (GDP) the market value of all goods and services produced within an economy during a year
inflation a general increase in prices
law of demand the principle that the quantity of purchases varies inversely with price; the higher the price, the lower the quantity
macroeconomics the study of the economy as a whole, focusing on unemployment, inflation, and total output
microeconomics the study of the economy at the individual level, focusing on how individuals and businesses choose to allocate scarce resources
nominal interest rate the quoted or stated interest rate
producer price index (PPI) a measure of the prices that producers of goods and services pay for their supplies and raw materials
real interest rate the nominal interest rate minus the rate of inflation
recession the part of the business cycle characterized by contraction
spot exchange rate the price to immediately buy one currency in terms of another currency
supply the quantity of a good or service that firms are willing to sell in the market during a given time period, ceteris paribus
transaction exposure the risk that the value of a business's expected receipts or expenses will change as a result of a change in currency exchange rates
translation exposure the risk that a change in exchange rates will impact the financial statements of a company
unemployed members of the labor force who are not currently working but are actively seeking a job

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/cfa-study-session-4-economics). Reference with permission of CFA Institute.

Multiple Choice

1. Demand is the _____.
   a. amount of a good or service that consumers need
   b. amount of a good or service that consumers want to purchase at the equilibrium price
   c. quantity of a good or service that consumers want to purchase minus the amount that producers are currently supplying
   d. quantity of a good or service that consumers are willing to purchase at various prices over a given time period, ceteris paribus

2. An increase in supply will lead to _____.
   a. a lower equilibrium price and a lower equilibrium quantity
   b. a higher equilibrium price and a lower equilibrium quantity
   c. a higher equilibrium price and a higher equilibrium quantity
   d. a lower equilibrium price and a higher equilibrium quantity

3. An increase in the price of a basket of goods is known as _____.
   a. inflation
   b. falling GDP
   c. rising GDP

d. a change in quantity demanded

4. The unemployment rate equals _____.
a. the number of people unemployed divided by the labor force
b. the number of people seeking work divided by the adult population
c. the number of people unemployed divided by the number of people employed
d. the number of people unemployed plus the number of people working part-time divided by the adult population

5. To be considered unemployed, an individual must be _____.
a. out of work
b. actively seeking a job
c. able to work
d. All of the above

6. When measuring GDP, purchases are divided into the four broad categories of _____.
a. interest rates, inflation, unemployment, and investment
b. demand, inflation, interest rates, and government spending
c. imports, exports, loanable funds, and government spending
d. consumer spending, investment, government spending, and net exports

7. A business cycle is measured from _____.
a. one peak to the next trough
b. one trough to the next trough
c. one trough to the next peak
d. the time of the highest unemployment rate to the time of the lowest unemployment rate

8. Which of the following economic environments would most likely be associated with a recession?
a. Unemployment falling to 30-year low
b. GDP growing at an annual rate of 4.2%
c. Unemployment increasing from 5% to 9% during the year
d. New businesses opening in record numbers while new housing starts reach a 10-year high

9. The interest rate is the _____.
a. rental cost of money
b. increase in the price of a market basket of goods
c. measure of economic activity
d. speed at which the money supply is increasing

10. If the nominal interest rate is 9% and the rate of inflation is 2%, the real rate of interest is approximately _____.
a. $\frac{2}{9}\%$
b. 7%
c. 11%
d. 18%

11. A foreign exchange rate is _____.
a. the rate of inflation in a foreign country
b. the amount of imports a country has relative to its exports
c. the price of one currency in terms of another currency

d. the rate of unemployment in one country compared to the rate in another country

12. In 2020, the CPI in a country is 120. In 2021, the CPI in the same country is 126. This would mean that inflation is _____.

a. 5%
b. 6%
c. 26%
d. 46%

Review Questions

1. Explain the difference between an increase in demand and an increase in quantity demanded.

2. You see that price of laptop computers is falling at the same time that the quantity of laptop computers is rising. Would you attribute this to a change in supply or a change in demand for computers? Explain.

3. Outline the stages of the business cycle.

4. Use a graph of the supply of loanable funds and demand for loanable funds to explain what will happen if the Federal Reserve increases the money supply. What would you expect to happen to the interest rate when this occurs?

5. Your bank offers you a car loan with an interest rate of 6%. You expect inflation to be 2%. What is the real interest rate on this loan?

6. You see that First National Bank is willing to make you a four-year $40,000 car loan with an interest rate of 4.2%. However, the same bank will charge you 16.5% interest on a credit card that it issues. Why is the interest rate on the credit card so much higher than the interest rate on the car loan?

7. Last year, the exchange rate between the Korean won and the US dollar was $\text{KWN } 1020 = \text{USD } 1$. This year, the exchange rate is $\text{KWN } 1150 = \text{USD } 1$. Has the Korean won appreciated or depreciated over the past year? Explain.

Problems

1. You are planning a budget for an upcoming trip to Japan. Your hotel will cost 12,000 yen per night, and you will stay in the hotel for six nights. If the current exchange rate is $\text{YEN } 98 = \text{USD } 1$, how much will the hotel stay cost you in US dollars?

2. Visit the Federal Reserve Bank of St. Louis's FRED site. Create a graph that plots the unemployment rate for men and the unemployment rate for women since 1948. Turn recession shading on so that you can tell when recession occurred. Are there any patterns that you detect when looking at your chart?

Video Activity

Should Investors Prepare for Inflation or Hyperinflation?

Click to view content (https://openstax.org/r/inflation-or-hyper-inflation)

Inflation is a general increase in the price level. If inflation is extremely high, hyperinflation is said to exist. The video *Should Investors Prepare for Inflation or Hyperinflation?* by TD Ameritrade explores economic conditions that existed in the spring of 2021 that led some economists to be concerned that investors should be preparing for high inflation.

1. How might the Federal Reserve's response to the economic conditions that existed in the wake of the COVID-19 pandemic lead to a higher rate of inflation than the United States has experienced over the

previous few decades?

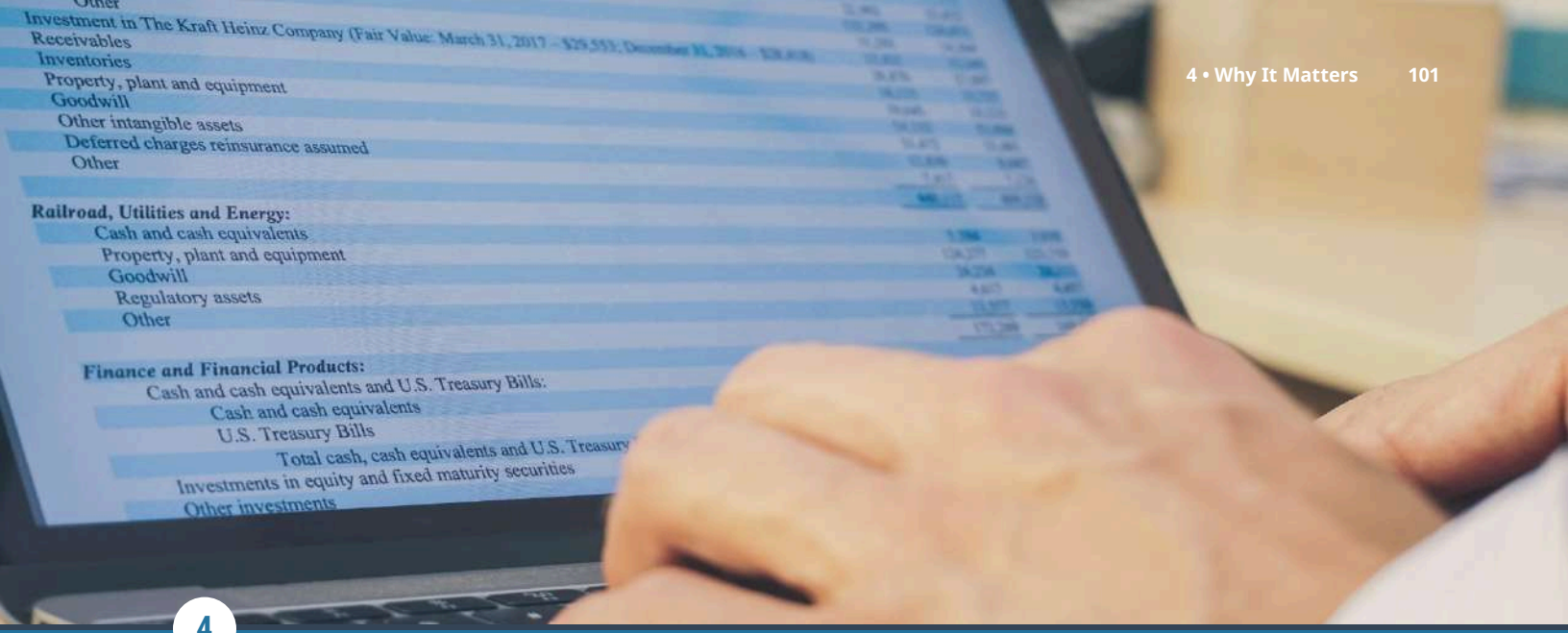
2. What suggestions does the video provide to investors who want to protect the value of their savings from being negatively impacted by inflation? Do some research to find out how much inflation has occurred since the spring of 2021 and how an investor who followed the advice would have fared.

Unemployment Explained

Click to view content (https://openstax.org/r/unemployment-explained)

The video *Unemployment Explained*, produced by the International Monetary Fund (IMF), explores how economists think about unemployment. The basic economic tools of supply and demand are used to explain what causes unemployment. In this video, you will also learn about how economists categorize different types of unemployment and why a zero rate of unemployment is not likely or even desirable.

3. List the types of unemployment presented in the video, giving an example of each type.
4. Choose three countries and find out what unemployment has been in each of those countries over the past decade. Do you detect any patterns in the unemployment rates in those countries over time or across the three different countries? Tell which type of unemployment you think has been most prevalent in each country, and explain your reasoning.



4

Accrual Accounting Process

Figure 4.1 Accrual accounting reports revenue when goods are delivered or services are performed but are not necessarily paid for. (credit: modification of work "Reviewing Financial Statements" by Instructional Institutions)

Chapter Outline

Why It Matters

Emma, an accounting major, was on her way to her Wednesday morning accounting class with her friend Sam. Sam, a finance major, kept complaining to Emma that he didn’t enjoy their accounting class at all. “Why do we have to spend so much time worried about debits, credits, accounts, and all this other accounting jargon anyway? I’m a finance major. I won’t be spending my days recording entries and counting pennies. I’m dreading class today. I looked at the syllabus, we’re studying the accrual method. So what? Just give me the financial statements so I have the data I need.”

Emma smiled at her friend and thought for a moment before responding. Emma loves the details of debits, credits, and “all that other accounting jargon,” as Sam put it. She knows that while not everyone enjoys the details or understands them, they do play a big role in the timing and accuracy of financial statements. “Yeah, yeah, Sam, accounting isn’t always easy or fun, but it’s important. The financial statements you will use in finance are a part of the foundation for many decisions. They are an important tool. Even though you don’t have to create financial statements in a finance role, it’s still necessary to understand the accounting principles they are based on. We haven’t covered the details yet, but I do know that income or loss in a period can be significantly different if the income statement is prepared under cash versus accrual methods. I would think that would be important to know if you are the one using the income statement.”

4.1 Cash versus Accrual Accounting

Learning Outcomes

By the end of this section, you will be able to:

- Outline the key concepts of the cash-basis accounting method.
- Explain the key characteristics of the accrual-basis accounting method.
- Identify businesses for which cash accounting or accrual accounting is more appropriate.

In this section, we will explore the basic elements of cash and accrual accounting and the businesses that are most likely to use each one. Some private companies may choose to use **cash-basis accounting** rather than **accrual-basis accounting** to report financial information.

Cash-Basis Accounting

In business, cash is certainly important. In fact, it's so important that it dictates one of two ways we can account for our business transactions. The *cash method* is just as the name implies—it records transactions only when cash flows. We track cash inflows and outflows as they occur. This method is most commonly used by small businesses that deal primarily in cash transactions. The other method, called the *accrual method*, records transactions when they occur, rather than waiting for cash to be accumulated. Using the accrual method, we match cash inflows and the outflows required to generate them. We call this the *matching principle*. This method is used by most publicly traded companies. In this chapter, you'll explore both methods, see how each impacts financial statements differently, note the role of timing in each method, and learn how and when to record capital and expense transactions.

Let's look at an example. Chris just finished the first month of her landscaping business operations at the end of August, and she used the cash method of accounting to figure out her **net income**. Most small start-up companies use the cash method of accounting because it is easy to understand, requires no special training, and helps them focus on one big key to their survival—cash. This means that she simply recorded the cash that came in and the cash that went out of her business. She brought in $1,400 in revenue in her first month, which she felt was substantial given that it was her first month. But after deducting her expenses, she had only $250 left, so she worried about the future of her business. Would she have to increase her sales exponentially in order to start bringing in a decent profit each month?

As you move through the chapter, you'll get to see the impact of the two methods of accounting and how these methods impact the insights and decisions Chris made for her new business.

Cash-basis accounting is a method of accounting in which transactions are not recorded in the financial statements until there is an exchange of cash. Cash-basis accounting sometimes impacts the timing of **revenue** and **expense** reporting until cash receipts or outlays occur. For example, as you saw above, Chris measured the performance of her landscaping business for the month of August using cash flows. Cash accounting is far simpler to track than accrual-basis accounting.

Accrual-Basis Accounting

Public companies reporting their financial positions use either US generally accepted accounting principles (GAAP) or International Financial Reporting Standards (IFRS), as allowed under the Securities and Exchange Commission (SEC) regulations. GAAP is a set of accounting standards created by the Financial Accounting Standards Board (FASB) and the Governmental Accounting Standards Board (GASB). It's key to note that though they are similar in many areas, there are still key areas that differ between GAAP and IFRS. Therefore, when using financial statements, it's important to be aware of the standards under which they were prepared. However, public or private companies using GAAP or IFRS must prepare their financial statements using the rules of accrual accounting. Accrual-basis accounting prescribes that revenues and expenses must be recorded in the accounting period in which they were earned or incurred, no matter when cash receipts or payments occur. It is because of accrual accounting that we have the revenue recognition principle and the

expense recognition principle (also known as the matching principle).

The accrual method is considered to better match revenues and expenses and standardizes reporting information for comparability purposes. Having comparable information is important to external users of information trying to make investment or lending decisions and to internal users trying to make decisions about company performance, budgeting, and growth strategies.

Who Uses Each Method?

Cash-basis accounting can be more efficient and well-suited for certain types of businesses, such as farming or professional services provided by lawyers and doctors. However, the accrual basis of accounting is theoretically preferable to the cash basis of accounting because it takes into account the timing of the transactions (when goods and services are provided and when the cash involved in the transactions is received). Cash can often be received a significant amount of time after the initial transaction. Considering this amount allows accountants to provide, in a timely manner, relevant and complete information to stakeholders.

There are several reasons accrual-basis accounting is preferred to cash-basis accounting. Accrual-basis accounting is required by GAAP because it typically provides a better sense of the financial well-being of a company. Accrual-based accounting information allows management to analyze a company's progress, and management can use that information to improve their business. Accrual accounting is also used to assist companies in securing financing because banks will typically require a company to provide accrual-basis financial income statements. The Internal Revenue Service requires businesses to report using accrual-basis information when preparing tax returns. In addition, companies with inventory must use accrual-based accounting for income tax purposes, though there are exceptions to the general rule.

So why might a company use cash-basis accounting? Companies that do not sell stock publicly can use cash-basis instead of accrual-basis accounting for internal management purposes or because they are exempt from such requirements in agreements such as a bank loan. Cash-basis accounting is a simpler accounting system to use than an accrual-basis accounting system when tracking real-time revenues and expenses.

THINK IT THROUGH

Cash- or Accrual-Basis Accounting?

You are a new accountant at a beauty salon. The salon had previously used cash-basis accounting to prepare its financial records but is now considering switching to an accrual-basis method. You have been tasked with determining if this transition is appropriate.

When you go through the records, you notice that this transition will greatly impact how the salon reports revenues and expenses. The salon will now report some revenues and expenses before it receives or pays cash.

How will this change positively impact its business reporting? How will it negatively impact its business reporting? If you were the accountant, would you recommend the salon transition from cash basis to accrual basis?

Solution:

Accrual accounting creates a more accurate picture of profit or loss, so the salon's owner can have a better understanding of its profitability from period to period. However, it can be more work to record under accrual accounting. If the salon is small and the profits and costs are easily understood, it might not be worth the extra effort to the owner to use accrual-basis accounting. If the salon is seeking ways to better understand profits and costs, accrual-basis accounting would be a great choice.

4.2 Economic Basis for Accrual Accounting

Learning Outcomes

By the end of this section, you will be able to:

- Assess the impact of business transactions on cash flow.
- Define double-entry accounting and explain how it supports the accounting equation.

How and when we record our transactions can have a significant impact on financial statements, especially the **income statement (net income)**. In this section you will explore the impact business transactions have on financial statements under each method. In doing so, you'll be introduced to **double-entry accounting** and see how it functions to support the accounting equation.

Timing of Business Activity versus Cash Flow

The first financial statement prepared is the income statement, a statement that shows the organization's financial performance *for a given period of time*. We already saw that Chris, who is a sole proprietor, started a summer landscaping business on August 1, 2020. She categorized her business as a service entity and used the cash-basis method of accounting to record the initial operations for her business. Although Chris was using her family's tractor to get her work done, she was responsible for paying for fuel and any maintenance costs. So, on August 31, Chris realized she had only $250 in her checking account.

This balance was lower than expected because she had spent only slightly less ($1,150 for brakes, fuel, and insurance) than she earned ($1,400)—leaving a net income of $250. While she would like the checking balance to grow each month, she realized that most of the August expenses were infrequent (brakes and insurance) and the insurance, in particular, was an unusually large expense. She knew that the checking account balance would likely grow more in September because she would earn money from some new customers; she also anticipated having fewer expenses.

This simple landscaping example can be used to discuss the elements of the income statement, which are revenues, expenses, **gains**, and **losses** for a particular period of time (see Figure 4.2). Together, these determine whether the organization has net income (where revenues and gains are greater than expenses and losses) or net loss (where expenses and losses are greater than revenues and gains). Revenues, expenses, gains, and losses are further defined in the Income Statement provided.

Chris's Landscaping
Income Statement
For the Month Ended August 31

Revenue	$1,400	
Total revenue		$1,400
Expenses		
Tractor brake repair	100	
Tractor fuel	50	
Business insurance	1,000	
Total expenses		1,150
Net income		$ 250

Figure 4.2 Income Statement for Chris's Landscaping

The income statement can also be visualized by the formula:

$$\text{Revenue} - \text{Expenses} = \text{Net Income or Net Loss}$$

Let's change this example slightly and assume the $1,000 payment to the insurance company will be paid in

September rather than in August. In this case, the ending balance in Chris's checking account would be $1,250, a result of earning $1,400 and only spending $100 for the brakes on the tractor and $50 for fuel. This stream of cash flows is an example of cash-basis accounting because it reflects when payments are received and made, not necessarily the time period that they affect. At the end of this section, you will address accrual accounting, which does reflect the time period that payments affect.

The Accounting Equation

It may be helpful to think of the **accounting equation** from a "sources and claims" perspective. Under this approach, the assets (items owned by the organization) were obtained by incurring liabilities or were provided by owners. Stated differently, every asset has a claim against it—by creditors and/or owners.

$$\text{Assets} = \text{Liabilities} + \text{Owner's Equity}$$

You may recall from mathematics courses that an equation must always be in balance. Therefore, we must ensure that the two sides of the accounting equation are always equal. We will explore the components of the accounting equation in more detail shortly. First, we need to examine several underlying concepts that form the foundation for the accounting equation: the double-entry accounting system, debits and credits, and the "normal" balance for each account that is part of a formal accounting system.

THINK IT THROUGH

The Accounting Equation

On a sheet of paper, use three columns to create your own accounting equation. In the first column, list all the things you own (assets). List only the asset itself; don't worry about any associated liabilities (expenses) in that column. In the second column, list any amounts owed (the liabilities). When you are done, total up all the assets. Then total up all the liabilities.

Now, use the accounting equation to calculate the net amount of the asset (equity). To do so, subtract the total assets from the total liabilities. This figure makes the accounting equation balance and represents equity, or an estimate of your net worth.

Here is something else to consider: Is it possible to have negative equity? It sure is . . . ask any college student who has taken out loans. At first glance there is no asset directly associated with the amount of the loan. But is that, in fact, the case? You might ask yourself why you should make an investment in a college education—what is the benefit (asset) to going to college? The answer lies in the difference in lifetime earnings with a college degree versus without a college degree. This is influenced by many things, including the supply and demand of jobs and employees. It is also influenced by the earnings for the type of college degree pursued.

Solution:

Answers will vary but may include vehicles, clothing, electronics (include cell phones and computer/gaming systems), and sports equipment. They may also include money owed on these assets, most likely vehicles and perhaps cell phones. In the case of a student loan, there may be a liability with no corresponding asset (yet). Responses should be able to evaluate the benefit of investing in college and the wage differential between earnings with and without a college degree.

Let's continue our exploration of the accounting equation, focusing on the equity component in particular. Recall that we defined equity as the net worth of an organization. It is helpful to also think of net worth as the accounting *value* of the organization. Recall, too, that revenues (inflows as a result of providing goods and services) *increase* the accounting value of the organization. So every dollar of revenue an organization generates increases the overall value of the organization.

Likewise, expenses (outflows as a result of generating revenue) *decrease* the value of the organization. So each dollar of expenses an organization incurs decreases the overall value of the organization. The same approach can be taken with the other elements of the financial statements:

- Gains *increase* the value (equity) of the organization.
- Losses *decrease* the value (equity) of the organization.
- Investments by owners *increase* the value (equity) of the organization.
- Distributions to owners *decrease* the value (equity) of the organization.
- Changes in assets and liabilities can *either* increase or decrease the value (equity) of the organization depending on the net result of the transaction.

Let's look at Chris's Landscaping business again and do the same quick exercise you did with your personal finances. If we were to total all of Chris's assets, we would find just one: $250 in cash. She's using the family's tractor, but she doesn't own the tractor, so it is not her asset. Her liabilities are currently $0, as she paid cash for all the expenses she incurred already. If we total her assets, we get $250. Liabilities total $0. Using the accounting equation, we find her equity to currently be $250, or

$$\text{Assets } (\$250) - \text{ Liabilities } (\$0) = \text{Equity } (\$250)$$

Double-Entry Accounting

Accounting is based on a double-entry accounting system, which requires the following:

- Each time we record a transaction, we must record a change in at least two different accounts. Having two or more accounts change will allow us to keep the accounting equation in balance.
- Not only will at least two accounts change, but there must also be at least one **debit** and one **credit** side impacted.
- The sum of the debits must equal the sum of the credits for each transaction.

In order for companies to record the myriad of transactions they have each year, there is a need for a simple but detailed system. Journals are useful tools to meet this need.

Debits and Credits

Each account can be represented visually by splitting the account into left and right sides as shown. The graphic representation of a general ledger account is known as a **T-account**. It is called this because it looks like a "T," as you can see with the T-account shown in Figure 4.3.

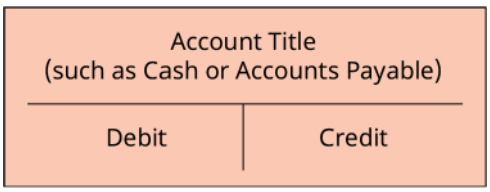


Figure 4.3 T-Account

A debit records financial information on the left side of each account. A credit records financial information on the right side of an account. One side of each account will increase, and the other side will decrease. The ending account balance is found by calculating the difference between debits and credits for each account. You will often see the terms *debit* and *credit* represented in shorthand, written as *DR* or *dr* and *CR* or *cr*, respectively. Depending on the account type, the sides that increase and decrease may vary. We can illustrate each account type and its corresponding debit and credit effects in the form of an *expanded* equation (see Figure 4.4).

Assets		= Liabilities		+ Equity: Common Stock		– Dividends		+ Revenues		– Expenses	
Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit
Increase	Decrease	Decrease	Increase	Decrease	Increase	Increase	Decrease	Decrease	Increase	Increase	Decrease

Figure 4.4 Expanded Accounting Equation

As we can see from this expanded accounting equation, Assets accounts increase on the debit side and decrease on the credit side. This is also true of Dividends and Expenses accounts. Liabilities increase on the credit side and decrease on the debit side. This is also true of Common Stock and Revenues accounts. This becomes easier to understand as you become familiar with the *normal balance* of an account.

The balance sheet is a reflection of the accounting equation (see Figure 4.5). It has two sections, assets in one section and liabilities and equity in the other section. It's key to note that both assets and liabilities are broken down on the balance sheet into current and noncurrent classifications in order to provide more detail and transparency. Current assets are those that are consumed within a year. Assets that will be in use longer than a year are considered noncurrent. Current liabilities are those that will be due within a year. Noncurrent liabilities are those that are due more than a year into the future.

Assets				= Liabilities				+ Owner's Equity	
Current		Noncurrent		Current		Noncurrent			
+	–	+	–	–	+	–	+	–	+
								Distribution to Owners Expenses Losses Comprehensive Income	Investments by Owners Revenues Gains Comprehensive Income

Figure 4.5 Graphical Representation of the Accounting Equation Both assets and liabilities are categorized as current and noncurrent. Also highlighted are the various activities that affect the equity (or net worth) of the business.

Notice each account subcategory (Current Assets and Noncurrent Assets, for example) has an "increase" side and a "decrease" side. As you may recall, these are called T-accounts, and they are used to analyze transactions.

The basic components of even the simplest accounting system are *accounts* and a *general ledger*. An account is a record showing increases and decreases to assets, liabilities, and equity—the basic components found in the accounting equation. Each of these categories, in turn, includes many individual accounts, all of which a company maintains in its general ledger. A general ledger is a comprehensive listing of all of a company's accounts with their individual balances.

4.3 How Does a Company Recognize a Sale and an Expense?

Learning Outcomes

By the end of this section, you will be able to:

- Explain the revenue recognition principle and how it relates to current and future sales transactions.
- Explain the expense recognition principle and how it relates to current and future purchase transactions.
- Assess the role of ethics in revenue and expense recognition.

You've learned the basics of each method as well as the accounting equation and double-entry accounting. Next, let's turn our attention to when we record transactions, as timing is key.

Revenue Recognition

Revenue is the value of goods and services the organization sold or provided to customers for a given period of time. In our current example, Chris's landscaping business, the "revenue," or the value of services

performed, for the month of August would be $1,400. It is the value Chris received in exchange for the services provided to her clients. Likewise, when a business provides goods or services to customers for cash at the time of the service or in the future, the business classifies the amount(s) as revenue. Just as the $1,400 revenues from a business made Chris's checking account balance increase, revenues increase the value of a business. In accounting, **revenue recognition** involves recording sales or fees earned within the period earned. Just as earning wages from a business or summer job reflects the number of hours worked for a given rate of pay or payments from clients for services rendered, revenues (and the other terms) are used to indicate the dollar value of goods and services provided to customers for a given period of time.

THINK IT THROUGH

Coffee Shop Products

Think about a coffee shop in your area. Identify items the coffee shop sells that would be classified as revenues. Remember, revenues for the coffee shop are related to its primary purpose: selling coffee and related items. Or, better yet, make a trip to the local coffee shop and get a first-hand experience.

Solution:

Many coffee shops earn revenue through multiple revenue streams, including coffee and other specialty drinks, food items, gift cards, and merchandise.

Short-Term Revenue Recognition Examples

Two brief examples may help illustrate the difference between cash accounting and accrual accounting. Assume that a business sells $200 worth of merchandise. In some businesses, there are two ways the customers pay: cash and credit (also referred to as "on account"). Cash sales include checks and credit cards and are paid at the time of the sale. Credit sales (not to be confused with credit card sales) allow the customer to take the merchandise but pay within a specified period of time, usually up to 45 days.

A cash sale would be recorded in the financial statements under both the cash basis and accrual basis of accounting. It makes sense because the customer received the merchandise and paid the business at the same time. It is considered two events that occur simultaneously (exchange of merchandise for cash).

A credit sale, however, would be treated differently under each of these types of accounting. Under the cash basis of accounting, a credit sale would not be recorded in the financial statements until the cash is received, under terms stipulated by the seller. For example, assume that in the next year of Chris's landscaping business, on April 1, she provides $500 worth of services to one of her customers. The sale is made on account, with the payment due 45 days later. Under the cash basis of accounting, the revenue would not be recorded until May 16, when the cash was received. Under the accrual basis of accounting, this sale would be recorded in the financial statements at the time the services were provided, April 1. The reason the sale would be recorded is that, under accrual accounting, the business reports that it provided $500 worth of services to its customer. The fact that the customers will pay later is viewed as a separate transaction under accrual accounting (see Figure 4.6).

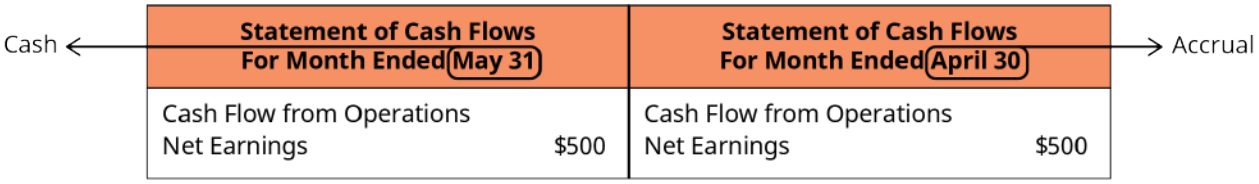


Figure 4.6 Credit versus Cash On the left is a credit sale recorded under the cash basis of accounting. On the right, the same credit sale is recorded under the accrual basis of accounting.

Let's now explore the difference between the cash basis and accrual basis of accounting using an expense.

Assume a business purchases $160 worth of printing supplies from a supplier (vendor). Similar to a sale, a purchase of merchandise can be paid for at the time of sale using cash (also a check or credit card) or at a later date (on account). A purchase paid with cash at the time of the sale would be recorded in the financial statements under both cash basis and accrual basis of accounting. It makes sense because the business received the printing supplies from the supplier and paid the supplier at the same time. It is considered two events that occur simultaneously (exchange of merchandise for cash).

If the purchase was made on account (also called a credit purchase), however, the transaction would be recorded differently under each of these types of accounting. Under the cash basis of accounting, the $160 purchase on account would not be recorded in the financial statements until the cash is paid, as stipulated by the seller's terms. For example, if the printing supplies were received on July 17 and the payment terms were 15 days, no transaction would be recorded until August 1, when the goods were paid for. Under the accrual basis of accounting, this purchase would be recorded in the financial statements at the time the business received the printing supplies from the supplier (July 17). The reason the purchase would be recorded is that the business reports that it bought $160 worth of printing supplies from its vendors. The fact that the business will pay later is viewed as a separate issue under accrual accounting. Table 4.1 summarizes these examples under the different bases of accounting.

Transaction	Under Cash-Basis Accounting	Under Accrual-Basis Accounting
$200 sale for cash	Recorded in financial statements at time of sale	Recorded in financial statements at time of sale
$200 sale on account	*Not* recorded in financial statements until cash is received	Recorded in financial statements at time of sale
$160 purchase for cash	Recorded in financial statements at time of purchase	Recorded in financial statements at time of purchase
$160 purchase on account	*Not* recorded in financial statements until cash is paid	Recorded in financial statements at time of purchase

Table 4.1 How Transactions Are Viewed under Cash and Accrual Accounting

Businesses often sell items for cash as well as on account, where payment terms are extended for a period of time (for example, 30 to 45 days). Likewise, businesses often purchase items from suppliers (also called vendors) for cash or, more likely, on account. Under the cash basis of accounting, these transactions would not be recorded until the cash is exchanged. In contrast, under accrual accounting, the transactions are recorded when the transaction occurs, regardless of when the cash is received or paid.

CONCEPTS IN PRACTICE

Ethics in Revenue Recognition

Because each industry typically has a different method for recognizing income, revenue recognition is one of the most difficult tasks for accountants, as it involves a number of ethical dilemmas related to income reporting. To provide an industry-wide approach, Accounting Standards Update No. 2014-09 and other related updates were implemented to clarify revenue recognition rules. The American Institute of Certified Public Accountants (AICPA) announced that these updates would replace US GAAP's current industry-specific revenue recognition practices with a principle-based approach, potentially affecting both day-to-day business accounting and the execution of business contracts with customers.[1] The AICPA and the International Federation of Accountants (IFAC) require professional accountants to act with due care and to remain abreast of new accounting rules and methods of accounting for different transactions, including revenue recognition.

The IFAC emphasizes the role of professional accountants working within a business in ensuring the quality of financial reporting: "Management is responsible for the financial information produced by the company. As such, professional accountants in businesses therefore have the task of defending the quality of financial reporting right at the source where the numbers and figures are produced!"[2] In accordance with proper revenue recognition, accountants do not recognize revenue before it is earned.

CONCEPTS IN PRACTICE

Gift Card Revenue Recognition

Gift cards have become an essential part of revenue generation and growth for many businesses. Although they are practical for consumers and are a low cost for businesses, navigating revenue recognition guidelines can be difficult. Gift cards with expiration dates require that revenue recognition be delayed until customer use or expiration. However, most gift cards now have no expiration date. So when do you recognize revenue?

Companies may need to provide an estimation of projected (or deferred) gift card revenue and usage during a period based on past experience or industry standards. There are a few rules governing reporting. If a company determines that a portion of all the issued gift cards will never be used, it may write this off to income. In some states, if a gift card remains unused, in part or in full, the unused portion of the card is transferred to the state government. It is considered unclaimed property for the customer, meaning that the company cannot keep these funds as revenue because, in this case, they have reverted to the state government.

Expense Recognition

An expense is a cost associated with providing goods or services to customers. In our opening example, the expenses that Chris incurred totaled $1,150 (consisting of $100 for brakes, $50 for fuel, and $1,000 for insurance). You might think of expenses as the opposite of revenue, in that expenses reduce Chris's checking account balance. Likewise, expenses decrease the value of the business and represent the dollar value of costs incurred to provide goods and services to customers for a given period of time.

1 American Institute of Certified Public Accountants (AICPA). "Revenue Recognition." n.d. https://www.aicpa.org/interestareas/frc/accountingfinancialreporting/revenuerecognition.html
2 Len Jui and Jessie Wong. "Roles and Importance of Professional Accountants in Business." *China Accounting Journal.* October 21, 2013. https://www.ifac.org/news-events/2013-10/roles-and-importance-professional-accountants-business

THINK IT THROUGH

Coffee Shop Expenses

While thinking about or visiting a coffee shop in your area, look around (or visualize) and identify items or activities that are the expenses of the coffee shop. Remember, expenses for the coffee shop are related to resources consumed while generating revenue from selling coffee and related items. Do not forget about any expenses that might not be so obvious—as a general rule, every activity in a business has an associated cost.

Solution:

Costs of the coffee shop that might be readily observed would include rent, wages for the employees, and the cost of the coffee, pastries, and other items/merchandise that may be sold. In addition, costs such as utilities, equipment, and cleaning or other supplies might also be readily observable. More obscure costs of the coffee shop would include insurance, regulatory costs such as health department licensing, point-of-sale/credit card costs, advertising, donations, and payroll costs such as workers' compensation, unemployment, and so on. There are also unseen costs, such as aging of the building (if owned by the coffee shop) and wear and tear or aging of the equipment.

4.4 When Should a Company Capitalize or Expense an Item?

Learning Outcomes

By the end of this section, you will be able to:

- Define the key characteristics of a fixed asset.
- Explain how the cost of a fixed asset is spread throughout its useful life via depreciation.
- Assess the impact to net income of expensing versus capitalizing an item.

Assets are items a business owns. For accounting purposes, assets are categorized as current versus long term and tangible versus intangible. Any asset that is expected to be used by the business for more than one year is considered a **long-term asset**. These assets are not intended for resale and are anticipated to help generate revenue for the business in the future. Some common long-term assets are computers and other office machines, buildings, vehicles, software, computer code, and copyrights. Although these are all considered long-term assets, some are tangible and some are intangible.

To better understand the nature of fixed assets, let's get to know Liam and their new business. Liam is excited to be graduating from their MBA program and looks forward to having more time to pursue their business venture. During one of their courses, Liam came up with the business idea of creating trendy workout attire. For their class project, they started silk-screening vintage album cover designs onto tanks, tees, and yoga pants. They tested the market by selling their wares on campus and were surprised how quickly and how often they sold out. In fact, sales were high enough that they decided to go into business for themselves. One of their first decisions involved whether they should continue to pay someone else to silk-screen their designs or do their own silk-screening. To do their own silk-screening, they would need to invest in a silk screen machine.

Liam will need to analyze the purchase of a silk screen machine to determine the impact on their business in the short term as well as the long term, including the accounting implications related to the expense of this machine. Liam knows that over time, the value of the machine will decrease, but they also know that an asset is supposed to be recorded on the books at its historical cost. They also wonder what costs are considered part of this asset. Additionally, Liam has learned about the matching principle (**expense recognition**) but needs to learn how that relates to a machine that is purchased in one year and used for many years to help generate revenue. Liam has a lot of information to consider before making this decision.

What Is a Fixed Asset?

An asset is considered a **tangible asset** when it is an economic resource that has physical substance—it can be seen and touched. Tangible assets can be either short term, such as inventory and supplies, or long term, such as land, buildings, and equipment. To be considered a long-term tangible asset, the item needs to be used in the normal operation of the business for more than one year, be of material value, and not be near the end of its useful life, and the company must have no plan to sell the item in the near future. The useful life is the time period over which an asset cost is allocated. Long-term tangible assets are known as fixed assets. It's also key to note that companies will **capitalize** a fixed asset if they have material value. A $10 stapler to be used in the office, for example, may last for years, but the value of the item is not significant enough to warrant capitalizing it.

Businesses typically need many different types of these assets to meet their objectives. These assets differ from the company's products. For example, the computers that Apple, Inc. intends to sell are considered inventory (a short-term asset), whereas the computers Apple's employees use for day-to-day operations are long-term assets. In Liam's case, the new silk screen machine would be considered a long-term tangible asset as they plan to use it over many years to help generate revenue for their business. Long-term tangible assets are listed as noncurrent assets on a company's balance sheet. Typically, these assets are listed under the category of Property, Plant, and Equipment (PP&E), but they may be referred to as fixed assets or plant assets.

Apple, Inc. lists a total of $36.766 million in total Property, Plant, and Equipment (net) on its September 2020 consolidated balance sheet (see Figure 4.7). As shown in the figure, this net total includes land and buildings, machinery, equipment and internal-use software, and leasehold improvements, resulting in a gross PP&E of $103.526 million—less accumulated depreciation and amortization of $66.760 million—to arrive at the net amount of $36.766 million.

	2020	2019
Land and Buildings	$ 17,952	$ 17,085
Machinery, Equipment, and Internal-Use Software	75,291	69,797
Leasehold Improvements	10,283	9,075
Gross Property, Plant, and Equipment	**103,526**	**95,957**
Accumulated Depreciation and Amortization	(66,760)	(58,579)
Total Property, Plant, and Equipment, Net	**$ 36,766**	**$ 37,378**

Figure 4.7 Apple's Property, Plant, and Equipment, Net (September 2020, in $ million)[3] This report shows the company's consolidated financial statement details as of September 30, 2020, and September 30, 2019.

THINK IT THROUGH

Classifying Assets and Related Expenditures

You work at a business consulting firm. Your new colleague, Milan, is helping a client company organize its accounting records by types of assets and expenditures. Milan is a bit stumped on how to classify certain assets and related expenditures, such as capitalized costs versus expenses. They have given you the following list and asked for your help to sort through it. Help your colleague classify the expenditures as either capitalized or expensed, and note which assets are property, plant, and equipment.

Expenditures:

- Normal repair and maintenance on the manufacturing facility
- Cost of taxes on new equipment used in business operations
- Shipping costs on new equipment used in business operations
- Cost of a minor repair on existing equipment used in business operations

Assets:

- Land next to the production facility held for use next year as a place to build a warehouse
- Land held for future resale when the value increases
- Equipment used in the production process

Solution:

Expenditures:

- Normal repair and maintenance on the manufacturing facility: expensed
- Cost of taxes on new equipment used in business operations: capitalized
- Shipping costs on new equipment used in business operations: capitalized
- Cost of a minor repair on existing equipment used in business operations: expensed

Assets:

- Land next to the production facility held for use next year as a place to build a warehouse: property, plant, and equipment
- Land held for future resale when the value increases: investment
- Equipment used in the production process: property, plant, and equipment

Why are the costs of putting a long-term asset into service capitalized and written off as expenses (depreciated) over the economic life of the asset? Let's return to Liam's start-up business as an example. Liam plans to buy a silk screen machine to help create clothing that they will sell. The machine is a long-term asset because it will be used in the business's daily operation for many years. If the machine costs Liam $5,000 and it is expected to be used in their business for several years, GAAP require the allocation of the machine's costs over its useful life, which is the period over which it will produce revenues. Overall, in determining a company's financial performance, we would not expect that Liam should have an expense of $5,000 this year and $0 in expenses for this machine for future years in which it is being used. GAAP addressed this through the expense recognition (matching) principle, which states that expenses should be recorded in the same period with the revenues that the expense helped create. In Liam's case, the $5,000 for this machine should be allocated over the years in which it helps to generate revenue for the business. Capitalizing the machine allows this to occur. As stated previously, to capitalize is to record a long-term asset on the balance sheet and expense its allocated costs on the income statement over the asset's economic life. Therefore, when Liam purchases the machine, they will record it as an asset on the financial statements (see journal entry in Figure 4.8).

Journal			
Date	**Account**	**Debit**	**Credit**
Jan. 1	Machine	5,000	
	Cash		5,000

Figure 4.8 Journal Entry for Machine/Cash

When capitalizing an asset, the total cost of acquiring the asset is included in the cost of the asset. This includes additional costs beyond the purchase price, such as shipping costs, taxes, assembly, and legal fees. For example, if a real estate broker is paid $8,000 as part of a transaction to purchase land for $100,000, the land would be recorded at a cost of $108,000.

Over time, as the asset is used to generate revenue, Liam will need to depreciate recognize the cost of the asset.

3 In the Chapter 4 financial statements, a number contained within parentheses is a negative number, such as the "Accumulated depreciation and amortization" line item.

What Is Depreciation?

When a business purchases a long-term asset (used for more than one year), it classifies the asset based on whether the asset is used in the business's operations. If a long-term asset is used in the business's operations, it will belong in property, plant, and equipment or intangible assets. In this situation, the asset is typically capitalized. Capitalization is the process by which a long-term asset is recorded on the balance sheet and its allocated costs are expensed on the income statement over the asset's economic life.

Long-term assets that are not used in daily operations are typically classified as an investment. For example, if a business owns land on which it operates a store, warehouse, factory, or offices, the cost of that land would be included in property, plant, and equipment. However, if a business owns a vacant piece of land on which the business conducts no operations (and assuming no current or intermediate-term plans for development), the land would be considered an investment.

Depreciation is the process of allocating the cost of a tangible asset over its useful life, or the period of time that the business believes it will use the asset to help generate revenue.

Fundamentals of Depreciation

As you have learned, when accounting for a long-term fixed asset, we cannot simply record an expense for the cost of the asset and record the entire outflow of cash in one accounting period. Like all other assets, when you purchase or acquire a long-term asset, it must be recorded at the historical (initial) cost, which includes all costs to acquire the asset and put it into use. The initial recording of an asset has two steps:

1. Record the initial purchase on the date of purchase, which places the asset on the balance sheet (as property, plant, and equipment) at cost, and record the amount as notes payable, accounts payable, or an outflow of cash.
2. At the end of the period, make an adjusting entry to recognize the depreciation expense. Depreciation expense is the amount of the asset's cost to be recognized, or expensed, in the current period. Companies may record depreciation expense incurred annually, quarterly, or monthly.

Following GAAP and the expense recognition principle, the depreciation expense is recognized over the asset's estimated useful life.

Recording the Initial Asset

Assets are recorded on the balance sheet at cost, meaning that all costs to purchase the asset and to prepare the asset for operation should be included. Costs outside of the purchase price may include shipping, taxes, installation, and modifications to the asset.

The journal entry to record the purchase of a fixed asset (assuming that a note payable, not a short-term account payable, is used for financing) is shown in Figure 4.9.

Journal			
Date	**Account**	**Debit**	**Credit**
Jan. 1	Fixed Asset (truck, building, etc.) Cash/Notes Payable *To record purchase of fixed asset*	XXX	 XXX

Figure 4.9 Journal Entry for Fixed Asset

Applying this to Liam's silk-screening business, we learn that they purchased their silk screen machine for $54,000 by paying $10,000 cash and the remainder in a note payable over five years. The journal entry to record the purchase is shown in Figure 4.10.

Journal			
Date	**Account**	**Debit**	**Credit**
Jan. 1	Equipment	54,000	
	Cash		10,000
	Notes Payable		44,000
	To recognize purchase of silk-screening machine		

Figure 4.10 Journal Entry for Equipment/Cash

CONCEPTS IN PRACTICE

Estimating Useful Life and Salvage Value

Useful life and salvage value are estimates made at the time an asset is placed in service. It is common and expected that the estimates are inaccurate due to the uncertainty involved in estimating the future. Sometimes, however, a company may attempt to take advantage of estimating salvage value and useful life to improve earnings. A larger salvage value and longer useful life decrease annual depreciation expense and increase annual net income. An example of this behavior is Waste Management, which was disciplined by the SEC in March 2002 for fraudulently altering its estimates to reduce depreciation expense and overstate net income by $1.7 billion.[4]

Components Used in Calculating Depreciation

The expense recognition principle that requires that the cost of the asset be allocated over the asset's useful life is the process of depreciation. For example, if we buy a delivery truck to use for the next five years, we would allocate the cost and record depreciation expense across the entire five-year period. The calculation of the depreciation expense for a period is not based on anticipated changes in the fair-market value of the asset; instead, the depreciation is based on the allocation of the cost of owning the asset over the period of its useful life.

The following items are important in determining and recording depreciation:

- Book value: the asset's original cost less accumulated depreciation.
- Useful life: the length of time the asset will be productively used within operations.
- Salvage (residual) value: the price the asset will sell for or be worth as a trade-in when its useful life expires. The determination of salvage value can be an inexact science since it requires anticipating what will occur in the future. Often, the salvage value is estimated based on past experiences with similar assets.
- Depreciable base (cost): the depreciation expense over the asset's useful life. For example, if we paid $50,000 for an asset and anticipate a salvage value of $10,000, the depreciable base is $40,000. We expect $40,000 in depreciation over the time period in which the asset was used, and then it would be sold for $10,000.

Depreciation records an expense for the value of an asset consumed and removes that portion of the asset from the balance sheet. The journal entry to record depreciation is shown in Figure 4.11.

4 United States Securities and Exchange Commission. "Waste Management, Inc. Founder and Five Other Former Top Officers Sued for Massive Earnings Management Fraud." March 26, 2002. https://www.sec.gov/litigation/litreleases/lr17435.htm

Journal			
Date	**Account**	**Debit**	**Credit**
Jan. 1	Depreciation Expense	XXX	
	Accumulated Depreciation		XXX
	To record depreciation on asset for period		

Figure 4.11 Journal Entry for Depreciation Expense

Depreciation expense is a common operating expense that appears on an income statement. It represents the amount of expense being recognized in the current period. Accumulated depreciation, on the other hand, represents the sum of all depreciation expense recognized to date, or the total of all prior depreciation expense for the asset. It is a contra account, meaning it is attached to another account and is used to offset the main account balance that records the total depreciation expense for a fixed asset over its life. In this case, the asset account stays recorded at the historical value but is offset on the balance sheet by accumulated depreciation. Accumulated depreciation is subtracted from the historical cost of the asset on the balance sheet to show the asset at book value. Book value is the amount of the asset that has not been allocated to expense through depreciation.

It is important to note, however, that not all long-term assets are depreciated. For example, land is not depreciated because depreciation is the allocating of the expense of an asset over its useful life. How can one determine a useful life for land? It is assumed that land has an unlimited useful life; therefore, it is not depreciated, and it remains on the books at historical cost.

Once it is determined that depreciation should be accounted for, there are three methods that are most commonly used to calculate the allocation of depreciation expense: the *straight-line method*, the *units-of-production method*, and the *double-declining-balance method*. A fourth method, the *sum-of-the-years-digits* method, is another *accelerated* option that has been losing popularity and can be learned in intermediate accounting courses. Note that these methods are for accounting and reporting purposes. The IRS allows firms to use the same or different methods to depreciate assets in calculating taxable income.

THINK IT THROUGH

Fixed Assets

You work for Georgia-Pacific as an accountant in charge of the fixed assets subsidiary ledger at a production and warehouse facility in Pennsylvania. The facility is in the process of updating and replacing several asset categories, including warehouse storage units, fork trucks, and equipment on the production line. It is your job to keep the information in the fixed assets subsidiary ledger up to date and accurate. You need information on original historical cost, estimated useful life, salvage value, depreciation methods, and additional capital expenditures. You are excited about the new purchases and upgrades to the facility and how they will help the company serve its customers better. However, you have been in your current position for only a few years and have never overseen extensive updates, and you realize that you will have to gather a lot of information at once to keep the accounting records accurate. You feel overwhelmed and take a minute to catch your breath and think through what you need. After a few minutes, you realize that you have many people and many resources to work with to tackle this project. Whom will you work with, and how will you go about gathering what you need?

Solution:

Though answers may vary, common resources would likely include purchasing managers (those actually buying the new equipment), maintenance managers (those who will repair and take care of the new equipment), and line managers (those in charge of the departments that will use the new equipment). To

gather the information needed, set up short meetings to visit with the individuals involved, walk around to see the equipment, and ask questions about functionality, life span, common problems or repairs, and more.

Assume that on January 1, Liam bought a silk screen machine for $54,000. Liam pays shipping costs of $1,500 and setup costs of $2,500 and assumes a useful life of five years or 960,000 prints. Based on experience, Liam anticipates a salvage value of $10,000. Recall that determination of the costs to be depreciated requires including all costs that prepare the asset for use by the company. Liam's example would include shipping and setup costs. Any costs for maintaining or repairing the equipment would be treated as regular expenses, so the total cost would be $58,000, and after allowing for an anticipated salvage value of $10,000 in five years, the business could take $48,000 in depreciation over the machine's economic life (see Figure 4.12).

	Total Cost
Purchase Price	$ 54,000
Shipping Costs	1,500
Set-up Costs	2,500
Total Cost	$ 58,000
– Salvage Value	(10,000)
Depreciable Base	$ 48,000

Figure 4.12 Purchase Price and Depreciable Base

Straight-line depreciation is a method of depreciation that evenly splits the depreciable amount across the useful life of the asset. Therefore, we must determine the yearly depreciation expense by dividing the depreciable base of $48,000 by the economic life of five years, giving an annual depreciation expense of $9,600. The journal entries to record the first two years of expenses are shown, along with the balance sheet information. Here are the journal entry and information for year one (Figure 4.13):

Journal			
Date	**Account**	**Debit**	**Credit**
Dec. 31	Depreciation Expense: Silk Screen Machine	9,600	
	Accumulated Depreciation: Silk Screen Machine		9,600
	To record depreciation on asset for period		

Silk Screen Machine	$ 58,000
– Accumulated Depreciation: Silk Screen Machine	(9,600)
Net Book Value	$ 48,400

Figure 4.13 Journal Entry for Silk Screen Machine Depreciation Expense, Year 1

After the journal entry in year one, the machine would have a book value of $48,400. This is the original cost of $58,000 less the accumulated depreciation of $9,600. The journal entry and information for year two are shown in Figure 4.14.

Journal			
Date	**Account**	**Debit**	**Credit**
Dec. 31	Depreciation Expense: Silk Screen Machine	9,600	
	Accumulated Depreciation: Silk Screen Machine		9,600
	To record depreciation on asset for period		

Silk Screen Machine	$ 58,000
– Accumulated Depreciation: Silk Screen Machine	(19,200)
Net Book Value	$ 38,800

Figure 4.14 Journal Entry for Silk Screen Machine Depreciation Expense, Year 2

Liam records an annual depreciation expense of $9,600. Each year, the accumulated depreciation balance increases by $9,600, and the machine's book value decreases by the same $9,600. At the end of five years, the asset will have a book value of $10,000, which is calculated by subtracting the accumulated depreciation of $\$48{,}000\ (5 \times \$9{,}600)$ from the cost of $58,000.

Units-of-Production Depreciation

Straight-line depreciation is efficient accounting for assets used consistently over their lifetime, but what about assets that are used with less regularity? The units-of-production depreciation method bases depreciation on the actual usage of the asset, which is more appropriate when an asset's life is a function of usage instead of time. For example, this method could account for depreciation of a silk screen machine for which the depreciable base is $48,000 (as in the straight-line method), but now the number of prints is important.

In our example, the machine will have total depreciation of $48,000 over its useful life of 960,000 prints. Therefore, we would divide $48,000 by 960,000 prints to get a cost per print of $0.05. If Liam printed 180,000 items in the first year, the depreciation expense would be $180{,}000 \text{ prints} \times \$0.05 \text{ per print}$, or $\$9{,}000$. The journal entry to record this expense would be the same as with straight-line depreciation: only the dollar amount would have changed. The presentation of accumulated depreciation and the calculation of the book value would also be the same. Liam would continue to depreciate the asset until a total of $48,000 in depreciation was taken after running 960,000 total prints.

THINK IT THROUGH

Deciding on a Depreciation Method

Liam is struggling to determine which deprecation method they should use for their new silk screen machine. They expect sales to increase over the next five years. They also expect (hope) that in two years they will need to buy a second silk screen machine to keep up with the demand for products of their growing company. Which depreciation method makes more sense for Liam: higher expenses in the first few years or keeping expenses consistent over time? Or would it be better for them to think not in terms of time, but rather in the usage of the machine?

Double-Declining-Balance Depreciation

The double-declining-balance depreciation method is the most complex of the three methods because it accounts for both time and usage and takes more expense in the first few years of the asset's life. Double declining considers time by determining the percentage of depreciation expense that would exist under straight-line depreciation. To calculate this, divide 100 percent by the estimated life in years. For example, a five-year asset would be 100/5, or 20 percent a year. A four-year asset would be 100/4, or 25 percent a year. Next, because assets are typically more efficient and are used more heavily early in their life span, the double-

declining method takes usage into account by doubling the straight-line percentage. For a four-year asset, multiply 25 percent $(100\%/4\text{-year life}) \times 2$, or 50 percent. For a five-year asset, multiply 20 percent $(100\%/5\text{-year life}) \times 2$, or 40 percent.

One unique feature of the double-declining-balance method is that in the first year, the estimated salvage value is not subtracted from the total asset cost before calculating the first year's depreciation expense. Instead, the total cost is multiplied by the calculated percentage. However, depreciation expense is not permitted to take the book value below the estimated salvage value, as demonstrated in Figure 4.15.

Year	Depreciation Expense	Accumulated Depreciation	Book Value
			$58,000
1: $58,000 × 40% =	$23,200	$23,200	34,800
2: $34,800 × 40% =	13,920	37,120	20,880
3: $20,880 × 40% =	8,352	45,472	12,528
4: $12,528 − $10,000 =	2,528	48,000	10,000
5	0	48,000	10,000
Total	$48,000	$48,000	$10,000

Figure 4.15 Depreciation Expense, Accumulated Depreciation, and Book Value, Years 1–5

Notice that in year four, the remaining book value of $12,528 was not multiplied by 40 percent. This is because the expense would have been $5,011.20, and since we cannot depreciate the asset below the estimated salvage value of $10,000, the expense cannot exceed $2,528, which is the amount left to depreciate (difference between the book value of $12,528 and the salvage value of $10,000). Since the asset has been depreciated to its salvage value at the end of year four, no depreciation can be taken in year five.

In our example, the first year's double-declining-balance depreciation expense would be $\$58{,}000 \times 40\%$, or $\$23{,}200$. For the remaining years, the double-declining percentage is multiplied by the remaining book value of the asset. Liam would continue to depreciate the asset until the book value and the estimated salvage value are the same (in this case, $10,000). The net effect of the differences in straight-line depreciation versus double-declining-balance depreciation is that under the double-declining-balance method, the allowable depreciation expenses are greater in the earlier years than those allowed for straight-line depreciation. However, over the depreciable life of the asset, the total depreciation expense taken will be the same no matter which method the entity chooses. In the current example, both straight-line and double-declining-balance depreciation will provide a total depreciation expense of $48,000 over its five-year depreciable life.

LINK TO LEARNING

McDonald's Corporation

See Form 10-K (https://openstax.org/r/2019-annual-report-pdf) that was filed with the SEC to determine which depreciation method McDonald's Corporation used for its long-term assets in 2019.

Hint: Use the search feature to search for key words in an annual report to find information more quickly. For example, search "depreciation." You should find the information you are looking for on page 40 of the annual report.

Based on the company's business model and the industry in which it operates, why do you think McDonald's chose this method of depreciating assets? Do you agree with this choice? Why or why not?

Summary of Depreciation

Table 4.2 and Figure 4.16 compare the three methods discussed. Note that although each time-based (straight-line and double-declining balance) annual depreciation expense is different, after five years the total amount depreciated (accumulated depreciation) is the same. This occurs because at the end of the asset's useful life, it was expected to be worth $10,000: thus, both methods depreciated the asset's value by $48,000 over that time period.

Depreciation Method	Calculation
Straight line	(Cost − Salvage Value)/Useful Life
Units of production	(Cost − Salvage Value) × (Units Produced in Current Period /Estimated Total Units to Be Produced)
Double-declining balance	Book Value × Straight − Line Annual Depreciation Percentage × 2

Table 4.2 Three Methods of Calculating Depreciation Expense

Period	Straight-Line Depreciation Method	Units of Production Method		Double-Declining-Balance Method
Year 1	$ 9,600	(180,000 units)	$ 9,000	$23,200
Year 2	9,600	(200,000 units)	10,000	13,920
Year 3	9,600	(210,000 units)	10,500	8,352
Year 4	9,600	(190,000 units)	9,500	2,528
Year 5	9,600	(180,000 units)	9,000	0
Total	$48,000		$48,000	$48,000

Figure 4.16 Straight-Line Depreciation, Units of Production, Double-Declining Balance Method, Years 1–5

When analyzing depreciation, accountants are required to make a supportable estimate of an asset's useful life and its salvage value. However, "management teams typically fail to invest either time or attention into making or periodically revisiting and revising reasonably supportable estimates of asset lives or salvage values, or the selection of depreciation methods, as prescribed by GAAP."[5] This failure is not an ethical approach to properly accounting for the use of assets.

Accountants need to analyze depreciation of an asset over the entire useful life of the asset. As an asset supports the cash flow of the organization, expensing its cost needs to be allocated, not just recorded as an arbitrary calculation. An asset's depreciation may change over its life according to its use. If asset depreciation is arbitrarily determined, the recorded "gains or losses on the disposition of depreciable property assets seen in financial statements"[6] are not true best estimates. Due to operational changes, the depreciation expense needs to be periodically reevaluated and adjusted.

Any mischaracterization of asset usage is not proper GAAP and is not proper accrual accounting. Therefore, "financial statement preparers, as well as their accountants and auditors, should pay more attention to the quality of depreciation-related estimates and their possible mischaracterization and losses of credits and charges to operations as disposal gains."[7] An accountant should always follow GAAP guidelines and allocate the expense of an asset according to its usage.

5 Howard B. Levy. "Depreciable Asset Lives: The Forgotten Estimate in GAAP." *The CPA Journal.* September 2016. cpajournal.com/2016/09/08/depreciable-asset-lives/
6 Ibid.

CONCEPTS IN PRACTICE

Ethical Considerations: How WorldCom's Improper Capitalization of Costs Almost Shut Down the Internet

In 2002, telecommunications giant WorldCom filed for the largest Chapter 11 bankruptcy to date, a situation resulting from manipulation of its accounting records.[8] At the time, WorldCom operated nearly a third of the bandwidth of the 20 largest US internet backbone routes, connecting over 3,400 global networks that serviced more than 70,000 businesses in 114 countries.[9]

WorldCom used a number of accounting gimmicks to defraud investors, mainly including capitalizing costs that should have been expensed. Under normal circumstances, this might have been considered just another accounting fiasco leading to the end of a company. However, WorldCom controlled a large percentage of backbone routes, a major component of the hardware supporting the internet, as even the Securities and Exchange Commission recognized. If such an event were to happen today, it could shut down international commerce and would be considered a national emergency.[10] As demonstrated by WorldCom, the unethical behavior of a few accountants could have shut down the world's online businesses and international commerce. An accountant's job is fundamental and important: keep businesses operating in a transparent fashion.

(Sources: "WorldCom (UNNET)." *Cybertelecom*. n.d. http://www.cybertelecom.org/industry/wcom.htm; Dennis R. Beresford, Nicholas DeB. Katzenbach, and C. B. Rogers, Jr. "Report of the Special Investigative Committee of the Board of Directors of WorldCom, Inc." US Securities and Exchange Commission. March 31, 2003. https://www.sec.gov/Archives/edgar/data/723527/000093176303001862/dex991.htm)

4.5 What Is "Profit" versus "Loss" for the Company?

Learning Outcomes

By the end of this section, you will be able to:

- Outline the components necessary to calculate profit or loss.
- Contrast revenue and gains versus expenses and losses.
- Differentiate revenue and expense versus receipt or payment of cash.

It's a common misconception that if a business has cash they are making a profit, and if they are suffering a loss they must not have any cash. While this could be true, it's not necessarily true. In this section you'll explore key differences between cash flow, revenue, expense, profits, and losses.

Calculating Profit and Loss

Net income (net loss) is determined by comparing revenues and expenses. Net income is a result of revenues (inflows) being greater than expenses (outflows). A net loss occurs when expenses (outflows) are greater than revenues (inflows). In accounting it is common to present net income in the following format:

Recall that revenue is the value of goods and services a business provides to its customers and increases the value of the business. Expenses, on the other hand, are the costs of providing the goods and services and decrease the value of the business. When revenues exceed expenses, companies have net income. This means the business has been successful at earning revenues, containing expenses, or a combination of both. If, on the other hand, expenses exceed revenues, companies experience a net loss. This means the business was

7 Ibid.
8 Luisa Beltran. "WorldCom Files Largest Bankruptcy Ever." *CNN Money*. July 22, 2002. https://money.cnn.com/2002/07/19/news/worldcom_bankruptcy/
9 Jeff Keefe. *Monopoly.com: Will the WorldCom–MCI Merger Tangle the Web*? Washington, DC: Economic Policy Institute, 1998. https://www.epi.org/publication/monopoly-will-the-worldcom-mci-merger-tangle-the-web/
10 Dan Schiller. *Bad Deal of the Century: The Worrisome Implications of the WorldCom–MCI Merger*. Washington, DC: Economic Policy Institute, 1998. https://www.epi.org/publication/studies_baddealfull/

unsuccessful in earning adequate revenues, sufficiently containing expenses, or a combination of both. While businesses work hard to avoid net loss situations, it is not uncommon for a company to sustain a net loss from time to time. It is difficult, however, for businesses to remain viable while experiencing net losses over the long term.

Shown as a formula, the net income (loss) function is:

$$\text{Revenues } (R) - \text{Expenses } (E) = \text{Net Income (when } R > E)$$
$$\text{Revenues } (R) - \text{Expenses } (E) = \text{Net Loss (when } E > R)$$

To be complete, we must also consider the impact of gains and losses. While gains and losses are infrequent in a business, it is not uncommon that a business would present a gain and/or loss in its financial statements. Recall that gains are similar to revenue and losses are similar to expenses. Therefore, the traditional accounting format would be as shown in Figure 4.17.

Gains and Losses
Revenue (sometimes called Sales or Fees Earned) + Gains – Expenses – Losses Net Income (or Net Loss)

Figure 4.17 Gains and Losses

Shown as a formula, the net income (loss) function, including gains and losses, is:

$$\text{Revenues } (R) + \text{Gains } (G) - \text{Expenses } (E) - \text{Losses } (L) = \text{Net Income } [\text{when } (R + G) > (E + L)]$$
$$\text{Revenues } (R) + \text{Gains } (G) - \text{Expenses } (E) - \text{Losses } (L) = \text{Net Loss } [\text{when } (E + L) > (R + G)]$$

When assessing a company's net income, it is important to understand the source of the net income. Businesses strive to attain "high quality" net income (earnings). High-quality earnings are based on sustainable earnings, also called permanent earnings, while relying less on infrequent earnings, also called temporary earnings. Recall that revenues represent the ongoing value of goods and services the business provides (sells) to its customers, while gains are infrequent and involve items ancillary to the primary purpose of the business. For example, assume a bakery sells the truck it uses to deliver wedding cakes and experiences a gain on the sale. The bakery is not in the business of buying and selling trucks. It is in the baked goods business. Thus, the gain on the sale of the truck would be ancillary to the primary purpose of the business and represent a gain rather than revenue. We should use caution if a business attains a significant portion of its net income as a result of gains rather than revenues. Likewise, net losses derived as a result of losses should be put into the proper perspective due to the infrequent nature of losses. While net losses are undesirable for any reason, net losses that result from expenses related to ongoing operations, rather than losses that are infrequent, are more concerning for the business.

Profit versus Cash Flow

Knowing the difference between the cash basis and accrual basis of accounting is necessary to understand the need for the statement of cash flows. Stakeholders need to know the financial performance (as measured by the income statement—that is, net income or net loss) and financial position (as measured by the balance sheet—that is, assets, liabilities, and owners' equity) of the business. This information is provided in the income statement, statement of owner's equity, and balance sheet. However, since these financial statements are prepared using accrual accounting, stakeholders do not have a clear picture of the business's cash activities. The statement of cash flows solves this inadequacy by specifically focusing on the cash inflows and cash outflows. It also helps better delineate the difference between revenues and cash flow in versus expenses and cash flow out. As mentioned in prior sections, revenue can occur without cash actually flowing. For

example, a customer may buy a good on account. Revenues would be recorded, but cash would not yet be received. The same is true on the expenses side. An expense can be incurred, such as an electric bill, but cash may not have been paid out yet. Thus, an expense is recorded and recognized on the income statement, but cash has not yet been given up. The statement of cash flows helps reconcile the difference between net income (a result of recorded revenues and expenses) and actual cash flow.

Summary

4.1 Cash versus Accrual Accounting

Cash-basis accounting records revenues and expenses only when cash is received or distributed. Accrual-basis accounting, on the other hand, records revenues and expenses when they are earned or incurred rather than waiting until cash changes hands. Most publicly traded companies are required by the SEC to use accrual-basis accounting. Generally, smaller businesses that deal primarily in cash are the best candidates for using the cash basis since the accrual method more accurately depicts net income or net loss each period.

4.2 Economic Basis for Accrual Accounting

Double-entry accounting means that each time a transaction is recorded, there are at minimum two accounts impacted by the entry. Each entry's debits must total its credits in order to support and maintain the balance in the accounting equation. The accounting equation is expressed as

$$\text{Assets} = \text{Liabilities} + \text{Owner's Equity}.$$

4.3 How Does a Company Recognize a Sale and an Expense?

In accrual accounting, the timing of revenues (when to record them) is governed by the revenue recognition principle. The principle indicates that revenue is only recognized on the income statement once it is earned. This means goods or services must have been delivered or rendered. Expenses, on the other hand, are guided by the expense recognition principle, which dictates that expenses must be recorded in the period in which they are incurred.

4.4 When Should a Company Capitalize or Expense an Item?

Determining when an item is actually an expense depends on whether it is capitalized (a fixed asset) or not. Fixed assets are those that are of significant value and last longer than one year. The cost of fixed assets is capitalized (placed on the balance sheet as an asset) and expensed over the useful life of the asset by recording depreciation. Depreciation can be calculated using straight-line, double-declining-balance, or units-of-production methods.

4.5 What Is "Profit" versus "Loss" for the Company?

Profit or loss for a company is calculated by subtracting expenses from revenue. The result is a profit if revenues are larger than expenses. Profit (or loss) is the money earned from the day-to-day general business operations. Gains and losses, on the other hand, occur when the business does something they don't normally do (like sell a piece of their equipment) and earns or loses money on the transaction. It's key to note that the timing of cash flows can vary from the timing of recording revenues or expenses. Thus a revenue does not necessarily equal cash in, and an expense does not necessarily equal a cash flow out.

Key Terms

accounting equation $\text{Assets} = \text{Liabilities} + \text{Owner's Equity}$

accrual-basis accounting an accounting system in which revenue is recorded or recognized when earned yet not necessarily received, and in which expenses are recorded when legally incurred and not necessarily when paid

capitalize the process in which a long-term asset is recorded on the balance sheet and its allocated costs are expensed on the income statement over the asset's economic life

cash-basis accounting a method of accounting in which transactions are not recorded in the financial statements until there is an exchange of cash

credit a record of financial information on the right side of an account

debit a record of financial information on the left side of each account

depreciation the process of allocating the costs of a tangible asset over the asset's economic life
double-entry accounting an accounting method that requires the sum of the debits to equal the sum of the credits for each transaction
expense a cost associated with providing goods or services
expense recognition (also, matching principle) matches expenses with associated revenues in the period in which the revenues were generated
gains increases in organizational value from activities that are "incidental or peripheral" to the primary purpose of the business
income statement a financial statement that measures the organization's financial performance for a given period of time
long-term asset asset used in the normal, ongoing course of business for more than one year that is not intended to be resold
losses decreases in organizational value from activities that are "incidental or peripheral" to the primary purpose of the business
net income income earned when revenues and gains are greater than expenses and losses
revenue inflows or other enhancements of assets of an entity or settlements of its liabilities (or a combination of both) from delivering or producing goods, rendering services, or other activities that constitute the entity's ongoing major or central operations
revenue recognition principle stating that a company must recognize revenue in the period in which it is earned; it is not considered earned until a product or service has been provided
T-account a graphic representation of a general ledger account in which each account is visually split into left and right sides
tangible asset an asset that has physical substance

Multiple Choice

1. Which method of accounting must be used by publicly traded companies?
   a. cash basis
   b. accrual basis
   c. a hybrid of cash and accrual basis
   d. modified accelerated basis

2. Which two accounting principles directly support the accrual method of accounting?
   a. periodicity, transparency
   b. historical cost, time period
   c. conservativism, going concern
   d. expense recognition, revenue recognition

3. Which of the following account types has a normal debit balance?
   a. cash
   b. notes payable
   c. wages payable
   d. revenue

4. Sara sells $100 worth of inventory to her client on credit on January 15. She delivers the inventory to the client on January 20. The client pays for the inventory of February 26. On what date should Sara recognize the revenue from the sale?
   a. January 15
   b. January 20
   c. January 31

d. February 26

5. How is the book value of a fixed asset calculated?
   a. original cost less accumulated depreciation
   b. original cost divided by useful life
   c. market value less depreciation expense
   d. depreciable base less market value

6. Which of the following balance sheet item is classified as a fixed asset?
   a. inventory
   b. goodwill
   c. equipment
   d. accounts receivable

7. What is the formula to determine net income or net loss?
   a. revenues less expenses
   b. cash less expenses
   c. revenues plus cash
   d. revenues divided by expenses

Review Questions

1. Joe runs a small barbershop. Most of his customers pay with cash. He has only a few monthly expenses including wages for one employee and utilities. Which method of accounting should Joe use?
2. Which method of accounting generally provides the most accurate information on organizational performance (income or loss)?
3. Under the accrual basis of accounting, when is an expense recorded?
4. Describe the basic elements of a T-account.
5. What is double-entry accounting?
6. What is the expense recognition principle?
7. Why is ethics an important concept pertaining to revenue and expense recognition principles?
8. What is the revenue recognition principle?
9. What is the difference between a tangible and an intangible fixed asset? List common examples of each.
10. How is the cost of a fixed asset recorded and recognized over time?

Problems

1. Padma's Pools Inc. paid $500 for office supplies. What was the impact of this transaction on Padma's cash flow?
2. Sally's BigBox Store issued 1,000 shares of common stock with par value of $10 each and market value of $16 each in exchange for a new building. What was the impact of this transaction on Sally's cash flow?
3. Jose sells $500 worth of merchandise to a client on June 1. He delivers the product and invoices the customer on June 10. The customer pays Jose on July 9. What is Jose's revenue for June and July, respectively, under the cash and accrual methods of accounting?

4. Jamal's Car Repair purchases a new piece of equipment with a 10-year useful life for $10,000. What is the impact to Jamal's net income in the year of purchase if he expenses the equipment? If he capitalizes it using straight-line depreciation?
5. Mariela's Shop had revenues of $10,000 and expenses of $6,000 and has cash on hand of $5,000. What is Mariela's net income or net loss?

Video Activity

Depreciation Basics! With Journal Entries

Click to view content (https://openstax.org/r/depreciation-basics)

1. In what ways do depreciation and capitalization impact the income statement? If you were an investor considering investing a large sum of money into a company, what questions would you ask or what accounts would you look at to assess the impact to their income statement specifically? How would the characteristics of capitalization affect your feelings toward investing in the company?
2. If a company spends a large sum of cash to invest in equipment or another fixed asset, resulting in a loss that year on the income statement if they expense it, have they really experienced a loss? Or have they simply traded one asset for another? How does this delineation relate to capitalizing an asset and spreading out the cost throughout its useful life? Do you feel the depreciation process is ethical? Or do you feel it hides the true cost of business from being fully transparent on the financial statements? Explain your answer.

Difference between Cash Flow and Profit

Click to view content (https://openstax.org/r/difference-cashflow-profit)

3. When a business incurs an expense (office supplies, utilities, or wages, for example), is their cash flow the same in both timing and amount as the expense they recognize?
4. What are the key components necessary to calculate profit or loss for a business? Are they the same elements necessary to calculate cash flow?

5

Financial Statements

Figure 5.1 Financial statements are needed to understand a firm's financial position and performance. (credit: modification of work "Drowning by Numbers" by Jorge Franganillo/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

People say that accounting is the "language of business." Using the language of business, accountants are able to communicate the financial performance and health of a firm via four key financial statements. These statements are the income statement, balance sheet, statement of owner's equity, and statement of cash flows. Each statement provides different insights into a firm's performance and financial health. Though some users may favor one or two statements over another, they are best used together to get a full picture.

In this chapter, you'll be introduced to a firm called Clear Lake Sporting Goods. Clear Lake Sporting Goods is a small merchandising company (a company that buys finished goods and sells them to consumers) that sells hunting and fishing gear. It needs financial statements to understand its profitability and current financial position, manage cash flow, and communicate its finances to outside parties like investors, governing bodies, and lenders. We will walk through each financial statement, its components, how they are connected, and how financial statement users understand each one.

5.1 The Income Statement

Learning Outcomes

By the end of this section, you will be able to:

- Outline the purpose and importance of the income statement.
- Identify the structure and key elements of the income statement.
- Discuss the use of EBITDA as a measure of a company's profit.

Financial information flows from one financial statement to the next. Thus, the statements are prepared in a specific order. The first statement prepared is the income statement.

Functionality of the Income Statement

The **income statement** shows a firm's performance over a specific period of time. The statement helps financial statement users understand the sales generated during the period and the **expenses** incurred to generate those sales. If the expenses are smaller than the sales, the net result is profitability, or net income, rather than a net **loss**.

Breaking the income statement down into smaller pieces provides a more transparent view of the firm's performance, allowing users to see more clearly what areas of the business incurred expenses. This is helpful to management in driving improvements and to outside users in assessing performance.

Sales and Gross Profit

The first section of the income statement begins with sales. Though financial statements are required to follow a certain format, account names can differ slightly from one firm to another. You may see the first line, often referred to as *the top line*, called *sales*, *sales revenue*, ***revenue***, *service revenues*, and other similar titles. All of these titles are meant to reflect the sales generated by selling product to customers in the day-to-day business. On Clear Lake's income statement in Figure 5.2, we see its top line referred to as Sales.

Income from items that aren't common to the firm's day-to-day business are reported as **gains** and losses, and they are reported further down in the income statement rather than at the top line with its regular, core business activities. This is to ensure that anomalies like selling a machine or a loss on retiring a bond don't mislead financial statement users as to the general performance of the firm and impact their assumptions of future results.

Firms report their sales and any reductions to sales separately on the income statement. They begin with gross sales, which includes all sales to customers. Clear Lake reported gross sales of $105,000 last year and $126,000 this year. The next line is sales returns and allowances, which is deducted from gross sales in order to find net sales. Clear Lake's sales returns and allowances were $5,000 and $6,000 respectively, leaving the company with net sales of $100,000 and $120,000 respectively

$$(\$105{,}000 - \$5{,}000 \text{ and } \$126{,}000 - \$6{,}000)\,.$$

Next, the cost of goods sold (COGS) is deducted from net sales in order to arrive at gross profit. (It is customary to refer to sales minus COGS as gross profit because gross margin = gross profit/sales.) Cost of goods sold includes the costs directly involved in making the product that was sold during the period. Common examples of costs included in cost of goods sold include direct labor, direct materials, and the overhead assigned to the product in production. For a service business, this would include its direct labor and any materials used to deliver its services. For a retail firm like Clear Lake Sporting Goods, this would include the costs of all the goods it purchased for resale. Clear Lake's COGS is seen at $50,000 and $60,000 for the prior and current years. Note that different types of companies will have different types of costs deducted in their Cost of Goods section. Clear Lake Sporting Goods is a retailer, or merchandiser that buys good to resell. Their cost of goods includes the cost of goods they purchased to resell. In the link to learning, you will explore Apple, a technology manufacturer. Their cost of goods would include the cost to manufacture the goods they

sell. Another type of firm is a service firm. A law office, for example, would include primarily the cost of labor in their cost of services.

Gross profit is a reflection of how profitable the firm's performance was in its core business function. It includes only the core business and direct costs of performing that business. If the company were a shoe company, gross profit would show how profitable the company was in simply making the shoes it sold. If it were a bakery, gross profit would show how profitable the company was in simply baking the goods it sold. Gross profit shows financial statement users how effective the business is at generating top-line profits on their core business function. It does not reflect the performance of other areas of the firm such as other operating costs to support the direct production process, indirect costs, and financing.

For Clear Lake Sporting Goods, we see its gross profit in Figure 5.2. The company earned $50,000 of gross profit ($\$100{,}000 - \$50{,}000$) the prior year and $60,000 in the current year ($\$120{,}000 - \$60{,}000$).

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	$ 50,000	$ 60,000

Figure 5.2 Income Statement through Gross Profit Line

LINK TO LEARNING

Gross Profit

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the income statement (it begins on page 31). Review gross sales, sales returns and allowances, and net sales for the last few years. What can you learn about the company's recent performance in the area of sales? Is the gross sales line improving? How about the sales returns and allowances line? Has it improved or declined or simply changed incrementally with gross sales?

Review the firm's gross profit for the past few years. Has it improved or declined? Consider the company's improvement (or decline) in gross sales as compared to the improvement or decline in gross profit. Does it reflect any change in performance over time (earning more or less gross profit on its gross sales)?

Income from Operations

Gross profit is a very helpful measure, but it is only the first of several provided by the income statement. After gross profit is calculated, other operating expenses are deducted in order to calculate the firm's income from operations, also commonly called operating income. Common operating costs found in this section include building rent and utilities, property taxes, wages and salaries, and other overhead costs. In Figure 5.3, we can see Clear Lake's operating expenses. To sell its hunting and fishing equipment in the current year, Clear Lake Sporting Goods paid rent for its building ($5,500) and utilities for its retail and warehouse spaces ($2,500); recorded **depreciation** on equipment, buildings, and store furnishings (shelves, racks, etc.) ($3,600); and paid salaries to its indirect employees in accounting, purchasing, and human resources ($5,400). The company's operating expenses are deducted from gross profit to arrive at operating income

$$(\$60{,}000 - 5{,}500 - 3{,}600 - 5{,}400 - 2{,}500 = \$43{,}000)\,.$$

While gross profit reflects only how profitable the firm was in making its core product, operating income

reflects how profitable the firm's daily operations were as a whole. This still does not include other miscellaneous items outside the scope of a firm's normal business. Just as the name implies, it shows income from the core operations of the firm.

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	$ 38,000	$ 43,000

Figure 5.3 Income Statement through Income from Operations

We can see that the company was able to generate $\$20{,}000$ ($\$120{,}000 - \$100{,}000$) more in net sales in the current year than the prior year. However, it only generated $\$10{,}000$ ($\$60{,}000 - \$50{,}000$) in gross profit and $\$5{,}000$ ($\$43{,}000 - \$38{,}000$) of additional operating income. Further investigation shows that while net sales increased, so did the direct costs of its goods (COGS) and its operating expenses.

We will further explore how to assess each of these expenses later in the chapter using common-size analysis. Common-size analysis reflects each element of a financial statement as a percentage of the base. In the case of the income statement, the base is net sales. Here we would see that COGS was 50 percent of net sales in both the current ($\$60{,}000/\$120{,}000$) and prior year ($\$50{,}000/\$100{,}000$), indicating there wasn't any significant change in performance we could detect from the information provided in the income statement.

LINK TO LEARNING

Operating Expenses

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the company's income statement (the income statement begins on page 31). Review Apple's operating income for the last few years. Has it improved or declined? Does this fall in line with your expectations based on your previous review of the company's net sales and gross profit?

Based on the improvement or decline in operating income, review Apple's operating expenses to investigate. Have any of the operating expenses changed significantly? How did that impact the company's operating income? What might it tell you about the company's performance?

Net Income

Finally, we move on to **net income**, or what is commonly referred to as *the bottom line*. Net income (or loss) reflects the net impact of all financial transactions for the firm, including those that are caused by events outside the normal course of business. The most common items deducted from operating income to arrive at net income include interest expense, gains/losses, and income tax expense. Remember, gains and losses are those that result from unusual transactions outside the normal course of business. Examples include selling a piece of old equipment or a loss on retiring debt.

We can see in Figure 5.4 that Clear Lake Sporting Goods has outstanding debt, so it incurred interest expense

of $2,000 in the current year and $3,000 the prior year. Since it recorded net income (not a loss), it must also record income tax expense of $6,000 in the current and $5,000 in the prior year.

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Figure 5.4 Comparative Year-End Income Statement

EBITDA (Earnings before Interest, Taxes, Depreciation, and Amortization)

Now that we have a full income statement, we can look at another commonly used measure of financial performance called EBITDA. EBITDA stands for earnings before interest, taxes, depreciation, and amortization. Amortization is similar to depreciation. It is the spreading of the cost of an intangible asset over the course of its useful life. Intangible assets are long-term assets that lack physical substance, such as patents and copyrights.

Since EBITDA removes noncash items from the net income equation, it is considered a useful measure in assessing the cash flows provided by operating activities. We will assess cash flows using the **statement of cash flows** and various other cash flow measures later in this chapter as well.

As shown in Figure 5.5, Clear Lake Sporting Goods' EBITDA in the prior year was

$$\$19{,}500\ (\$30{,}000 - \$3{,}000 - \$5{,}000 - \$2{,}500)$$

and in the current year was

$$\$23{,}400\ (\$35{,}000 - \$2{,}000 - \$6{,}000 - \$3{,}600).$$

Clear Lake Sporting Goods Comparative Year-End Income Statements		
	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Figure 5.5 EBITDA (Earnings before Interest, Taxes, Depreciation, and Amortization)

THINK IT THROUGH

Net Income

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the company's income statement (the income statement begins on page 31). Review net income for the last few years. Has it improved or declined? Does this fall in line with your expectations based on your previous review of the company's operating income?

Solution:

Net income improved in the current year over last year but declined from 2018 to 2019 (from $59,531 to $55,256). Apple's EBITDA in 2020 was 108.89. (Amounts are in millions.)

5.2 The Balance Sheet

Learning Outcomes

By the end of this section, you will be able to:

- Outline the purpose and importance of the balance sheet.
- Identify the structure and key elements of the balance sheet.

The Accounting Equation and the Classified Balance Sheet

Recall that the income statement shows the performance of a firm over the course of time. The classified balance sheet shows the financial state of a company as of a specific point in time. It is a key distinction between the two statements. The classified balance sheet is prepared in sections that align with the accounting equation.

Remember, the **accounting equation** reflects the **assets** (items owned by the organization) and how they were obtained (by incurring **liabilities** or provided by owners). Liabilities are debts owed to other parties. Stated differently, every asset has a claim against it—by creditors and/or owners.

$$\text{Assets} = \text{Liabilities} + \text{Owner's Equity}$$

The classified balance sheet is thus broken down into three sections; assets, liabilities, and owner's equity. If

prepared correctly, the total assets on the balance sheet equals the total liabilities and owner's equity sections of the balance sheet.

The classified balance sheet is considered or termed *classified* when the assets and liabilities within the balance sheet are grouped into even smaller sections: current and noncurrent (see Figure 5.6). Both assets and liabilities are broken down on the balance sheet into current and noncurrent classifications in order to provide more detail and transparency as well as abide by the convention of reporting in descending order of liquidity. **Current assets** are those that can be used or converted to cash within a year. Common examples of current assets include cash, inventory, accounts receivable, and short-term investments. Assets that will be in use longer than a year are considered noncurrent. Common examples of **noncurrent assets** include notes receivable, machinery and equipment, buildings, and land.

Just as we noted a few key differences in the income statements based on the type of firm, you may also notice a few slight differences in the balance sheet depending on the firm type. Clear Lake Sporting Goods is a retailer. Thus, you will see that their inventory for resale on their balance sheet is simply called "Inventory." This is the goods they have purchased for resale but have not yet sold. A manufacturer, like Apple, Inc. in the Link to Learning sections, will have a variety of inventory types including raw materials, work in progress, and finished goods inventory. These represent the various states of the inventory (ready to use, partially complete, and fully completed product). A service firm, on the other hand, may not have inventory at all. If it does, it may be simple goods it uses to help deliver its service. For example, a cleaning company may keep an inventory of cleaning supplies.

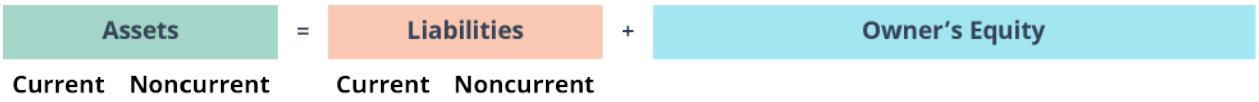


Figure 5.6 Graphical Representation of the Accounting Equation Both assets and liabilities are categorized as current and noncurrent.

Clear Lake Sporting Goods has cash, accounts receivable, inventory, short-term investments, and equipment. It rents its facilities, so it has no buildings on its balance sheets. Of all its assets, only the equipment is long term. The assets section for Clear Lake's classified balance sheet is shown in Figure 5.7.

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets		
Current Assets:		
Cash	$ 90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Assets	160,000	200,000
Noncurrent Assets:		
Equipment	40,000	50,000
Total Assets	$200,000	$250,000

Figure 5.7 Assets Section of Classified Balance Sheet

THINK IT THROUGH

Current and Noncurrent Assets

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the company's balance sheet (the balance sheet begins on page 33). What types of current assets

does the company have? What types of noncurrent assets does it have? How has the total of each type of asset changed over time?

Solution:

Apple reports cash and cash equivalents, marketable securities, accounts receivable, inventories, vendor non-trade receivables, and "other" current assets on its balance sheet. The company's current assets decreased from $162,819 in 2019 to $143,713 in 2020. Apple reports marketable securities, property, plant and equipment, and other noncurrent assets in the noncurrent asset section of its balance sheet. The company's noncurrent assets increased from $175,697 in 2019 to $180,175 in 2020. (Amounts are in millions.)

We've covered the assets side of the accounting equation; now let's turn our attention to the other side of the equation and the other two sections of the balance sheet: liabilities and equity. Just like the assets section, the liabilities section is broken down between current and noncurrent. **Current liabilities** are those that will be due within a year. Common examples of current liabilities include accounts payable, wages payable, and unearned revenue. **Noncurrent liabilities** are those that are due more than a year into the future. Notes payable is a common noncurrent liability.

Clear Lake Sporting Goods has accounts payable and has collected payments from a few customers that it hasn't yet shipped its product to (unearned revenue). It also owes money on a note payable. Its accounts payable and unearned revenue are both current liabilities. The note payable is not due for several years, thus making it a noncurrent liability (see Figure 5.8).

	Prior Year	Current Year
Current Liabilities:		
Accounts Payable	$ 60,000	$ 75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Noncurrent Liabilities:		
Notes Payable	40,000	50,000
Total Liabilities	$110,000	$150,000

Figure 5.8 Liability Section of Classified Balance Sheet

THINK IT THROUGH

Current and Noncurrent Liabilities

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate its balance sheet (the balance sheet begins on page 33). What types of current and noncurrent liabilities does the company have? How has the total of each type of liability changed over time?

Solution:

Apple has accounts payable, deferred revenue, commercial paper, and term debt listed as current liabilities. Its current liabilities declined by only a small amount from 2019 to 2020 ($105,718 to $105,392).

The company has term debt and "other" listed as noncurrent liabilities, which increased from 2019 to 2020 ($142,310 to $153,157). (Amounts are in millions.)

The stockholders' equity section of the balance sheet for corporations contains two primary categories of accounts. The first is contributed capital, which is funds paid in by owners. The second category is earned

capital, which is funds earned by the corporation as part of business operations. On the balance sheet, **retained earnings** is a key component of the earned capital section, while the stock accounts such as common stock, preferred stock, and additional paid-in capital are the primary components of the contributed capital section.

Clear Lake Sporting Goods has just one contributed capital account—common stock—and one earned capital account—retained earnings. The equity section of its balance sheet is shown in Figure 5.9.

	Prior Year	Current Year
Stockholder Equity		
Common Stock	$ 75,000	$ 80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure 5.9 Stockholders' Equity Section of Classified Balance Sheet

THINK IT THROUGH

Assets, Liability, and Equity

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the company's balance sheet (the balance sheet begins on page 33). What is the amount of the company's total assets for the most recent year? What is the amount of its total liabilities and equity?

Solution:

Apple's total assets for 2020 were $323,888, and its total liabilities and equity were also $323,888. (Amounts are in millions.)

Importance of the Balance Sheet

Now that we have gone to all the work to carefully assemble a classified balance sheet, what do we use it for? The answer lies within the accounting equation itself. Think of the accounting equation from a "sources and claims" perspective. Under this approach, the assets (items owned by the organization) were obtained by incurring liabilities or were provided by owners. Stated differently, every asset has a claim against it—by creditors and/or owners. The balance sheet shows us what the firm has (its assets), who owns them (equity), and who the firm owes (its liabilities).

Limitations of the Balance Sheet

The balance sheet is indeed a very helpful financial statement, but it also poses challenges. First, assets on the balance sheet, under generally accepted accounting principles (GAAP), are recorded at historical cost. Historical cost is simply the cost paid for the item at the time it was purchased. Changes in market value of big-ticket items like land or buildings are not reflected in the balance sheet. Land remains at historical cost, and depreciable items like buildings are reflected at their current book value (historical cost less accumulated depreciation). If the asset has appreciated over time, the higher market value of the assets would not be seen on the balance sheet.

Estimates are another limitation of the balance sheet. Items on the balance sheet such as allowance for doubtful accounts and allowance for bad debt are based on estimates. The useful lives for calculating depreciation is another common estimate. If these estimates are incorrect, the net value of the asset can be under- or overstated.

Another key limitation is the fact that a balance sheet reflects balances at only one given point in time. This

means that the account value could have been quite different on the day before or the day after the date of the balance sheet. For example, if a firm were concerned with certain ratios or investor/lender expectations of its cash balance, it could choose to not pay several vendor payments in the last week of December. Thus, on December 31, the firm reflects a high cash balance on its balance sheet. However, by the end of the first week of January, it has caught up on late vendor payments and again shows a low cash balance.

Finally, there are many possible things of value that are not recorded on the balance sheet. Internally generated assets and the firm's human capital are two common examples. Internally generated assets can be anything from a website, a process, to an idea.

5.3 The Relationship between the Balance Sheet and the Income Statement

Learning Outcomes

By the end of this section, you will be able to:

- Identify connected elements between the balance sheet and the income statement.
- Differentiate between expenses and payables.

Net Income and Retained Earnings

As mentioned earlier, the financial statements are linked by certain elements and thus must be prepared in a certain order. The income statement was first since net income (or loss) is a required figure in preparing the balance sheet. During the period close process, all temporary accounts are closed to the income summary account, which is then closed to retained earnings. All revenue and expense accounts are closed since they are temporary. The net result is either net profit or net loss as the balance in the income summary account.

Remember that the retained earnings account reflects all income the firm has earned since its inception less any **dividends** paid out to shareholders. Thus the result (net income) of the income statement feeds the retained earnings account on the balance sheet. Retained earnings is also an element of the statement of stockholders' equity, which we will cover later in this chapter.

In Figure 5.10, we see net income in the current year of $35,000, which was added to the company's prior year retained earnings balance of $15,000. Notice, however, that the prior year balance was $15,000, and the current year balance is only $20,000. It does not total $50,000 as we might have expected.

Remember, retained earnings represents all earnings since inception less any dividends paid out. Clear Lake Sporting Goods must have paid out $30,000 in dividends in the current year. We will see this information laid out in the statement of retained earnings. In the prior year they began with a $10,000 balance in retained earnings. Income of $30,000 increased retained earnings and dividends paid back out to investors reduced retained earnings, leaving an ending balance in the prior year of $15,000. This rolls over and is the beginning balance for the current year. In the current year Clear Lake had net income of $35,000 and paid $30,000 of their earnings out to shareholders, essentially resulting in a $5,000 increase to the retained earnings account.

Clear Lake Sporting Goods
Statement of Retained Earnings

	Prior Year	Current Year
Beginning Retained Earnings Balance Jan 1	$10,000	$15,000
Plus Net Income	30,000	35,000
Less Dividends Paid to Shareholders	25,000	30,000
Ending Retained Earnings Dec 31	$15,000	$20,000

Figure 5.10 Statement of Retained Earnings

Now we can see the full flow of information from the income statement to the statement of retained earnings (Figure 5.10) and finally to the balance sheet. Clear Lake's net income flows from the income statement into

retained earnings, which is reflected on the statement of retained earnings. The balance in retained earnings is then reflected on the balance sheet. This flow is depicted in Figure 5.11.

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Margin	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets		
Current Assets:		
Cash	$ 90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Assets	160,000	200,000
Noncurrent Assets:		
Equipment	40,000	50,000
Total Assets	200,000	250,000
Current Liabilities:		
Accounts Payable	60,000	75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Noncurrent Liabilities:		
Notes Payable	40,000	50,000
Total Liabilities	110,000	150,000
Stockholder Equity		
Common Stock	75,000	80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Clear Lake Sporting Goods
Statement of Retained Earnings

	Prior Year	Current Year
Beginning Retained Earnings Balance Jan 1	$10,000	$15,000
Plus Net Income	30,000	35,000
Less Dividends Paid to Shareholders	25,000	30,000
Ending Retained Earnings Dec 31	$15,000	$20,000

Figure 5.11 Connections between Clear Lake Sporting Goods' Balance Sheet and Income Statement

LINK TO LEARNING

Apple's Income Statement and Balance Sheet

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the company's income statement and balance sheet (they begin on page 31). What is the company's net income for the most recent year? What is the amount of retained earnings on the balance sheet for the current and prior years? Does it appear the company paid out dividends this year?

Expenses versus Payables

There is another key relationship between the income statement and the balance sheet can often be confusing to non-accountants: an expense versus a payable. The two are often assumed to be the same thing. However, it is important to note that the two are distinctly different.

Let's look at an example to outline the key differences. Clear Lake Sporting Goods incurred utility expenses during the current period (electric and gas). Its utilities totaled $1,500. In the month that followed, the utilities vendor sent an invoice for $1,500. Clear Lake has incurred an expense. It will reflect an expense of $1,500 on the income statement for the utilities expense. This is the income statement impact of the transaction. So is it safe to assume that because Clear Lake has an expense, it also used cash? Not necessarily. Or is it safe to assume that if the company has an expense, it is the same as a payable? Again, the answer is no.

Remember, the accounting equation rests on the foundation of the double-entry accounting system. This means that every transaction has two sides: a debit and a credit. They must be equal. When Clear Lake records an expense of $1,500, it must also record the other half of that transaction. In this case, the company incurred utilities expenses throughout the period "on account," which means it records an increase in their accounts payable. When the invoice comes due, another transaction must then be recorded to reduce accounts payable and reduce cash. Accounts payable is a liability found on the balance sheet, normally a current liability. The expense incurred caused the payable, but it is distinctly separate from the payable (see Figure 5.12).

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets		
Current Assets:		
Cash	$ 90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Assets	160,000	200,000
Equipment	40,000	50,000
Total Assets	200,000	250,000
Current Liabilities:		
Accounts Payable	60,000	75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Noncurrent Liabilities:		
Notes Payable	40,000	50,000
Total Liabilities	110,000	150,000
Stockholder Equity		
Common Stock	75,000	80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure 5.12 Connections between Expenses and Accounts Payable

5.4 The Statement of Owner's Equity

Learning Outcomes

By the end of this section, you will be able to:

- Explain the concept of owner's equity.
- Outline the purpose and importance of the statement of owner's equity.
- Identify the structure and key elements of the statement of owner's equity.

What Is Equity?

Recall that the accounting equation can help us see what is owned (assets), who is owed (liabilities), and finally who the owners are (equity). The statement of owner's equity addresses the last segment of the accounting equation in detail by laying out the equity elements of the firm and highlighting changes in these elements throughout the period.

Equity represents the ownership of the firm. The stockholders' equity section of the balance sheet for corporations contains two primary categories of accounts. The first is paid-in capital or contributed capital—consisting of amounts paid in by owners. The second category is earned capital, consisting of amounts earned by the corporation as part of business operations. On the balance sheet, retained earnings is a key component of the earned capital section, while the stock accounts such as common stock, preferred stock, and additional paid-in capital are the primary components of the contributed capital section.

Common stock represents ownership in the firm. Common stockholders normally have voting rights. Preferred stock has unique rights that are "preferred," or more advantageous, to shareholders than common stock. Unlike common stockholders, preferred shareholders typically do not have voting rights and do not share in the common stock dividend distributions. Instead, the "preferred" classification entitles shareholders to a dividend that is fixed (assuming sufficient dividends are declared). Treasury stock is shares that were outstanding and have been repurchased by the firm but not retired. Thus they are still issued, but not outstanding. Additional paid-in capital is the difference between the issue price and par value of the common stock. For example, if a firm issued and sold stock at a market price of $20 that had a $5 par value, $5 for each share would be recorded into common stock and the excess $15 per share would be recorded into the additional paid-in capital account.

If we review the balance sheet for Clear Lake Sporting Goods, we see just two elements of equity: common stock and retained earnings. Common stock in the prior year was $75,000 and increased to $80,000 in the current year, indicating Clear Lake issued additional common stock (see Figure 5.13).

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Stockholder Equity		
Common Stock	$ 75,000	$ 80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure 5.13 Stockholder Equity Section of Balance Sheet

THINK IT THROUGH

Equity Accounts

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and

locate the company's balance sheet (it begins on page 33). What types of equity accounts does it report?

Solution:

Apple reports common stock, retained earnings, and accumulated other comprehensive income.

Distributions to Owners

When firms earn a profit, they have two options as to what to do with their earnings. They can keep (retain) them and reinvest them back into the business, or they can pay them out to their shareholders in the form of dividends. Dividends are commonly in the form of cash, but dividends can be paid out in the form of stock or other assets as well.

To pay a cash dividend, the firm must have enough cash on hand and sufficient retained earnings. They cannot pay out a dividend beyond the retained earnings available. Some companies issue shares of stock as a dividend rather than cash or property. This often occurs when the company has insufficient cash but wants to keep its investors happy. When a company issues a stock dividend, it distributes additional shares of stock to existing shareholders.

A property dividend occurs when the firm pays out dividends in the form of something other than stock or cash, often one of their assets or something they hold in inventory. For example, Walt Disney Company may choose to distribute tickets to visit its theme parks. A property dividend may be declared when a company wants to reward its investors but doesn't have the cash to distribute, or if it needs to hold on to its existing cash for other investments.

Remember, the retained earnings account reflects the cumulative earnings of a firm since they began business, less dividends paid out to shareholders. This includes all forms of dividends (cash, stock, and other assets). Note that dividends are distributed or paid only to shares of stock that are outstanding. Treasury shares are not outstanding, so no dividends are declared or distributed for these shares. Regardless of the type of dividend, the declaration always causes a decrease in the retained earnings account.

THINK IT THROUGH

Dividends

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020. Review the notes to the financial statements found on pages 19 and 20. What kind of dividends did the company pay (cash, property, stock)? Review the notes regarding dividends on page 26. What does Apple intend to do regarding dividends in the future, pending board approval?

Solution:

Apple issued cash dividends. On page 26, it notes that the company intends to increase the dividend annually, pending approval by the board.

Elements of the Statement of Owner's Equity

Now that we have covered the basic elements of equity and know what dividends are, we have the basic pieces we need to create the statement of **owner's equity**. The statement is broken out into columns, one for each element of equity: common stock, preferred stock, additional paid-in capital, retained earnings, and treasury stock.

The first line of the statement provides the balance of each segment as of the first day of the period. Each

following line provides information on any events during the period that changed the value of any of the accounts. Common examples of events found on the statement include net income or loss for the period, issuing common or preferred stock, purchasing or selling treasury stock, and declaring a dividend.

Clear Lake Sporting Goods has just common stock and retained earnings to report in their statement of owner's equity. They had just two events to report in their statement that impacted their equity accounts; they reported net income and they issued dividends (see Figure 5.14).

	Common Stock	Additional Paid-in Capital	Retained Earnings	Treasury Stock	Total
Beginning Balance	$75,000	$0	$15,000	$0	$ 90,000
Net Income			35,000		35,000
Dividends Paid to Shareholders			(30,000)		(30,000)
Common Stock Issued	5,000				5,000
Ending Balance	$80,000	$0	$20,000	$0	$100,000

Figure 5.14 Statement of Stockholder Equity for Clear Lake Sporting Goods

LINK TO LEARNING

Cash Flows

Khan Academy (https://openstax.org/l/50CashFlowsVid) explains cash flows in a unique way.

5.5 The Statement of Cash Flows

Learning Outcomes

By the end of this section, you will be able to:

- Outline the purpose and importance of the statement of cash flows.
- Identify the structure and key elements of the statement of cash flows.

The final financial statement is the statement of cash flows. It is a crucial statement, as it shows the sources of and uses of cash for the firm during the accounting period. Remember, under accrual accounting, transactions are recorded when they occur, not necessarily when cash moves. Thus, the income statement does not provide all the insights necessary to understand a firm's cash flows. To fully understand the firm's flow of cash, the statement of cash flows is needed.

Importance of the Statement of Cash Flows

Remember, most firms use accrual accounting. Revenues and expenses are recorded when they occur, not necessarily when cash moves. This can create timing differences between profits and cash flows. A firm can be profitable and still not have an adequate flow of cash. The opposite is also true: it can experience a net loss and still have cash on hand. Earning a profit is wonderful, but it is not the only goal an organization has. It must also have adequate cash flow to support daily operations. To support cash planning and to provide external financial statement users such as lenders and investors information about the firm's cash flow, the statement of cash flows is prepared. Cash flow is also a crucial metric for determining the value of a company.

External financial statement users also rely on the statement of cash flows to help them evaluate the quality of the firm's earnings. Users compare earnings to cash flow to assess the validity of the earnings data. For example, a firm reporting a strong profit but very little cash flow might raise some questions as to what was recorded to drive profits that isn't also driving cash flows.

The statement of cash flows also helps external users determine the driving forces behind the firm's cash flows. They can see if cash is generated primarily by daily operations or if cash is being generated or

consumed by events outside the firm's normal course of business.

There are two key methods of preparing the statement: direct and indirect. FASB (Financial Accounting Standards Board) favors the **direct method**. Despite that, the most common method used by far in general practice is the **indirect method**. The direct method lists cash flows directly from revenues and expenses, whereas the indirect method reconciles income to cash flows. The indirect method begins with net income and reconciles each account in order to arrive at net cash flow. It essentially reconciles **accrual basis** accounting to **cash basis**, or cash flow.

Operating Activities

To provide clear information about what areas of the business generated and used cash, the statement of cash flows is broken down into three key categories: operating, financing, and investing. The operating section reflects cash flows generated by and used by the day-to-day operations of the business. Investing activities include investments in other firms as well as investments in the firm itself (items like machinery, land, or other fixed assets). Finally, financing activities are those used to provide funds to run the business (loans, interest).

As mentioned, operating activities are those that are used or generated by the day-to-day operations of the firm. The operating activities section of the statement of cash flows begins with net income. All lines thereafter, in that section, are then adjustments to reconcile net income to actual cash flows by adding back **noncash expenses** like depreciation and adjusting for changes in asset and liability accounts. For example, depreciation is a noncash expense. Thus, depreciation is added back to net income.

To prepare the statement of cash flows for Clear Lake Sporting Goods, we need the beginning cash balance from the balance sheet, net income and depreciation expense from the income statement, and a set of comparative balance sheets to see the change in asset and liability accounts (see Figure 5.15).

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Gross Sales	$105,000	$126,000
Sales Returns & Allowances	5,000	6,000
Net Sales	100,000	120,000
Cost of Goods Sold	50,000	60,000
Gross Margin	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets		
Current Assets:		
Cash	$ 90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Assets	160,000	200,000
Noncurrent Assets:		
Equipment	40,000	50,000
Total Assets	200,000	250,000
Current Liabilities:		
Accounts Payable	60,000	75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Noncurrent Liabilities:		
Notes Payable	40,000	50,000
Total Liabilities	110,000	150,000
Stockholder Equity		
Common Stock	75,000	80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure 5.15 Comparative Income Statements and Balance Sheets

Clear Lake's statement of cash flows begins with the current year net income of $35,000 from the income statement. Next, noncash expenses are deducted. Clear Lake's only noncash expense on their current year income statement is depreciation of $3,600. Since deprecation is an expense that reduces income but is not actually paid out in cash in the current period, it must be added back to net income to reconcile net income to cash flow.

Next, changes in operational assets and liabilities are used to continue reconciling net income to actual cash flow. For example, Clear Lake's accounts receivable increased from the prior period to the current period. This means that there were more sales recorded but not yet received in cash in this period than there were in the prior period, making an increase in accounts receivable a reduction on the statement. Inventory increased, which means additional cash was spent to acquire it, making it a use of cash or reduction to net income to move closer to cash. Accounts payable and unearned revenue, both liability accounts, increased. Since these are liabilities, an increase would indicate that the liability was incurred but not as quickly paid out; thus it is an increase to the statement.

Tallying all these adjustments to net income shows Clear Lake's net cash flows provided by operating activities of $53,600 (see Figure 5.16).

Clear Lake Sporting Goods Statement of Cash Flows Indirect Method		
Cash Flow from Operating Activities		
Net Income		$35,000
Adjustment to Reconcile Net Income to Net Cash Flow from Operating Activities:		
Depreciation	$ 3,600	
Accounts Receivable Increase	(10,000)	
Inventory Increase	(5,000)	
Accounts Payable Increase	15,000	
Unearned Revenue Increase	15,000	18,600
Net Cash Flow from Operating Activities		$53,600

Figure 5.16 Operating Activities Section of the Statement of Cash Flows

Investing Activities

As mentioned, investing activities include investments in other firms as well as investments in the firm itself (items like machinery, land, or other fixed assets). These are items that are capitalized (placed on the balance sheet and depreciated over time) and thus did not reduce net income. They did, however, cause an impact to cash flow (see Figure 5.17).

During the current year, Clear Lake purchased an additional $5,000 in short-term investments (see the comparative balances sheets; the balance in that account increased by $5,000 since the prior year). They also purchased additional plant assets in the amount of $13,600. This amount can be figured by comparing the difference in the current and prior plant assets accounts and including the impact of current year depreciation ($50,000 current year balance less $40,000 prior year balance and $3,600 of depreciation = $13,600 of new assets purchased).

Cash Flow from Investing Activities		
Purchase of Short-Term Investments	$(5,000)	
Cost of New Plant Assets	(13,600)	
Net Cash Flow: Investing Activities		$(18,600)

Figure 5.17 Investing Activities Section of the Statement of Cash Flows

Financing Activities

Recall that financing activities are those used to provide funds to run the business. Common items in this section of the statement include the payment of dividends, issuance of common or preferred stock, and issuance or payment of notes payable (see Figure 5.18).

In the current year, Clear Lake took out additional notes payable (a cash inflow). We can see this by the increase in their notes payable account from the prior year to current year ($40,000 to $50,000). This is an inflow of cash and thus an increase on the statement. Dividends of $30,000 were paid to shareholders (found on the statement of retained earnings and the statement of owner's equity). Finally, we see that Clear Lake must have issued additional common stock, as their common stock balance increased from $75,000 to $80,000.

Cash Flow from Financing Activities		
Additional Notes Payable	$10,000	
Issuance of Common Stock	5,000	
Payment of Dividends	(30,000)	
Net Cash Flow from Financing Activities		$(15,000)

Figure 5.18 Financing Activities Section of the Statement of Cash Flows

LINK TO LEARNING

Statement of Cash Flows

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and locate the company's statement of cash flows (it begins on page 35). What is the cash provided by/used by operating activities? Review the key adjustments in the operating section. What are the biggest adjustments? Review the investing section of the statement. Did the company have a net cash inflow or net cash used by investing? What key items appear in this section? What was the net cash provided by or used by financing activities? What key items appear in this section for Apple?

The final task to wrap up the statement of cash flows is to tally net cash generated or used by summing all three sections. This amount is then used to adjust the beginning cash balance from the balance sheet. Assuming the statement was prepared correctly, the sum should equal the ending cash balance on the balance sheet.

In the full statement, we can see that Clear Lake has net cash flow of $20,000. The beginning cash balance was $90,000, making the ending cash balance $110,000 (see Figure 5.19).

Clear Lake Sporting Goods
Statement of Cash Flows
Indirect Method

Cash Flow from Operating Activities		
Net Income		$ 35,000
Adjustment to Reconcile Net Income to Net Cash Flow from Operating Activities:		
Depreciation	$ 3,600	
Accounts Receivable Increase	(10,000)	
Inventory Increase	(5,000)	
Accounts Payable Increase	15,000	
Unearned Revenue Increase	15,000	18,600
Net Cash Flow from Operating Activities		53,600
Cash Flow from Investing Activities		
Purchase of Short-Term Investment	(5,000)	
Cost of New Plant Assets	(13,600)	
Net Cash Flow: Investing Activities		(18,600)
Cash Flow from Financing Activities		
Additional Notes Payable	10,000	
Issuance of Common Stock	5,000	
Payment of Dividends	$(30,000)	
Net Cash Flow from Financing Activities		(15,000)
Total Cash Flow Increase/Decrease		20,000
Beginning Cash Balance		90,000
Ending Cash Balance		$110,000

Figure 5.19 Full Statement of Cash Flows

Analyzing Performance

The statement of cash flows can be used in a number of ways to assess firm performance by both internal and external financial statement users. Internal users can assess sources of and uses of cash in order to aid in adapting, as necessary, to ensure adequate future cash flows. External users also use the statement. Recall that comparing net income to operational cash flows can help assess the quality of earnings. In the next section you'll explore operating cash flow and **free cash flow** to the firm, two key points of analysis in

assessing cash flows.

5.6 Operating Cash Flow and Free Cash Flow to the Firm (FCFF)

Learning Outcomes

By the end of this section, you will be able to:

- Calculate operating cash flow and free cash flow.
- Assess organizational cash management performance.

Operating Cash Flow

Now that we have a statement of cash flows prepared, we can move on to a few key elements of the statement used to assess organizational cash management performance. Operating cash flow, or net cash flow from operating activities, is calculated in the first section of the statement of cash flows. It depicts the cash generated (or used by) the primary business activities. Remember, operating cash flow is calculated under the indirect method by adjusting net income for noncash expenses like depreciation and adjustments for changes in current asset and liability accounts (changes in working capital).

$$\text{Operating Cash Flow} = \text{Operating Income} + \text{Depreciation} - \text{Taxes} + \text{Change in Working Capital}$$

Operating cash flow is helpful in assessing organizational cash management performance as it relates to the core business function—operations. Key management practices in this area can have a profound impact on the firm's cash flow. Practices and policies include customer payment terms, collection policies and practices, and vendor payment terms. Though changing a customer or vendor payment terms will not change the profit or loss for the firm, it will have an impact on the timing to cash flows. This is a key element of managing operational cash flow.

Free Cash Flow

Free cash flow (FCF) is calculated by taking operating cash flows less capital expenditures. Free cash flow is an important measure, as it depicts the cash available to support the business's operations and maintain its fixed assets. It is commonly used by investors as part of their overall evaluation of an investment, as it is a key measure of cash flow management practices and a firm's ability to generate enough cash to cover operations and capital assets and it shows if there is any left over for other considerations such as dividend payments, debt repayment, and contributions to increase working capital for future growth.

$$\text{Free Cash Flow (FCF)} = \text{Operating Cash Flow} - \text{Capital Expenditures}$$

Using the data for Clear Lake Sporting Goods, we can calculate its free cash flow as follows:

$$\text{Free Cash Flow (FCF)} = \$53{,}600 - \$13{,}600 = \$40{,}000$$

This means that Clear Lake Sporting Goods has $40,000 of cash available to repay debt or pay cash dividends after having covered the cash needs of its operations and capital asset investments.

Managing Cash Flow

Managing cash flow is not an easy task. A firm has a myriad of places that its cash flows from or to. However, there are a few key areas to place attention in order to manage or improve cash flows. First, consider where cash is coming from—customers. Managing terms and collection efforts with customers can have a significant impact on a firm's cash flow. For example, a customer with terms of net 10 will likely yield payment quite quickly—10 days, give or take. A customer with terms of net 60, on the other hand, will require roughly 60 days to collect assuming they pay on time. The 50-day difference between these two examples means that the firm will go 50 additional days having expended the resources to provide the customer their good or service, but with no cash flow yet to cover it.

The same theory holds true on the opposite side with accounts payable and the vendors a firm uses. Accepting

net 10 terms requires the firm to give up its cash quickly, while pushing for more favorable terms like net 30 or net 60 allows the firm to wait much longer to give up its cash.

It is important to assess both sides of cash flow and the impact it has on the firm as well as the customer and vendor relationships it maintains. Some customers may not have difficulty negotiating a more favorable payment term in order for the firm to improve its cash flow. Others, however, may not be willing to accept shorter payment terms. In order to be competitive in the industry, the firm must assess the customer relationships, industry standards, and its own ability to support cash flow when considering its customer payment terms.

When there is a gap in cash flow, it is crucial that it is recognized early, with proper cash flow forecasting, so financing can be obtained to bridge the gap. A common tool used to manage the ebb and flow of cash flow for a firm is an open line of credit with a bank. This allows the firm to borrow and repay from month to month as cash flow fluctuates.

Now that you've become more familiar with the four basic financial statements, let's move on to a tool helpful in evaluating them: common-size statements. Common-size financial statements, also termed vertical analysis, restate the financial statement items as a percentage of a base item. Doing so helps reveal relationships between items, aids in assessing performance over time, and makes it easier to compare one company to another, regardless of size (thus the name common-size).

5.7 Common-Size Statements

Learning Outcomes

By the end of this section, you will be able to:

- Prepare common-size statements.
- Assess organizational performance using common-size statements.
- Use industry comparisons to assess organizational performance.

Common-Size Income Statements

A common-size income statement is created by restating each line as a percentage of net sales. Expressing each item on the income statement as a percentage rather than in absolute dollars makes it much easier to make comparisons, particularly to other divisions or competitors of varying sizes. The formula to calculate each item on the income statement is:

$$\text{Common-Size Item} = \frac{\text{Income Statement Line Item}}{\text{Net Sales}}$$

Using Clear Lake Sporting Goods' current year income statement, we can see how each line item in it is divided by net sales in order to assemble a common-size income statement (see Figure 5.20).

Clear Lake Sporting Goods Comparative Year-End Income Statements			
	Current Year	Current Year %	Formula
Gross Sales	$126,000		
Sales Returns & Allowances	6,000		
Net Sales	120,000	100%	=120,000/120,000
Cost of Goods Sold	60,000	50%	=60,000/120,000
Gross Margin	60,000	50%	=60,000/120,000
Rent Expense	5,500	5%	=5,500/120,000
Depreciation Expense	3,600	3%	=3,600/120,000
Salaries Expense	5,400	5%	=5,400/120,000
Utility Expense	2,500	2%	=2,500/120,000
Operating Income	43,000	36%	=43,000/120,000
Interest Expense	2,000	2%	=2,000/120,000
Income Tax Expense	6,000	5%	=6,000/120,000
Net Income	$ 35,000	29%	=35,000/120,000

Figure 5.20 Common-Size Income Statement

It may seem cumbersome to create a common-size statement. However, a simple tool like Microsoft Excel can be quite handy in making the process easier and faster. The same formula can be copied and replicated in each income statement line, making the calculations much faster. In Figure 5.21, you can see the formulas used to create Clear Lake Sporting Goods' common-size income statement in Excel. Notice that the $ can be inserted to anchor a cell reference, making it easier to copy and paste the same formula onto many lines or columns.

	A	B	C	D	E	F	G
1		Prior Year	Prior Year %	Formula	Current Year	Current Year %	Formula
2	Gross Sales	$ 105,000			$ 126,000		
3	Sales Returns	5,000			6,000		
4	Net Sales	100,000	100%	=B4/$B$4	120,000	100%	=E4/$E$4
5	Cost of Goods Sold	50,000	50%	=B5/$B$4	60,000	50%	=E5/$E$4
6	Gross Margin	50,000	50%	=B6/$B$4	60,000	50%	=E6/$E$4
7	Rent Expense	5,000	5%	=B7/$B$4	5,500	5%	=E7/$E$4
8	Depreciation Expense	2,500	3%	=B8/$B$4	3,600	3%	=E8/$E$4
9	Salaries Expense	3,000	3%	=B9/$B$4	5,400	5%	=E9/$E$4
10	Utility Expense	1,500	2%	=B10/$B$4	2,500	2%	=E10/$E$4
11	Operating Income	38,000	38%	=B11/$B$4	43,000	36%	=E11/$E$4
12	Interest Expense	3,000	3%	=B12/$B$4	2,000	2%	=E12/$E$4
13	Income Tax Expense	5,000	5%	=B13/$B$4	6,000	5%	=E13/$E$4
14	Net Income	$ 30,000	30%	=B14/$B$4	$ 35,000	29%	=E14/$E$4

Figure 5.21 Clear Lake Sporting Goods Common-Size Income Statements with Excel Formulas

Common-Size Balance Sheet

The common-size balance sheet functions much like the common-size income statement. Each line item on the balance sheet is restated as a percentage of total assets.

$$\text{Common-Size Item} = \frac{\text{Balance Sheet Line Item}}{\text{Total Assets}}$$

Using Clear Lake Sporting Goods' current balance sheet, we can see how each line item in its statement is divided by total assets in order to assemble a common-size balance sheet (see Figure 5.22).

Clear Lake Sporting Goods Comparative Year-End Balance Sheets			
	Current Year	**Current Year %**	**Formula**
Assets			
Current Assets:			
Cash	$110,000	44%	=110,000/250,000
Accounts Receivable	30,000	12%	=30,000/250,000
Inventory	40,000	16%	=40,000/250,000
Short-Term Investments	20,000	8%	=20,000/250,000
Total Current Assets	200,000	80%	=200,000/250,000
Noncurrent Assets:			
Equipment	50,000	20%	=50,000/250,000
Total Assets	250,000	100%	=250,000/250,000
Current Liabilities:			
Accounts Payable	75,000	30%	=75,000/250,000
Unearned Revenue	25,000	10%	=25,000/250,000
Total Current Liabilities	100,000	40%	=100,000/250,000
Noncurrent Liabilities:			
Notes Payable	50,000	20%	=50,000/250,000
Total Liabilities	150,000	60%	=150,000/250,000
Stockholder Equity			
Common Stock	80,000	32%	=80,000/250,000
Ending Retained Earnings	20,000	8%	=20,000/250,000
Total Stockholders' Equity	100,000	40%	=100,000/250,000
Total Liabilities and Stockholder Equity	$250,000	100%	=250,000/250,000

Figure 5.22 Common-Size Balance Sheet

Excel can also be used to create a common-size balance sheet. Once the formula is created, it can be copied into each line, making the process to create a common-size statement much easier (see Figure 5.23):

	A	B	C	D
1		**Current Year**	**Current Year %**	**Formula**
2	**Assets**			
3	**Current Assets:**			
4	Cash	$ 110,000	44%	=B4/B$11
5	Accounts Receivable	30,000	12%	=B5/B$11
6	Inventory	40,000	16%	=B6/B$11
7	Short-Term Investments	20,000	8%	=B7/B$11
8	**Total Current Assets**	200,000	80%	=B8/B$11
9	**Noncurrent Assets:**			
10	Equipment	50,000	20%	=B10/B$11
11	**Total Assets**	$ 250,000	100%	=B11/B$11
12	**Current Liabilities:**			
13	Accounts Payable	75,000	30%	=B13/B$11
14	Unearned Revenue	25,000	10%	=B14/B$11
15	**Total Current Liabilities**	100,000	40%	=B15/B$11
16	**Noncurrent Liabilities:**			
17	Notes Payable	50,000	20%	=B17/B$11
18	**Total Liabilities**	150,000	60%	=B18/B$11
19	**Stockholder Equity**			
20	Common Stock	80,000	32%	=B20/B$11
21	Ending Retained Earnings	20,000	8%	=B21/B$11
22	Total Stockholders' Equity	100,000	40%	=B22/B$11
23	**Total Liabilities and Stockholder Equity**	$ 250,000	100%	=B23/B$11

Figure 5.23 Common-Size Balance Sheet with Excel Formulas

It is important to note that while we have provided two years of data here to explore the process, when performing analysis for a firm or investment, several years of data are commonly used to provide a better view of historical performance.

Analyzing Organizational Performance

Common-size financial statements facilitate the analysis of financial performance by converting each element of the statements to a percentage. This makes it easier to compare figures from one period to the next, compare departments within an organization, and compare the firm to other companies of any size as well as industry averages. On the income statement, analysts can see how much of sales revenue is spent on each type of expense. They can see this breakdown for each firm and compare how different firms function in terms of expenses, proportionally. They can also look at the percentage for each expense over time to see if they are spending more or less on certain areas of the business, such as research and development. On the balance sheet, analysts commonly look to see the percentage of debt and equity to determine capital structure. They can also quickly see the percentage of current versus noncurrent assets and liabilities.

In Clear Lake Sporting Goods' common-size income statement for the current and prior years, we can see that cost of goods as a percentage of sales remained the same (see Figure 5.24). This means that while sales

increased, so did cost of goods sold, but it increased at the same proportion as sales. No improvement or decline occurred in the company's cost of goods sold. The same is true for rent, depreciation, and utilities expenses. One key item did change slightly as a percentage: salaries expense. The 2 percent decrease in operating income from the prior year's 38 percent to the current year's 36 percent was caused by the increase in salaries expense as a percentage of sales.

Net income, however, only declined by 1 percent from 30 percent in the prior year to 29 percent in the current year because interest expense dropped by 1 percent, offsetting the 2 percent increase in salaries expense.

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Prior Year %	Current Year	Current Year %
Gross Sales	$105,000		$126,000	
Sales Returns & Allowances	5,000		6,000	
Net Sales	100,000	100%	120,000	100%
Cost of Goods Sold	50,000	50%	60,000	50%
Gross Profit	50,000	50%	60,000	50%
Rent Expense	5,000	5%	5,500	5%
Depreciation Expense	2,500	3%	3,600	3%
Salaries Expense	3,000	3%	5,400	5%
Utility Expense	1,500	2%	2,500	2%
Operating Income	38,000	38%	43,000	36%
Interest Expense	3,000	3%	2,000	2%
Income Tax Expense	5,000	5%	6,000	5%
Net Income	$ 30,000	30%	$ 35,000	29%

Figure 5.24 Common-Size Income Statement

LINK TO LEARNING

Common-Size Income Statement

Visit the Apple, Inc. Common-Size Income Statement (https://openstax.org/r/common-size-income-statement) provided by the Stock Analysis on Net website. Review the company's cost of sales, gross profit, operating income, other income, and net income percentages for the current and prior year. What can you learn about the company's recent performance in these areas? Has it improved or declined, or has it simply changed incrementally with gross sales?

On the Clear Lake Sporting Goods' common-size balance sheet, we see that current assets remained at 80 percent of total assets from the prior to current year (see Figure 5.25). The mix of current assets that comprise that 80 percent changed only slightly with a 1 percent decrease in cash, 2 percent increase in accounts receivable, 2 percent decrease in inventory, and no change in short-term investments. Noncurrent assets includes only equipment. While the balance in the equipment account did change as a percentage of total assets, equipment remained the same at 20 percent.

On the debt and equity side of the balance sheet, however, there were a few percentage changes worth noting. In the prior year, the balance sheet reflected 55 percent debt and 45 percent equity. In the current year, that balance shifted to 60 percent debt and 40 percent equity. The firm did issue additional stock and showed an increase in retained earnings, both totaling a $10,000 increase in equity. However, the equity increase was much smaller than the total increase in liabilities of $40,000. Long-term debt increased by only $10,000 by issuing additional notes payable. The remainder of that increase is seen in the 5 percent increase in current liabilities. In that increase, most of it was in unearned revenue.

Clear Lake Sporting Goods Comparative Year-End Balance Sheets				
	Prior Year	Prior Year %	Current Year	Current Year %
Assets				
Current Assets:				
Cash	$ 90,000	45%	$110,000	44%
Accounts Receivable	20,000	10%	30,000	12%
Inventory	35,000	18%	40,000	16%
Short-Term Investments	15,000	8%	20,000	8%
Total Current Assets	160,000	80%	200,000	80%
Noncurrent Assets:				
Equipment	40,000	20%	50,000	20%
Total Assets	200,000	100%	250,000	100%
Current Liabilities:				
Accounts Payable	60,000	30%	75,000	30%
Unearned Revenue	10,000	5%	25,000	10%
Total Current Liabilities	70,000	35%	100,000	40%
Noncurrent Liabilities:				
Notes Payable	40,000	20%	50,000	20%
Total Liabilities	110,000	55%	150,000	60%
Stockholder Equity				
Common Stock	75,000	38%	80,000	32%
Ending Retained Earnings	15,000	8%	20,000	8%
Total Stockholders' Equity	90,000	45%	100,000	40%
Total Liabilities and Stockholder Equity	$200,000	100%	$250,000	100%

Figure 5.25 Common-Size Balance Sheet

LINK TO LEARNING

Common-Size Assets and Common-Size Liabilities and Equity

Visit the Apple, Inc. Common-Size Assets (https://openstax.org/r/common-size-assets) Balance Sheet and Common-Size Liabilities and Equity (https://openstax.org/r/common-size-liabilities) Balance Sheet provided by the Stock Analysis on Net website. Review the composition of the company's assets, liabilities, and equity. How have assets changed? Has capital structure changed? If so, what elements impacted the change?

Industry Comparison

Recall that a key benefit of common-size analysis is comparing the firm's performance to the industry. Expressing the figures on the income statement and balance sheet as percentages rather than raw dollar figures allows for comparison to other companies regardless of size differences.

Clear Lake Sporting Goods, for example, might compare their financial performance on their income statement to a key competitor, Charlie's Camping World. Charlie is a much bigger retailer for outdoor gear, as Charlie has nearly seven times greater sales than Clear Lake. Common-size statements allow Clear Lake to compare their statements in a meaningful way (see Figure 5.26). Notice that Clear Lake spends 50 percent of its sales on cost of goods sold while Charlie spends 59 percent. This is a significant difference that would be an indicator that Clear Lake and Charlie have key differences in their operations, purchasing policies, or general performance in their core products.

We know that Charlie is a bigger retailer, and we see this clearly in the rent expense as a percentage of sales. Charlie spends 11 percent of its sales on building rent, while Clear Lake spends only 5 percent. A clear difference in performance is hinted at here, alluding to Charlie spending more per square foot on rent or using its retail space differently, causing it to rent more space for its product per sales dollar than Clear Lake does. Depreciation expense, though not a large figure, is smaller for Charlie, giving us a hint that Charlie has less capital equipment than Clear Lake, perhaps tied to the higher rent expense. It is possible that Charlie rents some of its equipment, which would help explain the higher rent percentage. Finally, Charlie's salaries percentage is significantly higher at 12 percent than Clear Lake's 5 percent. Though the simple percentage does not tell us why, it does provide us a hint and allow for further questions or investigation. Charlie may pay its employees a much higher wage than Clear Lake. They may also have far more sales associates on the floor in their larger spaces than Clear Lake does in their smaller retail spaces.

Note that although we have compared just two years of data for Charlie and Clear Lake, it is more common to use several years of data to get a more robust view of long-term trends.

	Charlie's Camping World Common-Size Income Statement		Clear Lake Sporting Goods Common-Size Income Statement	
	Prior Year	Prior Year %	Current Year	Current Year %
Gross Sales	$748,000		$126,000	
Sales Returns & Allowances	41,000		6,000	
Net Sales	707,000	100%	120,000	100%
Cost of Goods Sold	418,000	59%	60,000	50%
Gross Profit	289,000	41%	60,000	50%
Rent Expense	75,000	11%	5,500	5%
Depreciation Expense	5,000	1%	3,600	3%
Salaries Expense	85,000	12%	5,400	5%
Utility Expense	25,000	4%	2,500	2%
Operating Income	99,000	14%	43,000	36%
Interest Expense	1,000	0%	2,000	2%
Income Tax Expense	14,000	2%	6,000	5%
Net Income	$ 84,000	12%	$ 35,000	29%

Figure 5.26 Comparison of Common-Size Income Statements

LINK TO LEARNING

Microsoft versus Apple

Locate the sales, cost of goods sold, and gross profit data for Microsoft (https://openstax.org/r/microsoft-financial)'s most current period using Yahoo! Finance. Calculate the common-size percentage for cost of goods sold and gross profit (cost of goods sold divided by net sales, and gross profit divided by net sales). Compare these percentages to those of Apple, Inc (https://openstax.org/r/common-size-income-statement)., a key competitor, on its common-size income statement. What can you learn about the performance of each firm based on these two percentages?

Now that you have covered the basic financial statements and a little bit about how they are used, where do we find them? How often are they prepared? Who gets them? In this next section we will explore the requirements for what needs to be reported, when, and to whom.

5.8 Reporting Financial Activity

Learning Outcomes

By the end of this section, you will be able to:

- Identify the most common types of accounting periods.
- Outline key considerations and accounting principles that dictate the timing of financial reporting.
- Describe the SEC reporting requirements relevant to financial statements.
- Identify the key elements of a company annual report.

Defining Accounting Periods

An accounting period can be any period of time, but the most common accounting periods are months, quarters, and a year. Accounting periods are important, particularly in accrual accounting, so there are clear cutoffs for recording transactions.

It is important to note that Generally Accepted Accounting Principles (GAAP) require companies to provide quarterly financial statements. However, most firms, even those not covered by GAAP, prepare financial statements monthly in order to provide timely data to their financial statement users both internally and externally.

Time Period Principle

Providing information to financial statement users in a timely fashion brings us to our next key topic, which is the time period principle. In order for information to be useful, it must be timely. This means that financial statement users need to get the statements quickly enough to be able to make relevant decisions with them. Providing statements on a timely basis is the foundation of the time period accounting principle.

Fiscal versus Calendar Year

Though a firm may present financial statements monthly, quarterly, and annually, not all time periods are created equal. Firms have the option to choose between a fiscal and a calendar year. The calendar year, which begins January 1 and ends December 31, is the traditional year we are accustomed to. The calendar year, however, doesn't always work well with a firm's business cycle. Due to seasonality or other factors, a firm may choose to adopt a fiscal year with their own beginning and end date. For example, a firm may choose to start its fiscal year on June 1 and end it on May 31. A firm can opt to change from a fiscal to a calendar year or vice versa but must only do so for a justifiable reason.

THINK IT THROUGH

Fiscal versus Calendar Year

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and review the title of the table of contents on page 1. The title reads "Apple Inc. Form 10-K." The next line provides information on the company's chosen time period. Does Apple use a fiscal or calendar year?

Solution:

Apple uses a fiscal year. Their fiscal year ended on September 26, 2020.

The Annual Report

An annual report is part of the 10-K filing that publicly traded firms must provide to the SEC and investors each year. The report details the firm's operations and performance for the year and its current financial conditions. The report contains general company information, the firm's financial statements, notes to the financial

statements, various required disclosures pertaining to accounting policies, the management discussion and analysis (MD&A) statement, a letter from the CEO to the shareholders, and the firm's audit report.

THINK IT THROUGH

Annual Report Key Elements

Visit the Apple, Inc. Annual Report (https://openstax.org/r/2020-doc-financial-annual-report) for 2020 and review the title of the table of contents on page 1. What key elements would you be drawn to review if you were a potential investor? In Part II of the table of contents, find the MD&A report (page 20) and use the table of contents link to navigate to it. What key highlights and challenges did the company report for the year?

Solution:

Answers may vary. A few key items of note might include risk factors, financial statements, the MD&A letter, and disclosures about market risk. Apple's MD&A reported significant updates on the impact of the COVID-19 pandemic, a few financial updates, product updates, segment performance data, a conversation about its debt, contractual obligations, and accounting policies.

SEC Reporting Requirements

The Securities and Exchange Commission (SEC) requires publicly traded firms to regularly provide several reports. The two most common are the 10-K and quarterly report (10-Q). Certain unique events also require an additional filing called an 8-K. There are many events that might require reporting. A few key examples include changes to rights of shareholders, changes in control of the company, and amendments to the company charter or bylaws.

The quarterly report is much like the annual report already discussed. It contains the firm's financial statements, required accounting disclosures, statements on internal control, and a management discussion and analysis (MD&A) letter. It does not contain an auditor's report, as firms are not audited on a quarterly basis. Quarterly reports are helpful to investors because they provide information on a timely enough basis to be relevant.

LINK TO LEARNING

Investor Relations

Visit the Apple, Inc. Investor Relations page, SEC Filings section (https://openstax.org/r/sec-filings). Notice how many different reports Apple files regularly with the SEC. Locate the most recent quarterly (10-Q) and annual reports (10-K) and scan the table of contents. How does the quarterly report differ from the annual report? Do you notice key items in the annual report not provided in the quarterly report?

Summary

5.1 The Income Statement

The income statement reflects a firm's performance over a period of time. Most financial statements are prepared monthly, quarterly, and annually. The income statement reflects sales less cost of goods sold to arrive at gross profit. Operating costs are deducted to arrive at operating income. Finally, other nonoperational costs like interest and taxes are deducted to arrive at net income.

5.2 The Balance Sheet

The balance sheet reflects the financial position of a firm as of a particular point in time. It is laid out to clearly depict and support the accounting equation: $\text{assets} = \text{liabilities} + \text{owner's equity}$. A classified balance sheet breaks down the assets and liabilities sections into current and noncurrent for greater transparency.

5.3 The Relationship between the Balance Sheet and the Income Statement

The financial statements are all tied together. The income statement is generated first, as net income is needed in order to determine the ending balance of retained earnings, a key account in the equity section of the balance sheet.

5.4 The Statement of Owner's Equity

The statement of owner's equity is divided by each type of equity the firm has: common stock, preferred stock, additional paid-in capital, and retained earnings, for example. Beginning balances are provided, and all key transactions impacting equity are provided in order to show how ending balance were derived. Key transactions commonly include recording net income or loss, issuing additional stock, and paying out dividends.

5.5 The Statement of Cash Flows

Under accrual accounting, transactions are recorded when they occur, not necessarily when cash moves. This creates a timing difference. Net profit, therefore, does not necessarily mean a firm has cash, and a net loss doesn't mean they don't have any cash. To reconcile net income to actual cash flow and see how a firm generates and uses its funds, a statement of cash flows is prepared. The statement reflects cash flow from operating activities, financing activities, and investing activities.

5.6 Operating Cash Flow and Free Cash Flow to the Firm (FCFF)

Operating cash flow reflects the cash generated by (or used by) the core business function. Free cash flow to the firm (FCFF) or simply free cash flow (FCF) is calculated by deducting capital expenditures from operating cash flow. FCF reflects the cash available to repay debts, pay dividends to shareholders, and contribute to cash needs for growth.

5.7 Common-Size Statements

Common-size statements are a restatement of the financial statements with all dollar figures restated as a percentage. On the income statement, each line is restated as a percentage of net sales. On the balance sheet, each line is restated as a percentage of total assets. Common-size statements are useful for analysis and are particularly helpful in comparing firms of different sizes.

5.8 Reporting Financial Activity

Publicly traded firms must file company and financial data with the Securities and Exchange Commission (SEC) on a regular basis. Key reports include the quarterly report, called a 10-Q, and the annual report, called a 10-K.

Key Terms

accounting equation $\text{assets} = \text{liabilities} + \text{owner's equity}$
accrual basis accounting system in which revenue is recorded or recognized when earned yet not necessarily received, and in which expenses are recorded when legally incurred and not necessarily when paid
assets tangible or intangible resources owned or controlled by a company, individual, or other entity with the intent that they will provide economic value
cash basis method of accounting in which transactions are not recorded in the financial statements until there is an exchange of cash
current assets asset typically used up, sold, or converted to cash in one year or less
current liabilities debt or obligation due within one year or, in rare cases, a company's standard operating cycle, whichever is greater
depreciation process of allocating the costs of a tangible asset over the asset's economic life
direct method approach used to determine net cash flows from operating activities, whereby accrual basis revenue and expenses are converted to cash basis collections and payments
dividends portion of the net worth (equity) that is returned to owners of a corporation as a reward for their investment
expenses costs associated with providing goods or services
free cash flow operating cash, reduced by expected capital expenditures
gains increases in organizational value from activities that are "incidental or peripheral" to the primary purpose of the business
income statement financial statement that measures the organization's financial performance for a given period of time
indirect method approach used to determine net cash flows from operating activities, starting with net income and adjusting for items that impact new income but do not require outlay of cash
liabilities probable future sacrifice of economic benefits arising from present obligations of a particular entity to transfer assets or provide services to other entities in the future as a result of past transactions or events
loss decrease in organizational value from activities that are "incidental or peripheral" to the primary purpose of the business
net income revenues and gains that are greater than expenses and losses
noncash expenses expenses that reduce net income but are not associated with a cash flow; most common example is depreciation expense
noncurrent assets assets used in the normal course of business for more than one year that are not intended to be resold
noncurrent liabilities liabilities that are expected to be settled in more than one year
owner's equity residual interest in the assets of an entity that remains after deducting its liabilities
retained earnings cumulative, undistributed net income or net loss for the business since its inception
revenue inflows or other enhancements of assets of an entity or settlements of liabilities from delivering or producing goods, rendering services, or other activities that constitute the entity's ongoing major or central operations
statement of cash flows financial statement listing the cash inflows and cash outflows for the business for a period of time

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/media-document-study-session). Reference with permission of CFA Institute.

Multiple Choice

1. Which of the following is a measure of the performance of a firm's daily operations?
   a. gross profit
   b. cost of goods sold
   c. operating income
   d. net income

2. In which section of the classified balance sheet would you find a note payable due in six months?
   a. current assets
   b. current liabilities
   c. noncurrent liabilities
   d. common stock

3. Which financial statement must be prepared first?
   a. statement of retained earnings
   b. balance sheet
   c. statement of cash flows
   d. income statement

4. Which of the following represents earned capital on the statement of owner's equity?
   a. retained earnings
   b. common stock
   c. preferred stock
   d. additional paid-in capital

5. Which section of the statement of cash flows reflects the cash generated from or used by a company's day-to-day operations?
   a. investing activities
   b. financing activities
   c. operating activities
   d. noncash activities

6. How do you calculate free cash flow (FCF)?
   a. net income less dividends
   b. operating income less capital expenditures
   c. gross profit less depreciation
   d. net income plus interest

7. How do you calculate common-size analysis on the income statement?
   a. income statement line item/gross profit
   b. income statement line item/net income
   c. net sales/income statement line item
   d. income statement line item/net sales

8. Which of the following does not represent a filing commonly required by the SEC?
   a. annual report, 10-K
   b. quarterly report, 10-Q
   c. Form 8-K
   d. 1040

Review Questions

1. What is the difference between gross profit and net income?
2. If a classified balance sheet has total assets of $900,000 and total owner's equity of $350,000, what must the company's total liabilities be?
3. What key element of the income statement flows through to the balance sheet?
4. What key columns are commonly found on the statement of owner's equity?
5. Ted's firm reported net income for the current period of $65,750. Is it safe to assume that because Ted's firm reported such a large net income, it has plenty of cash to fund its operations? Why or why not?
6. What useful insights does free cash flow (FCF) provide in financial analysis?
7. Describe how common-size statements are useful.
8. What is the difference between a calendar year and a fiscal year?

Problems

1. Rickey's Retail has the following financial information for the most recent accounting period. Prepare an income statement.

Rickey's Retail Income Statement	
Gross Sales	$864,740
Sales Returns & Allowances	47,399
Cost of Goods Sold	483,237
Rent Expense	86,705
Interest Expense	1,156
Income Tax Expense	16,185
Depreciation Expense	5,780
Salaries Expense	98,266
Utility Expense	$ 28,902

2. Big Box has the following accounts. In which section of its classified balance sheet does each belong?
   Cash
   Wages payable
   Taxes payable
   Accounts receivable
   Retained earnings
   Common stock
   Land
   Note payable due in 10 years
   Prepaid insurance
3. Big Box Outlet has $10,350 of supplies expense on its income statement. Does this mean that there must also be a supplies payable account balance of $10,350 on its balance sheet? Why or why not?
4. What are the three key types of dividends a firm might distribute to their shareholders? Describe each.
5. Big Box Outlet had an increase in its accounts payable account this period and a decrease in its accounts receivable, took out a long-term note payable, paid dividends to its shareholders, had depreciation on its

equipment, bought new equipment, increased its inventory account, and repaid a bond. In which section of the statement of cash flows would each of these items appear?

6. Kokoya's Firm calculates its free cash flow at only $2,000, which the company feels is quite low based on its historical performance and compared to others in its industry. What actions might Kokoya's Firm take to improve its overall cash flow?

7. Complete the common-size income statement for Big Box Outlet using the information below:

Big Box Outlet Common-Size Income Statement		
	Current Year	**Current Year %**
Gross Sales	$1,089,836	_____
Sales Returns & Allowances	59,737	_____
Net Sales	1,030,099	_____
Cost of Goods Sold	609,026	_____
Gross Profit	421,073	_____
Rent Expense	109,275	_____
Depreciation Expense	7,285	_____
Salaries Expense	123,845	_____
Utility Expense	36,425	_____
Operating Income	144,243	_____
Interest Expense	1,457	_____
Income Tax Expense	20,398	_____
Net Income	$ 122,388	

8. List at least eight items commonly found in a firm's annual report filed with the SEC.

Video Activity

The Income Statement Explained

Click to view content (https://openstax.org/r/income-statement-explain)

1. In the video, you see two years of data for Imaginary Ltd. The company had the same sales and same operating profit in both years. However, its performance really wasn't the same from one year to the next. How do the details of the income statement help you see this? What key performance measures were you able to glean from the income statement?

2. Though the key elements of the income statement can be summarized as simply all the firm's revenues and expenses, how would you describe the elements of the income statement in more detail? Assume you were consulting for a friend who owns a small dairy farm. What items would you expect to see on their income statement? Make a list and be as detailed as you can. Curious if your list is accurate? Consider doing an online search to find an income statement for a dairy farm or similar business. Compare its income statement to your list to see if you had the right idea.

How the Balance Sheet Works

Click to view content (https://openstax.org/r/balance-sheet-works)

3. In the video, before the example started, a fair amount of discussion time was devoted to the accounting equation, double-entry accounting, and the past versus the present data. How do all of these concepts tie together in the balance sheet and the type of data we can hope to glean from a balance sheet?

4. Three key account types are represented on the balance sheet: assets, liabilities, and equity. Much like the income statement, however, there is a great deal more detail to a balance sheet than simply these three

figures. What additional accounts and detail can you find on the balance sheet? If you were to look up the balance sheet for the company that sells your favorite thing (e.g., coffee, your laptop, your phone, candy), what types of accounts do you think you will find on its balance sheet? Consider doing an online search for the company's balance sheet to see if your guess is correct.

6

Measures of Financial Health

Figure 6.1 Organizations must continually measure their financial health in order to remain successful. (credit: "Money" by Pictures of Money/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

Financial analysis is a crucial element of business, but it can be used in personal finance as well. It differs depending on the role and perspective of those performing the analysis. For example, your personal accountant will have different goals and needs in making recommendations to you about your personal finances. All accounting professionals use financial analysis to check for validity, accurate data, compliance in reporting, and more.

Some tactics for managing your personal finances can be the same as for managing business finances. For example, reducing expenses and maximizing returns on long-term investments are always good practices. Debt can also be a beneficial tool in both personal and professional finances when used appropriately. Debt is neither inherently good nor bad; it simply needs to be properly managed in order to achieve a reasonable return in exchange for the cost and risk it poses.

Though the process and tools may be similar, financial analysis from a business perspective has different goals and needs. Investors are looking to identify firm performance, financial health, and profitability. Financial analysts closely review information found on financial statements so they can make informed business decisions. The income statement, statement of retained earnings, balance sheet, and statement of cash flows, among other financial information, are analyzed for internal and external stakeholders and provide a company with valuable information about its overall performance and specific areas for improvement. The analysis can

help with budgeting and making decisions about where the company could cut costs, how it might increase revenues, and what capital investment opportunities it should pursue.

LINK TO LEARNING

Financial Analyst

Lots of individuals and companies perform financial analysis. One of these roles is that of a financial analyst. The skills and qualifications of a financial analyst vary widely from one industry to another, but there are a number of similarities in individuals who hold these roles. As you watch the video about financial analysts (https://openstax.org/r/video-about-financial-analysts), consider your own career path and how your skills, abilities, and interests may fit this role.

6.1 Ratios: Condensing Information into Smaller Pieces

By the end of this section, you will be able to:

- Explain the importance of financial statement analysis in making informed decisions about business opportunities.
- Outline the limitations of financial statement analysis in making investment decisions.

When considering the outcomes from analysis, it is important for a company to understand that the data generated needs to be compared to similar data within the industry at large as well as that of close competitors. The company should also consider its past experience and how it corresponds to current and future performance expectations.

Importance of Ratios and Analysis

Financial ratios help internal and external stakeholders make informed decisions about actions like investing, becoming a supplier, making a loan, or altering internal operations, among other things. The information resulting from ratio analysis can be used to examine trends in performance, establish benchmarks for success, set budget expectations, and compare industry competitors. There are four main types of ratios: liquidity, solvency, efficiency, and profitability. While outcomes for some ratios may seem more ideal, the industry in which the business operates can change the influence of these outcomes on stakeholder decisions.

There are several benefits to analyzing financial statements. The information can show trends over time, which can help in making future business decisions. Converting information to percentages or ratios eliminates some of the disparities between competitors' sizes and operating abilities, making it easier for stakeholders to make informed decisions. It can assist with understanding the makeup of current operations within the business and which shifts need to occur internally to increase productivity.

Limitation of Financial Statement Analysis

Though useful, it's important to note that there are limitations to financial statement analysis as well. Stakeholders need to remember that past performance does not always predict future performance. Economic influences, such as inflation or a recession, could skew the data being analyzed. Additionally, the way a company reports information may change over time. For example, there could be changes in where and when certain transactions are recorded, and this may not be immediately evident to financial statement users. It is also key to note that though all publicly traded companies in the United States are required to follow Generally Accepted Accounting Principles (GAAP), there are many estimates and flexibility in how some standards are applied. This means that firms can still follow accounting standards appropriately but present some information differently from other firms.

It makes good sense for a company to use financial statement analysis to guide future operations so it can

budget properly, control costs, increase revenues, and make long-term expenditure decisions. As long as stakeholders understand the limitations of financial statement analysis, it is a useful way to predict growth and financial strength.

Despite limitations, ratios are still a valuable tool if used appropriately. The next section discusses several operating efficiency ratios including accounts receivable turnover, total asset turnover, inventory turnover, and days' sales in inventory. Operating efficiency ratios help users see how well management is using the financial assets of the firm.

6.2 Operating Efficiency Ratios

By the end of this section, you will be able to:

- Calculate accounts receivable turnover to assess a firm's performance in managing customer receivables.
- Evaluate management's use of assets using total asset turnover and inventory turnover.
- Assess organizational performance using days' sales in inventory calculations.

Efficiency ratios show how well a company uses and manages its assets, one key element of financial health. Important areas of efficiency are the management of sales, accounts receivable, and inventory. A company that is efficient will usually be able to generate revenues quickly using the assets it has acquired. Let's examine four **efficiency ratios**: accounts receivable turnover, total asset turnover, inventory turnover, and **days' sales in inventory**.

Accounts Receivable Turnover

For our discussion of financial statement analysis, we will look at Clear Lake Sporting Goods. Clear Lake Sporting Goods is a small merchandising company (a company that buys finished goods and sells them to consumers) that sells hunting and fishing gear. Figure 6.2 shows the comparative income statements and balance sheets for the past two years.

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Prior Year	Current Year
Net Sales	$100,000	$120,000
Cost of Goods Sold	50,000	60,000
Gross Profit	50,000	60,000
Rent Expense	5,000	5,500
Depreciation Expense	2,500	3,600
Salaries Expense	3,000	5,400
Utility Expense	1,500	2,500
Operating Income	38,000	43,000
Interest Expense	3,000	2,000
Income Tax Expense	5,000	6,000
Net Income	$ 30,000	$ 35,000

Clear Lake Sporting Goods
Comparative Year-End Balance Sheets

	Prior Year	Current Year
Assets:		
Cash	$ 90,000	$110,000
Accounts Receivable	20,000	30,000
Inventory	35,000	40,000
Short-Term Investments	15,000	20,000
Total Current Assets	160,000	200,000
Equipment	40,000	50,000
Total Assets	$200,000	$250,000
Liabilities:		
Accounts Payable	$ 60,000	$ 75,000
Unearned Revenue	10,000	25,000
Total Current Liabilities	70,000	100,000
Notes Payable	40,000	50,000
Total Liabilities	$110,000	$150,000
Stockholder Equity		
Common Stock	75,000	80,000
Ending Retained Earnings	15,000	20,000
Total Stockholders' Equity	90,000	100,000
Total Liabilities and Stockholder Equity	$200,000	$250,000

Figure 6.2 Comparative Income Statements and Year-End Balance Sheets Note that the comparative income statements and

balance sheets have been simplified here and do not fully reflect all possible company accounts.

To begin an analysis of receivables, it's important to first understand the cycles and periods used in the calculations.

Operating Cycle

A period is one **operating cycle** of a business. The operating cycle includes the cash conversion cycle plus the accounts receivable cycle (discussed below). Essentially it is the time it takes a business to purchase or make inventory and then sell it. For example, assume Clear Lake Sporting Goods orders and receives a shipment of fishing lures on June 1. It stocks the shelves with lures and tracks its inventory and sales. By July 15, all the lures from that shipment are gone. In this example, Clear Lake's operating cycle is 45 days.

Cash Conversion Cycle

Cash, however, doesn't necessarily flow linearly with accounting periods or operating cycles. The cash conversion cycle is the time it takes to spend cash to purchase inventory, produce the product, sell it, and then collect cash from the customer. Accounts receivable is one section of that cycle. Referring to Clear Lake's June 1 shipment of lures that sold by July 15, assume that some of the customers were fishing guides that keep an open account with Clear Lake. This company did not pay for its lures until August 15 when it settled its account. In this example, Clear Lake's cash cycle is 75 days.

Let's take a look at the accounts receivable turnover ratio, which helps assess that element of the cash conversion cycle.

Accounts Receivable Turnover Ratio

Receivables ratios show company performance in relation to current receivables (what is due from customers), as well as credit policy effect on sales growth. One receivables ratio is called the **accounts receivable turnover ratio**.This ratio determines how many times (i.e., how often) accounts receivable are collected during a year and converted to cash. A higher number of times indicates that receivables are collected quickly. This quick cash collection may be viewed as a positive occurrence because liquidity improves, and the company may reinvest in its business sooner when the value of the dollar has more buying power (time value of money). The higher number of times may also be a negative occurrence, signaling that credit extension terms are too tight, and it may exclude qualified consumers from purchasing. Excluding these customers means that they may take their business to a competitor, thus reducing potential sales.

In contrast, a lower number of times indicates that receivables are collected at a slower rate. A slower collection rate could signal that lending terms are too lenient; management might consider tightening lending opportunities and more aggressively pursuing payment from its customers. The lower turnover also shows that the company has cash tied up in receivables longer, thus hindering its ability to reinvest this cash in other current projects. The lower turnover rate may signal a high level of bad debt accounts. The determination of a high or low turnover rate really depends on the standards of the company's industry. It's key to note the tradeoff in adjusting credit terms. Loose credit terms may attract more customers but may also increase bad debt expense. Tighter credit terms may attract fewer customers but may also reduce bad debt expense.

The formula for accounts receivable turnover is

$$\text{Accounts Receivable Turnover} = \frac{\text{Net Credit Sales}}{\text{Average Accounts Receivable}}$$

$$\text{Average Accounts Receivable} = \frac{\text{Beginning Accounts Receivable} + \text{Ending Accounts Receivable}}{2}$$

Net credit sales are sales made on credit only; cash sales are not included because they do not produce receivables. However, many companies do not report credit sales separately from cash sales, so "net sales" may be substituted for "net credit sales" in this case. Beginning and ending accounts receivable refer to the

beginning and ending balances in accounts receivable for the period. The beginning accounts receivable balance is the same figure as the ending accounts receivable balance from the prior period.

When computing the accounts receivable turnover for Clear Lake Sporting Goods, let's assume net credit sales make up $100,000 of the $120,000 of the net sales found on the income statement in the current year.

$$\text{Average Accounts Receivable} = \frac{\$20{,}000 + \$30{,}000}{2} = \$25{,}000$$

$$\text{Accounts Receivable Turnover} = \frac{\$100{,}000}{\$25{,}000} = 4 \text{ times}$$

To gain a better understanding of its ratio performance, Clear Lake Sporting Goods can compare its turnover to industry averages, key competitors, and its own historical ratios. Given this outcome, the managers may want to consider stricter credit lending practices to make sure credit customers are of a higher quality. They may also need to be more aggressive with collecting any outstanding accounts.

THINK IT THROUGH

Accounts Receivable Turnover

You are a consultant assessing cash management practices for two firms, Company A and Company B (see Figure 6.3).

	Company A	Company B
Beginning Accounts Receivable	$ 50,000	$ 60,000
Ending Accounts Receivable	80,000	90,000
Net Credit Sales	$550,000	$460,000

Figure 6.3 Financial Information for Company A and Company B

Based on the information provided, do the following:

- Compute the accounts receivable turnover ratio.
- Interpret the outcomes, indicating how each company is performing

Solution:

Company A: $\text{ART} = 8.46$ times, Company B: $\text{ART} = 6.13$ times. Upon initial review of this limited information, Company A seems to be performing better since its turnover ratio is higher. Accounts receivable turnover has a significant impact on cash flows. One might want more information on trends for each company with these ratios and a comparison to others in the same industry. More information is helpful in assessing performance.

LINK TO LEARNING

American Superconductor Corporation

American Superconductor Corporation specializes in the production and service of energy-efficient wind turbine systems, as well as energy grid construction solutions. On the company's 2019 financial statement (https://openstax.org/r/financial-statement), the accounts receivable turnover ratio is approximately 6.32 times.

Total Asset Turnover

Total asset turnover measures the ability of a company to use its assets to generate revenues. A company would like to use as few assets as possible to generate the most net sales. Therefore, a higher total asset turnover means the company is using their assets very efficiently to produce net sales. The formula for total asset turnover is

$$\text{Total Asset Turnover} = \frac{\text{Net Sales}}{\text{Average Total Assets}}$$

$$\text{Average Total Assets} = \frac{\text{Beginning Total Assets} + \text{Ending Total Assets}}{2}$$

Average total assets are found by dividing the sum of beginning and ending total assets balances found on the balance sheet. The beginning total assets balance in the current year is taken from the ending total assets balance in the prior year.

Clear Lake Sporting Goods' total asset turnover is

$$\text{Average Total Assets} = \frac{\$200{,}000 + \$250{,}000}{2} = \$225{,}000$$

$$\text{Total Asset Turnover} = \frac{\$120{,}000}{\$225{,}000} = 0.53 \text{ times (rounded)}$$

The outcome of 0.53 means that for every $1 of assets, $0.53 of net sales are generated. Over time, Clear Lake Sporting Goods would like to see this turnover ratio increase.

Inventory Turnover

Inventory turnover measures how many times during the year a company has sold and replaced inventory. This can tell a company how well inventory is managed. A higher ratio is preferable; however, an extremely high turnover may mean that the company does not have enough inventory available to meet demand. A low turnover may mean the company has too much supply of inventory on hand. The formula for inventory turnover is

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\text{Average Inventory} = \frac{\text{Beginning Inventory} + \text{Ending Inventory}}{2}$$

Cost of goods sold for the current year is found on the income statement. Average inventory is found by dividing the sum of beginning and ending inventory balances found on the balance sheet. The beginning inventory balance in the current year is taken from the ending inventory balance in the prior year.

Clear Lake Sporting Goods' inventory turnover is

$$\text{Average Inventory} = \frac{\$35{,}000 + \$40{,}000}{2} = \$37{,}500$$

$$\text{Inventory Turnover} = \frac{\$60{,}000}{\$37{,}500} = 1.6 \text{ times}$$

A ratio of 1.6 times seems to be a very low turnover rate for Clear Lake Sporting Goods. This may mean the company is maintaining too high an inventory supply to meet a low demand from customers. Managers may want to decrease their on-hand inventory to free up more liquid assets to use in other ways. Keep in mind, ratios should not be taken out of context. One ratio alone can't tell the whole story. Ratios should be used with caution and in conjunction with other ratios and additional financial and contextual information.

As with accounts receivable, there is a trade-off to consider in managing inventory. Low turnover will usually

mean a low risk of stockouts and the ability to carry more of what customers are looking for. But high inventory levels will mean that more cash is tied up in inventory. High turnover will mean carrying less inventory and the higher risk of stockouts, causing customers to go elsewhere to find what they need.

Figure 6.4 Inventory turnover can help determine how well a company manages its inventory. (credit: "Untitled" by Marcin Wichary/ flickr, CC BY 2.0)

LINK TO LEARNING

Target Corporation

As we have learned, the inventory turnover ratio shows how well a company manages its inventory. Look through the financial statements in the 2019 Annual Report for Target (https://openstax.org/r/annual-report-for-target) and calculate the inventory turnover ratio. What does the outcome mean for Target?

Days' Sales in Inventory

Days' sales in inventory expresses the number of days it takes a company to turn inventory into sales. The fewer the number of days, the more quickly the company can sell its inventory. The greater the number of days, the longer it takes to sell its inventory. The formula for days' sales in inventory is

$$\text{Days' Sales in Inventory} = \frac{\text{Ending Inventory}}{\text{Cost of Goods Sold}} \times 365$$

Clear Lake Sporting Goods' days' sales in inventory is

$$\text{Days' Sales in Inventory} = \frac{\$40{,}000}{\$60{,}000} \times 365 = 243 \text{ days (rounded)}$$

Depending on the industry, 243 days may be a long time to sell inventory. While industry dictates what is an acceptable number of days to sell inventory, 243 days is likely to be unsustainable long-term. Remember, it's important to not take one ratio out of context. Review the ratio in conjunction with other ratios and other financial data. For example, we might review the days' sales in inventory along with accounts receivable turnover for Clear Lake Sporting Goods relative to the industry average to get a better picture of Clear Lake's performance in this area.

6.3 Liquidity Ratios

By the end of this section, you will be able to:

- Calculate current, quick, and cash ratios to assess a firm's liquidity and make informed business decisions.
- Assess organizational performance using liquidity ratios.

Liquidity refers to the business's ability to manage current assets or convert assets into cash in order to meet short-term cash needs, another aspect of a firm's financial health. Examples of the most liquid assets include cash, accounts receivable, and inventory for merchandising or manufacturing businesses. The reason these are among the most liquid assets is that these assets will be turned into cash more quickly than land or buildings, for example. Accounts receivable represents goods or services that have already been sold and will typically be paid/collected within 30 to 45 days.

Inventory is less liquid than accounts receivable because the product must first be sold before it generates cash (either through a cash sale or sale on account). Inventory is, however, more liquid than land or buildings because, under most circumstances, it is easier and quicker for a business to find someone to purchase its goods than it is to find a buyer for land or buildings.

Current Ratio

The **current ratio** is closely related to working capital; it represents the current assets divided by current liabilities. The current ratio utilizes the same amounts as working capital (current assets and current liabilities) but presents the amount in ratio, rather than dollar, form. That is, the current ratio is defined as current assets/current liabilities. The interpretation of the current ratio is similar to working capital. A ratio of greater than one indicates that the firm has the ability to meet short-term obligations with a buffer, while a ratio of less than one indicates that the firm should pay close attention to the composition of its current assets as well as the timing of the current liabilities.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

The current ratio in the current year for Clear Lake Sporting Goods is

$$\text{Current Ratio} = \frac{\$200{,}000}{\$100{,}000} = 2 \text{ or } 2{:}1$$

A 2:1 ratio means the company has twice as many current assets as current liabilities; typically, this would be plenty to cover obligations. A 2:1 ratio is actually quite high for most companies and most industries. Again, it's recommended that ratios be used in conjunction with one another. An analyst would likely look at the high current ratio and low accounts receivable turnover to begin asking questions about management performance, as this might indicate a trouble area (high inventory and slow collections).

LINK TO LEARNING

Target Corporation

As we have learned, the current ratio shows how well a company can cover short-term liabilities with short-term assets. Look through the balance sheet in the 2019 Annual Report for Target (https://openstax.org/r/annual-report-for-target) and calculate the current ratio. What does the outcome mean for Target?

Quick Ratio

The **quick ratio**, also known as the *acid-test ratio*, is similar to the current ratio except current assets are more narrowly defined as the most liquid assets, which exclude inventory and prepaid expenses. The conversion of

inventory and prepaid expenses to cash can sometimes take more time than the liquidation of other current assets. A company will want to know what it has on hand and can use quickly if an immediate obligation is due. The formula for the quick ratio is

$$\text{Quick Ratio} = \frac{\text{Cash} + \text{Short-Term Investments} + \text{Accounts Receivable}}{\text{Current Liabilities}}$$

The quick ratio for Clear Lake Sporting Goods in the current year is

$$\text{Quick Ratio} = \frac{\$110{,}000 + \$20{,}000 + \$30{,}000}{\$100{,}000} = 1.6 \text{ or } 1.6{:}1$$

A 1.6:1 ratio means the company has enough quick assets to cover current liabilities. It's again key to note that a single ratio shouldn't be used out of context. A 1.6 ratio is difficult to interpret on its own. Industry averages and trend analysis for Clear Lake Sporting Goods would also be helpful in giving the ratio more meaning.

LINK TO LEARNING

Target Corporation

As we have learned, the quick ratio shows how quickly a company can liquidate current assets to cover current liabilities. Look through the financial statements in the 2019 Annual Report for Target (https://openstax.org/r/annual-report-for-target) and calculate the quick ratio. What does the outcome mean for Target?

Cash Ratio

Cash is the most liquid asset a company has, and **cash ratio** is often used by investors and lenders to asses an organization's liquidity. It represents the firm's cash and cash equivalents divided by current liabilities and is a more conservative look at a firm's liquidity than the current or quick ratios. The ratio is reflected as a number, not a percentage. A cash ratio of 1.0 means the firm has enough cash to cover all current liabilities if something happened and it was required to pay all current debts immediately. A ratio of less than 1.0 means the firm has more current liabilities than it has cash on hand. A ratio of more than 1.0 means it has enough cash on hand to pay all current liabilities and still have cash left over. While a ratio greater than 1.0 may sound ideal, it's important to consider the specifics of the company. Sitting on idle cash is not ideal, as the cash could be used to earn a return. And having a ratio less than 1.0 isn't always bad, as many firms operate quite successfully with a ratio of less than 1.0. Comparing the company ratio with trend analysis and with industry averages will help provide more insight.

$$\text{Cash Ratio} = \frac{\text{Cash and Cash Equivalents}}{\text{Current Liabilities}}$$

The cash ratio for Clear Lake Sporting Goods in the current year is:

$$\text{Cash Ratio} = \frac{\$110{,}000}{\$100{,}000} = 1.1$$

A 1.1 ratio means the company has enough cash to cover current liabilities.

Figure 6.5 Cash is the most liquid asset a company has and is often used by investors and lenders to assess an organization's liquidity. (credit: "20 US Dollar" by Jack Sem/flickr CC BY 2.0)

6.4 Solvency Ratios

By the end of this section, you will be able to:

- Evaluate organizational solvency using the debt-to-assets and debt-to-equity ratios.
- Calculate the times interest earned ratio to assess a firm's ability to cover interest expense on debt as it comes due.

Solvency implies that a company can meet its long-term obligations and will likely stay in business in the future. Meeting long-term obligations includes the ability to pay any interest incurred on long-term debt. Two main solvency ratios are the debt-to-equity ratio and the times interest earned ratio.

Debt-to-Assets Ratio

The **debt-to-assets ratio** shows the relationship between debt and assets. It reflects how much of the assets of the business was financed through debt. It reflects the company's leverage and is helpful to analysts in comparing how leveraged one company is compared to another.

Debts normally carry interest expense and must be repaid. The debt-to-assets ratio includes all debt—both long-term debt and current liabilities. The formula for the debt-to-assets ratio is

$$\text{Debt-to-Assets Ratio} = \frac{\text{Current Liabilities} + \text{Long-Term Liabilities}}{\text{Total Assets}}$$

The information needed to compute the debt-to-assets ratio for Clear Lake Sporting Goods in the current year can be found on the balance sheet. The debt-to-assets ratio for Clear Lake Sporting Goods in the current year is

$$\text{Debt-to-Assets Ratio} = \frac{\$100{,}000 + \$50{,}000}{\$250{,}000} = 0.6 \text{ or } 60\%$$

This means that 60 percent of Clear Lake's assets are financed by debt. We can also then infer that the other 40 percent is financed by equity. A ratio higher than 1.0 means the company has more debts than assets, which means it has negative equity. In Clear Lake's case, a 60 percent debt-to-assets ratio indicates some risk, but perhaps not a high risk. Comparing Clear Lake's ratio to industry averages would provide better insight.

LINK TO LEARNING

Target Corporation

As we have learned, the debt-to-assets ratio shows the relationship between a firm's debt and assets. Look through the financial statements in the 2019 Annual Report for Target (https://openstax.org/r/annual-report-for-target) and calculate the debt-to-assets ratio. What does the outcome mean for Target?

Debt-to-Equity Ratio

The **debt-to-equity ratio** shows the relationship between debt and equity as it relates to business financing. A company can take out loans, issue stock, and retain earnings to be used in future periods to keep operations running. A key difference in debt and equity is the interest expense repayment that a loan carries as opposed to equity, which does not have this requirement. Therefore, a company wants to know how much debt and equity contribute to its financing. The formula for the debt-to-equity ratio is

$$\text{Debt-to-Equity Ratio} = \frac{\text{Total Liabilities}}{\text{Total Stockholder Equity}}$$

The information needed to compute the debt-to-equity ratio for Clear Lake Sporting Goods in the current year can be found on the balance sheet.

$$\text{Debt-to-Equity Ratio} = \frac{\$150{,}000 + \$50{,}000}{\$100{,}000} = 1.5 \text{ or } 1.5{:}1$$

This means that for every one dollar of equity contributed toward financing, $1.50 is contributed from lenders. Recall that total assets equal total liabilities plus total equity. Both the debt-to-assets and debt-to-equity ratio have total liabilities in the numerator. The difference in the two ratios is the denominator. The denominator for the debt-to-equity ratio is total stockholder equity. The denominator for the debt-to-assets ratio is total assets, or total liabilities plus total equity. Thus, the two ratios contain the same information, making calculating both ratios redundant. A financial analyst may prefer to calculate one ratio over the other because of the format of readily available industry data to use for comparison purposes or for consistency with other calculations the analyst is performing.

THINK IT THROUGH

Financing a Business Expansion

You are the CFO of a small corporation. The president, who is one of five shareholders, has created an innovative new product that is testing well with substantial demand. To begin manufacturing, $400,000 is needed to acquire the equipment. The corporation's balance sheet shows total assets of $2,400,000 and total liabilities of $600,000. Most of the liabilities relate to debt that carries a covenant requiring that the company maintain a debt-to-equity ratio not exceeding 0.50. Determine the effect that each of the two options of obtaining additional capital will have on the debt covenant.

Solution:

We know the total liabilities for the firm to be $600,000. Using the accounting equation, we can find that the firm has $1,800,000 in equity. $\$600{,}000/\$1{,}800{,}000 =$ current debt-to-equity ratio of 0.33, which is well below the requirement for the debt covenant. If the firm issues debt, the ratio changes to $\$1{,}000{,}000/\$1{,}800{,}000$, which is 0.55 and would violate the debt covenant. If the firm chooses to issue additional stock, the new debt-to-equity ratio would be $\$600{,}000/\$2{,}200{,}000$, which is 0.27. This is well below the requirements in the debt covenant.

Times Interest Earned (TIE) Ratio

The **times interest earned (TIE) ratio** measures the company's ability to pay interest expense on all debt incurred. This ability to pay is determined by the available earnings before interest and taxes (EBIT) are deducted. These earnings are considered the operating income. Lenders will pay attention to this ratio before extending credit. The more times over a company can cover interest, the more likely a lender will extend long-term credit. The formula for times interest earned is

$$\text{Times Interest Earned} = \frac{\text{Earnings Before Interest and Taxes (EBIT)}}{\text{Interest Expense}}$$

The information needed to compute times interest earned for Clear Lake Sporting Goods in the current year can be found on the income statement.

$$\text{Times Interest Earned} = \frac{\$43{,}000}{\$2{,}000} = 21.5 \text{ times}$$

The $43,000 is the operating income, representing earnings before interest and taxes. The 21.5 times outcome suggests that Clear Lake Sporting Goods can easily repay interest on an outstanding loan and creditors would have little risk that Clear Lake Sporting Goods would be unable to pay.

LINK TO LEARNING

Times Interest Earned

This video about times interest earned (https://openstax.org/r/video-about-times) explains how to calculate it and why the ratio is useful, and it provides an example.

6.5 Market Value Ratios

By the end of this section, you will be able to:

- Calculate earnings per share to determine the portion of profit allocated to each outstanding share of common stock.
- Evaluate firm value using the price/earnings ratio and book value per share.

In this section we will turn our attention to **market value ratios**, measures used to assess a firm's overall market price. Common ratios used include earnings per share, the price/earnings ratio, and book value per share.

Earnings per Share (EPS)

Earnings per share (EPS) measures the portion of a corporation's profit allocated to each outstanding share of common stock. An increasing earnings per share can drive up a stock price. Conversely, falling earnings per share can lower a stock's market price. Earnings per share is also a component in calculating the price-to-earnings ratio (the market price of the stock divided by its earnings per share), which many investors find to be a key indicator of the value of a company's stock.

It's key to note, however, that EPS, like any ratio, should be used with caution and in tandem with other ratios and contextual data. Many financial professionals choose not to rely on income statement data and, similarly, EPS because they feel the cash flow statement provides more reliable and insightful information.

CONCEPTS IN PRACTICE

Alibaba Group Earnings Announcements Continue to Exceed Market Expectations

Alibaba, a Chinese-based company traded in the United States, exceeded market expectations in 2020 quarterly earnings releases. In the November 2020 earnings release, Alibaba reported earnings per share of 17.97 yuan versus market estimates of 14.33. Despite many companies struggling due to the pandemic, Alibaba reported strong earnings as a result of the surge in online shopping and remote work.

(sources: "Alibaba Beats Estimates as Pandemic Fuels Online, Cloud Computing Demand." *CNBC.* August 20, 2020. https://www.cnbc.com/2020/08/20/alibaba-beats-quarterly-revenue-estimates.html; Emily Bary. "Alibaba Earnings Top Expectations as Pandemic Drives Increased Digital Purchases. *Market Watch.* August 20, 2020. https://www.marketwatch.com/story/alibaba-earnings-top-expectations-as-pandemic-drives-increased-digital-purchases-2020-08-20; Matthew Johnston. "Alibaba Earnings: What Happened." *Investopedia*. November 5, 2020. https://www.investopedia.com/alibaba-q2-2021-earnings-5085444; Chris Versace. "Why S&P 500 EPS Expectations Showcase the Need for Thematic Investing." *Tematica Research.* June 3, 2020. https://www.tematicaresearch.com/why-sp-500-eps-expectations-showcase-the-need-for-thematic-investing)

Calculating Earnings per Share

Earnings per share is the profit a company earns for each of its outstanding common shares. Both the balance sheet and income statement are needed to calculate earnings per share. The balance sheet provides details on the preferred dividend rate, the total par value of the preferred stock, and the number of common shares outstanding. The income statement indicates the net income for the period. The formula to calculate basic earnings per share is

$$\text{Earnings per Share} = \frac{\text{Net Income} - \text{Preferred Dividends}}{\text{Weighted Average Common Shares Outstanding}}$$

By removing the preferred dividends from net income, the numerator represents the profit available to common shareholders. Because preferred dividends represent the amount of net income to be distributed to preferred shareholders, this portion of the income is obviously not available for common shareholders. While a number of variations of measuring a company's profit, such as NOPAT (net operating profit after taxes) and EBITDA (earnings before interest, taxes, depreciation, and amortization), are used in the financial world, GAAP requires companies to calculate earnings per share based on a corporation's net income, as this amount appears directly on a company's income statement, which for public companies must be audited.

In the denominator, only common shares are used to determine earnings per share because earnings per share is a measure of earnings for each common share of stock. The denominator can fluctuate throughout the year as a company issues and buys back shares of its own stock. The weighted average number of shares is used on the denominator because of this fluctuation. To illustrate, assume that a corporation began the year with 600 shares of common stock outstanding and then on April 1 issued 1,000 more shares. During the period January 1 to March 31, the company had the original 600 shares outstanding. Once the new shares were issued, the company had the original 600 plus the new 1,000 shares, for a total of 1,600 shares for each of the next nine months—from April 1 to December 31. To determine the weighted average shares, apply these fractional weights to both of the stock amounts (see Figure 6.6).

Number of Shares	×	Portion of Year	=	Weighted Shares
600	×	3/12	=	150
1,600	×	9/12	=	1,200
Weighted Average Shares				1,350

Figure 6.6 Weighted Shares

If the shares were not weighted, the calculation would not consider the time period during which the shares were outstanding.

To illustrate how earnings per share is calculated, assume Clear Lake Sporting Goods earns $35,000 in net income during the current year. During the year, the company also declared a $5,000 dividend on preferred stock and a $6,000 dividend on common stock. The company had 8,000 common shares outstanding the entire year. Clear Lake Sporting Goods has generated $3.75 of earnings ($35,000 less the $5,000 of preferred dividends) for each of the 8,000 common shares of stock it has outstanding.

$$\text{Earnings per Share} = \frac{\$35{,}000 - \$5{,}000}{8{,}000} = \$3.75$$

Measuring Performance with Earnings per Share

Earnings per share is a key profitability measure that both current and potential common stockholders monitor. Its importance is accentuated by the fact that GAAP requires public companies to report earnings per share on the face of a company's income statement. This is the only ratio that requires such prominent reporting. If fact, public companies are required to report two different earnings per share amounts on their income statements—basic and diluted. We've illustrated the calculation of basic earnings per share. Diluted earnings per share, which is not demonstrated here, involves the consideration of all securities, such as stocks and bonds, that could potentially dilute, or reduce, the basic earnings per share.

LINK TO LEARNING

Finding Earning per Share for Public Companies

Where can you find earnings per share information on public companies? Use the Yahoo! Finance (https://openstax.org/r/yahoo-finance) website to look up stock and earnings per share data for Tellurian Inc. (TELL), Amazon (AMZN), or CVS Pharmacy (CVS). Or use the search function to search for earnings per share data for your favorite corporation. Enter the ticker for the company you are looking up, and a basic chart and graph will display with stock price data along with several commonly used ratios (including earnings per share).

As you review data, keep in mind that a company can manipulate or impact its earnings per share by issuing new shares or buying back issued shares. What are the ethical implications of earnings per share calculations?

Common stock shares are normally purchased by investors to generate income through dividends or to sell at a profit in the future. Investors realize that inadequate earnings per share can result in poor or inconsistent dividend payments and fluctuating stock prices. As such, companies seek to produce earnings per share amounts that rise each period. However, an increase in earnings per share may not always reflect favorable performance, as there are multiple reasons that earnings per share may increase. One way earnings per share can increase is through increased net income. On the other hand, it can also increase when a company buys back its own shares of stock.

For example, assume that Clear Lake Sporting Goods generated net income of $30,000 and paid out $3,000 in

preferred shareholder dividends last year. In addition, 10,550 shares of common stock were outstanding throughout the entire year. In January of the current year, the company buys back shares of its common stock and holds them as treasury shares, making its current weighted average shares outstanding for this year 8,000. Net income for the current year is $35,000, $5,000 of which was paid to preferred shareholders in dividends. In the prior year, the company's earnings per share was

$$\text{Earnings per Share} = \frac{\$30{,}000 - \$3{,}000}{10{,}550} = \$2.56$$

Clear Lake Sporting Goods' current year earnings per share is

$$\text{Earnings per Share} = \frac{\$35{,}000 - \$5{,}000}{8{,}000} = \$3.75$$

The purchase of treasury stock in the current year reduces the common shares outstanding to 8,000 because treasury shares are considered issued but not outstanding. Earnings per share for the current year is now $3.75 per share even though earnings only increased by $5,000. It's key to note the impact of purchasing treasury stock and the intentions in doing so. Treasury stock is commonly purchased for a variety of reasons, but doing so to intentionally manipulate earnings per should not be a primary reason.

This increase in earnings per share occurred because the net income is now spread over fewer shares of stock. Similarly, earnings per share can decline even when a company's net income increases if the number of shares increases at a higher degree than net income.

CONCEPTS IN PRACTICE

Stock Buybacks Can Drive Up Earnings per Share: Ethical?

As many companies struggled to make ends meet or meet their cash flow needs amid the COVID-19 pandemic, some companies continued to thrive. Apple continued to have a healthy financial position with ample cash supply. It repurchased $18.5 billion of its own stock in the second quarter of 2020.[1] The total stock buyback over the preceding five years was $282.87 billion, which is 3.5 times higher than any other company. Since the earnings per share calculation is earnings divided by average outstanding shares, the fewer shares there are outstanding, the higher earnings per share goes without the firm having to actually raise earnings.

What do you think? Did Apple act ethically in repurchasing large quantities of its own shares? Is it ethical for any company to do so? If you were an investor or analyst, what questions would you ask or what cautions would you take in assessing and comparing earnings per share data?

(sources: Wayne Duggan. "7 S&P 500 Companies with Stock Buybacks." *US News & World Report.* December 14, 2020. https://money.usnews.com/investing/stock-market-news/slideshows/s-p-500-companies-with-stock-buybacks?slide=2; "Apple's $460 Billion Stock Buyback." *Above Avalon.* April 23, 2020. https://www.aboveavalon.com/notes/2020/4/23/apples-460-billion-stock-buyback; "Apple Stock Buybacks (Quarterly)." *Ycharts.* n.d. https://ycharts.com/companies/AAPL/stock_buyback)

LINK TO LEARNING

Stock Buybacks

This *Wall Street Journal* video about stock buybacks (https://openstax.org/r/video-about-stock-buybacks)

1 Bill Maurer. "Apple: New Highs Seem Likely." Seeking Alpha. May 11, 2020. https://seekingalpha.com/article/4346246-apple-new-highs-seem-likely

explains the various perspectives on the subject. It walks through the basic concepts of how buybacks work and explores some viewpoints on whether buybacks are good, bad, or otherwise.

To put a firm's earnings per share into perspective and allow for a more meaningful analysis, earnings per share is often tracked over a number of years, such as when presented in the comparative income statements for Clear Lake Sporting Goods (see Figure 6.7).

Clear Lake Sporting Goods
Comparative Year-End Income Statements

	Current Year	Prior Year	2 Years Prior
Net Sales	$120,000	$100,000	$90,000
Cost of Goods Sold	60,000	50,000	45,000
Gross Profit	60,000	50,000	45,000
Rent Expense	5,500	5,000	5,000
Depreciation Expense	3,600	2,500	2,000
Salaries Expense	5,400	3,000	2,750
Utility Expense	2,500	1,500	1,250
Operating Income	43,000	38,000	34,000
Interest Expense	2,000	3,000	2,000
Income Tax Expense	6,000	5,000	5,000
Net Income	$ 35,000	$ 30,000	$27,000
Basic Weighted Shares Outstanding	8,000	10,550	11,100
Basic Net Income per Share (EPS)	$ 3.75	$ 2.56	$ 2.21
Common Dividends	$ 6,000	$ 4,000	$ 3,500
Preferred Dividends	$ 5,000	$ 3,000	$ 2,500

Figure 6.7 Comparative Year-End Income Statements Earnings per share year after year can be a good indication of a company's financial health.

Most analysts believe that a consistent improvement in earnings per share year after year is an indication of continuous improvement in the earning power of a company. This is what is seen in Clear Lake Sporting Goods' earnings per share amounts over each of the three years reported, moving from $2.21 to $2.56 to $3.75. However, it is important to remember that earnings per share is calculated on historical data, which is not always predictive of the future.

THINK IT THROUGH

Would You Have Invested?

What if, in 1997, you invested $5,000 in Amazon? Today, your investment would be worth nearly $6 million. Potential investors viewing Amazon's income statement in 1997 would have seen earnings per share of negative $1.27. In other words, Amazon lost $1.27 for each share of common stock outstanding. Would you have invested?

Solution:

Answers will vary. A strong response would include the idea that a negative or small earnings per share reflects upon the historical operations of a company. Earnings per share does not predict the future. Investors in 1997 looked beyond Amazon's profitability and saw its business model having strong future potential.

Price/Earnings (P/E) Ratio

The **price/earnings (P/E) ratio** measures the current market share price of a company's stock relative to its earnings per share (EPS). The ratio is helpful in comparing performance and stock price of a company to other companies. It's also helpful in evaluating how much investors are willing to pay for earnings performance. Investors, in particular, use this ratio and rely on two key characteristics: past performance (trailing) and future estimates (forward). Trailing data can be calculated but is also easily found online, as it's a common measure reported on financial sites. Investors will often look for P/E TTM, which is the price/earnings ratio for the trailing 12 months (last year worth of earnings data). This helps investors assess one day's stock price relative to the earnings per share over the past 12 months. P/E ratio is widely used by investors to determine if a stock is over- or undervalued. It also helps them compare one firm to that of the industry average or index, such as the S&P 500.

$$\text{Price/Earnings Ratio} = \frac{\text{Market Value per Share}}{\text{Earnings per Share}}$$

In the prior section we saw earnings per share data for Clear Lake Sporting Goods. Using its current year earnings per share of $3.75 and the current stock price of $69.41, we can calculate price/earnings ratio for Clear Lake Sporting Goods:

$$\text{Price Earnings Ratio} = \frac{\$69.41}{\$3.75} = 18.51$$

An 18.51 ratio means an investor would expect to invest $18.51 to gain $1 of earnings.

Book Value per Share

Book value per share is often used hand in hand with market value per share. Investors compare the two in order to see if the stock is possibly over- or undervalued. Book value is derived from accounting practices and shows the value of the firm on paper. Market value, on the other hand, is determined by supply and demand, based on what investors are willing to pay for the stock. If the market value per share is higher than the book value, the stock is considered overvalued. If the market value is lower than the book value, it's considered undervalued.

In theory, book value per share represents the total value common shareholders would receive if the firm were liquidated. It is total equity less preferred equity, spread across the total shares outstanding. The formula to calculate book value per share is

$$\text{Book Value per Share} = \frac{\text{Total Equity} - \text{Preferred Equity}}{\text{Total Shares Outstanding}}$$

The book value per share for Clear Lake Sporting Goods is

$$\text{Book Value per Share} = \frac{\$100{,}000 - \$20{,}000}{8{,}000} = \$10$$

If investors compared the book value per share of $10.00 for Clear Lake Sporting Goods to the P/E ratio of $18.51, they would likely conclude that the stock was undervalued in the year of analysis.

LINK TO LEARNING

Book Value versus Market Value of Shares

This video about book value and market value (https://openstax.org/r/video-about-book-value) explains the basic concepts and discusses how the two differ. Samples of the concept are then explored using Apple Inc. as an example.

6.6 Profitability Ratios and the DuPont Method

By the end of this section, you will be able to:

- Calculate profit margin to determine how much sales revenues the firm has translated into income.
- Evaluate firm performance by calculating return on total assets and return on equity.
- Analyze organizational performance using DuPont method calculations.

Profitability considers how well a company produces returns given its operational performance. The company needs to use its assets and operations efficiently to increase profit. To assist with profit goal attainment, company revenues need to outweigh expenses. Let's consider three profitability measurements and ratios: profit margin, return on total assets, and return on equity.

Profit Margin

Profit margin represents how much of sales revenue has translated into income. This ratio shows how much of each $1 of sales is returned as profit. The larger the ratio figure (the closer it gets to 1), the more of each sales dollar is returned as profit. The portion of the sales dollar not returned as profit goes toward expenses. The formula for profit margin is

$$\text{Profit Margin} = \frac{\text{Net Income}}{\text{Net Sales}}$$

For Clear Lake Sporting Goods, the profit margin in the current year is

$$\text{Profit Margin} = \frac{\$35{,}000}{\$120{,}000} = 0.29 \text{ (rounded) or } 29\%$$

This means that for every dollar of sales, $0.29 returns as profit. If Clear Lake Sporting Goods thinks this is too low, the company would try to find ways to reduce expenses and increase sales.

Return on Total Assets

The **return on total assets** measures the company's ability to use its assets successfully to generate a profit. The higher the return (ratio outcome), the more profit is created from asset use. Average total assets are found by dividing the sum of beginning and ending total assets balances found on the balance sheet. The beginning total assets balance in the current year is taken from the ending total assets balance in the prior year. The formula for return on total assets is

$$\text{Return on Total Assets} = \frac{\text{Net Income}}{\text{Average Total Assets}}$$

$$\text{Average Total Assets} = \frac{(\text{Beginning Total Assets} + \text{Ending Total Assets})}{2}$$

For Clear Lake Sporting Goods, the return on total assets for the current year is

$$\text{Average Total Assets} = \frac{(\$200{,}000 + \$250{,}000)}{2} = \$225{,}000$$

$$\text{Return on Total Assets} = \frac{\$35{,}000}{\$225{,}000} = 0.16 \text{ (rounded) or } 16\%$$

The higher the figure, the better the company is using its assets to create a profit. Industry standards can dictate what an acceptable return is.

LINK TO LEARNING

Return on Assets

This video explains how to calculate return on assets (https://openstax.org/r/video-explains-how-to-calculate) and how to interpret the results. The video provides the formula, a discussion of the concept, and the importance of the ratio.

Return on Equity

Return on equity measures the company's ability to use its invested capital to generate income. The invested capital comes from stockholders' investments in the company's stock and its retained earnings and is leveraged to create profit. The higher the return, the better the company is doing at using its investments to yield a profit. The formula for return on equity is

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Average Stockholder Equity}}$$

$$\text{Average Stockholder Equity} = \frac{\text{Beginning Stockholder Equity} + \text{Ending Stockholder Equity}}{2}$$

Average stockholders' equity is found by dividing the sum of beginning and ending stockholders' equity balances found on the balance sheet. The beginning stockholders' equity balance in the current year is taken from the ending stockholders' equity balance in the prior year. Keep in mind that the net income is calculated after preferred dividends have been paid.

For Clear Lake Sporting Goods, we will use the net income figure and deduct the preferred dividends that have been paid. The return on equity for the current year is

$$\text{Average Stockholder Equity} = \frac{90{,}000 + 100{,}000}{2} = 95{,}000$$

$$\text{Return on Equity} = \frac{\$35{,}000 - \$5{,}000}{\$95{,}000} = 0.32 \text{ (rounded) or } 32\%$$

The higher the figure, the better the company is using its investments to create a profit. Industry standards can dictate what an acceptable return is.

The DuPont Method

ROE in its basic form is useful; however, there are really three components of ROE: operating efficiency (profit margin), asset usage (total asset turnover), and leverage (equity ratio). This is known as the **DuPont method**. It originated in 1919 when the DuPont company implemented it for internal measurement purposes.[2] The DuPont method can be expressed using this formula:

$$\text{ROE} = \text{Profit Margin} \times \text{Total Asset Turnover} \times \text{Equity Multiplier}$$

Profit margin indicates how much profit is generated by each dollar of sales and is computed as shown:

$$\text{Profit Margin} = \frac{\text{Net Income}}{\text{Net Sales}}$$

Total asset turnover indicates the number of sales dollars produced by every dollar invested in capital assets—in other words, how efficiently the company is using its capital assets to generate sales. It is computed as shown:

2 Joshua Kennon. "What Is the DuPont Method Return on Equity, or ROE, Formula?" The Balance. December 16, 2020. https://thebalance.com/the-dupont-model-return-on-equity-formula-for-beginners-357494

$$\text{Equity Multiplier} = \frac{\text{Average Total Assets}}{\text{Average Stockholders' Equity}}$$

The equity multiplier measures leverage. It is computed as shown:

$$\text{Equity Multiplier} = \frac{\text{Average Total Assets}}{\text{Average Stockholders' Equity}}$$

Using DuPont analysis, investors can see overall performance broken down into smaller pieces, which helps them better understand what is driving ROE. We already have the computations for Clear Lake Sporting Goods' profit margin and total asset turnover:

$$\text{Profit Margin} = \frac{\$35{,}000}{\$120{,}000} = 0.29 \text{ (rounded) or } 29\%$$

$$\text{Total Asset Turnover} = \frac{\$120{,}000}{\$225{,}000} = 0.53 \text{ times (rounded)}$$

We can calculate the equity multiplier using the equity multiplier equation and prior calculations for Clear Lake's average total assets and average stockholder equity:

$$\text{Equity Multiplier} = \frac{\text{Average Total Assets}}{\text{Average Stockholders' Equity}}$$

$$\text{Average Total Assets} = \frac{\$200{,}000 + \$250{,}000}{2} = \$225{,}000$$

$$\text{Average Stockholder Equity} = \frac{\$90{,}000 + \$100{,}000}{2} = \$95{,}000$$

$$\text{Equity Multiplier} = \frac{\$225{,}000}{\$95{,}000} = 2.37$$

Now that we have all three elements, we can complete the DuPont analysis for Clear Lake Sporting Goods:

$$\text{ROE} = \text{Profit Margin} \times \text{Total Asset Turnover} \times \text{Equity Multiplier}$$

$$\text{ROE} = 29\% \times 0.53 \times 2.37 = 0.36 \text{ or } 36.4\%$$

LINK TO LEARNING

The DuPont Method

This video about the DuPont method (https://openstax.org/r/video-about-DuPont-method) walks through its history, discusses its basic components, and shows how to calculate and interpret each measurement.

Performance Analysis

ROE captures the nuances of all three elements. A good sales margin and a proper asset turnover are both needed for a successful operation. Like all ratios, assessing performance is relative. It's important to look at the ratio in context of the organization, its history, and the industry. If we compare Clear Lake's ROE of 26.4% to the recreational products industry average of 12.56% for the same year, it would appear as though Clear Lake Sporting Goods is outperforming the general industry. However, recreational products can include a wide variety of businesses beyond just the outdoor gear in which Clear Lake Sporting Goods specializes. An analyst could look at other key competitors such as Cabela's or Bass Pro Shops to get even more relevant comparisons.

Clear Lake Sporting Goods is also technically a retail store, albeit a specialized one. An analyst might also consider the industry averages for general or online retail of 20.64% and 27.05%, respectively. Compared to the broader retail industry, Clear Lake Sporting Goods is still performing well, but its performance is not as

disparate to industry average as when compared to recreational products (see Table 6.1).

Industry	ROE (%)
Advertising	2.93
Air Transportation	−47.03
Computer Services	13.50
Banking	8.22
Financial Services (nonbanking)	64.28
Food Processing	10.12
Renewable Energy	−20.59
Hospitals/Health Care Facilities	70.64
Hotels/Gaming	−30.40
Publishers	−14.18
Recreational Products	12.56
Real Estate (general)	2.00
Retail:	0.00
Automotive	36.28
Building Supply	0.27
General	20.64
Grocery	30.63
Online	27.05
Rubber and Tires	−26.69
Shoes	23.70
Software (systems and applications)	28.09
Transportation	21.47
Total Market Average	8.25

Table 6.1 Return on Equity by Industry in 2020 It's important to look at any ratio in context of the organization, its history, and the industry. (data source: Aswath Damodaran Online)

Summary

6.1 Ratios: Condensing Information into Smaller Pieces

Ratios used in financial analysis can help investors and other analysts identify trends over time, compare companies to one another, and make informed decisions about a company. There are, however, limitations to analysis, so it should be used wisely and in conjunction with other contextual information available.

6.2 Operating Efficiency Ratios

Efficiency ratios measure how well management uses the assets of the organization to earn a profit. Common efficiency ratios include accounts receivable turnover, total asset turnover, inventory turnover, and days' sales in inventory.

6.3 Liquidity Ratios

Liquidity ratios help analysts measure how well an organization can meet its short-term obligations (liabilities) as they come due. Common ratios to measure liquidity include the current ratio, the quick ratio, and the cash ratio. Each of these three ratios includes more (cash ratio) or less liquid (current ratio) current assets in its measure of liquidity.

6.4 Solvency Ratios

Solvency ratios measure how well an organization can meet its long-term obligations (liabilities) as they come due, or in more general terms, its ability to stay in business. Common solvency ratios include the debt-to-assets ratio and the debt-to-equity ratio.

6.5 Market Value Ratios

Market value ratios help analysts assess the value of publicly traded firms in the market. The most commonly used market value ratios include earnings per share (EPS), the price/earnings ratio, and book value per share.

6.6 Profitability Ratios and the DuPont Method

Profitability ratios help measure how effectively the organization earns a profit. Common profitability ratios include profit margin, return on total assets, and return on equity. The DuPont method breaks down return on equity into three smaller components for a more thorough assessment of performance: profit margin, total asset turnover, and an equity multiplier.

Key Terms

accounts receivable turnover ratio measures how many times in a period (usually a year) a company will collect cash from accounts receivable

book value per share total book value (assets – liabilities) of a firm expressed on a per-share basis

cash ratio represents the firm's cash and cash equivalents divided by current liabilities; often used by investors and lender to asses an organization's liquidity

current ratio current assets divided by current liabilities; used to determine a company's liquidity (ability to meet short-term obligations)

days' sales in inventory the number of days it takes a company to turn inventory into sales

debt-to-assets ratio measures the portion of debt used by a company relative to the amount of assets

debt-to-equity ratio measures the portion of debt used by a company relative to the amount of stockholders' equity

DuPont method framework for financial analysis that breaks return on equity down into smaller elements

earnings per share (EPS) measures the portion of a corporation's profit allocated to each outstanding share of common stock

efficiency ratios ratios that show how well a company uses and manages its assets

inventory turnover measures the number of times an average quantity of inventory was bought and sold during the period
liquidity ability to convert assets into cash in order to meet primarily short-term cash needs or emergencies
market value ratios measures used to assess a firm's overall market price
operating cycle amount of time it takes a company to use its cash to provide a product or service and collect payment from the customer
price/earnings (P/E) ratio company's stock price divided by the company's earnings per share; indicates the amount investors are willing to pay for one dollar of earnings
profit margin represents how much of sales revenue has translated into income
quick ratio also known as the *acid test ratio*; ratio used to determine a firm's ability to pay short-term debts using its most liquid assets
return on equity measures the company's ability to use its invested capital to generate income
return on total assets measures the company's ability to use its assets successfully to generate a profit
solvency implies that a company can meet its long-term obligations and will likely stay in business in the future
times interest earned (TIE) ratio measures the company's ability to pay interest expense on long-term debt incurred
total asset turnover measures the ability of a company to use its assets to generate revenues

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/cfa-study-session11). Reference with permission of CFA Institute.

Multiple Choice

1. Which of the following is financial statement analysis not used for?
   a. identifying trends over time
   b. benchmarking against other firms
   c. complying with SEC (Securities and Exchange Commission) regulations
   d. setting budget expectations

2. How is converting financial data to percentages helpful in financial analysis?
   a. It makes the figures easier to calculate.
   b. It masks actual financial data so the competition can't see it.
   c. It saves time.
   d. It makes comparisons to companies of varying sizes possible.

3. What is a common economic influence that has the potential to skew financial analysis figures?
   a. past performance
   b. inflation
   c. Generally Accepted Accounting Principles
   d. benchmark data

4. What is the formula for accounts receivable turnover?
   a. net credit sales / average accounts receivable
   b. total sales / average accounts receivable
   c. net credit sales / beginning accounts receivable
   d. net cash sales / ending accounts receivable

5. What is the formula for the times interest earned ratio?

a. net income / interest expense
b. earnings before interest and taxes / interest expense
c. interest expense / earnings before interest and taxes
d. earnings before interest and taxes – interest expense

6. What is the formula for the calculation of earnings per share?
a. (net income + preferred dividends) / weighted average common shares outstanding
b. net income / weighted average common shares outstanding
c. (net income – preferred dividends) / weighted average common shares outstanding
d. (net income – preferred dividends) / treasury shares outstanding

7. Most analysts believe which of the following is true about earnings per share?
a. Consistent improvement in earnings per share year after year is an indication of continuous improvement in the company's earning power.
b. Consistent improvement in earnings per share year after year is an indication of continuous decline in the company's earning power.
c. Consistent improvement in earnings per share year after year is an indication of fraud within the company.
d. Consistent improvement in earnings per share year after year is an indication that the company will never suffer a year of net loss rather than net income.

8. What is the formula for profit margin?
a. net sales / net income
b. cost of goods sold / net sales
c. sales / cost of goods sold
d. net income / net sales

Review Questions

1. Is past performance considered a good indicator of future performance?

2. The Pony Parts Tack Shop had inventory turnover of 12.8, 12.2, and 9.9 over the last three years, respectively. What can you learn about how well the Pony Parts management team is managing their inventory using this information?

3. The Pony Parts Tack Shop had total asset turnover of 1.8., 2.1, and 2.4 over the last three years, respectively. What can you learn about how well the Pony Parts management team is managing their total assets using this information?

4. Big Box Store Inc. had days' sales in inventory of 30, 32, and 34 for the last three years. Small Box Store Inc. had days' sales in inventory of 40, 38, and 36 for the last three years. What can you infer about the inventory management for the two companies based on this information? Which company is performing better?

5. Jackson's Beef Jerky Shop has a current ratio of 2.35. What does that mean? Is 2.35 a good or bad current ratio?

6. Jackson's Beef Jerky Shop has a quick ratio of 1.9. What does that mean? Is 1.9 a good or bad quick ratio?

7. Jackson's Beef Jerky Shop has a cash ratio of 1.75. What does that mean? Is 1.75 a good or bad cash ratio?

8. You have some funds that you would like to invest. Do some internet research to find two publicly traded companies in the same industry and compare their earnings per share. Would the earnings per share

reported by each company influence your decision in selecting which company to invest in?

9. Company A has a market value per share of 19.55 and book value per share of 12.79. If you were an investor, what would you conclude about the current value of Company A stock?
10. Company B has a price/earnings ratio of 21.2. The current industry average price/earnings ratio is 20.75. What might an investor conclude about investing in Company B?
11. What are the key elements of the DuPont formula, and how do these components function to help analysts assess an organization?

Problems

1. Sarah's Toy Shop has total sales of $100,000, net credit sales of $70,000, beginning accounts receivable of $20,000, and ending accounts receivable of $30,000. What is Sarah's accounts receivable turnover? Assume industry average is 2.9 times. How would you interpret Sarah's turnover?
2. Fantastic Foods has total assets of $150,000, current assets of $80,000 (current assets includes $30,000 of cash, $10,000 of short term investments, $20,000 of accounts receivable, and $20,000 of inventory), total liabilities of $120,000, and current liabilities of $70,000. What is Fantastic Foods' current ratio?
3. The Big Club has total assets of $150,000, current assets of $80,000 (current assets includes $30,000 of cash, $10,000 of short-term investments, $20,000 of accounts receivable, and $20,000 of inventory), total liabilities of $120,000, and current liabilities of $70,000. What is The Big Club's quick ratio?
4. Giant Sales has total assets of $150,000, current assets of $80,000 (current assets includes $30,000 of cash, $10,000 of short-term investments, $20,000 of accounts receivable, and $20,000 of inventory), total liabilities of $120,000, and current liabilities of $70,000. What is Giant Sales' cash ratio?
5. Bonita's Bread Company has total debt of $250,000 and total assets of $150,000. What is Bonita's debt-to-assets ratio, and what can we infer about Bonita's company using the ratio?
6. Jai Company has total liabilities of $200,000 and total stockholder equity of $300,000. What is the debt-to-equity ratio for Jai Company, and what can we infer about the firm using this ratio?
7. Jamilah's Manufacturing Company has earnings before interest and taxes of $29,000 and interest expense of $4,000 for the most current period. What is Jamilah's times interest earned ratio?
8. Sarai's Sandy Beach Gear has net sales of $100,000, cost of goods sold of $60,000, and net income of $25,000. What is Sarai's profit margin?
9. Bob's Tires Inc. has sales of $100,000, net income of $50,000, beginning asset balance of $200,000, ending asset balance of $220,000, beginning stockholder equity of $160,000, and ending stockholder equity of $200,000. What is Bob's return on total assets?
10. Bob's Tires Inc. has sales of $100,000, net income of $50,000, beginning asset balance of $200,000, ending asset balance of $220,000, beginning stockholder equity of $160,000, and ending stockholder equity of $200,000. What is Bob's return on equity?

Video Activity

Ratio Analysis—Limitations of Ratios

Click to view content (https://openstax.org/r/ratio-analysis)

1. In the video, Jim walks through several key limitations in the areas of reliability, comparability, relying on only one data source, and using information based in the past. Which limitation do you feel is the most worrisome? What might you do to compensate for the limitation you identified?

2. Outside of the four key areas of limitations, Jim also explores a number of key elements that ratios aren't able to convey. What characteristics of a firm would you most want to know about if you were to invest that you would not be able to glean from ratios? How would you go about gathering that information if you cannot get it through financial statements and ratio analysis?

The Problem with Earnings per Share (EPS)

Click to view content (https://openstax.org/r/problem-with-earnings)

3. What does Zach DeGregorio cite as the most beneficial characteristics of using EPS in financial analysis? And the most problematic?
4. After watching the video and listing the key benefits and problems with EPS, how do you feel about the EPS calculation? Should investors use it? Why or why not? If you were going to invest a large sum of money in a company, would you use EPS data in your decision-making process? Why or why not?

7

Time Value of Money I: Single Payment Value

Figure 7.1 Time has an impact on the value of money. (credit: modification of "Time is money" by Marco Verch/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

One of the single most important concepts in the study of finance is the time value of money (TVM). This concept puts forward the idea that a dollar received today is worth more than, and therefore preferable to, a dollar received at some point in the future. The three primary reasons for this are that (1) money received now can be saved or invested now and earn interest or a return, resulting in more money in the future; (2) any promise of future payments of cash will always carry the risk of default; and (3) it is simple human nature for people to prefer making their purchases of goods and services in the present rather than waiting to make them at some future time.

For this reason, it is important to incentivize people to give up their present consumption patterns by offering them greater value in the future. Based on the concept of TVM, it can be said that a dollar was worth more to us, and thus carried more value, yesterday than it is to us today. It also then follows that a dollar in our possession right now carries a greater value for us than a dollar we might receive tomorrow or at some other point in the future.

The entire concept of the time value of money is particularly important because it allows savers and investors to make better-informed decisions about what to do with their money. TVM can help a person understand which option may be best based on the critical factors of overall risk, rates of interest, inflation, and return. TVM can also be used to help a person understand how much money they'll need to save in an interest-bearing account in order to reach a desired financial goal, such as saving $50,000 in 10 years in an account that earns 4% compound interest each year. TVM is the key underlying principle of such important financial analytical activities as retirement planning, corporate capital project evaluation, and even deciding on your

own personal investments and bank accounts.

If the main concept behind the TVM is that a specific amount of money in hand now is worth more today than that same amount of money will be worth tomorrow, you might think that a person would be better off spending their money now rather than saving it for later use. However, we know that this is not always the case. Sometimes it is simply a better idea to save your money. While inflation can have the effect of making a dollar worth less tomorrow than it is worth today, the positive effect of compound interest works in favor of savers and investors.

7.1 Now versus Later Concepts

Learning Outcomes

By the end of this section, you will be able to:

- Explain why time has an impact on the value of money.
- Explain the concepts of future value and present value.
- Explain why lump sum cash flow is the basis for all other cash flows.

How and Why the Passage of Time Affects the Value of Money

The concept of the **time value of money (TVM)** is predicated on the fact that it is possible to earn **interest** income on cash that you decide to deposit in an **investment** or interest-bearing account. As times goes by, interest is earned on amounts you have invested (*present value*), which effectively means that time will add value (*future value*) to your savings. The longer the period of time you have your money invested, the more interest income will accrue. Also, the higher the rate of interest your account or investment is earning, again, the more your money will grow.

Understanding how to calculate values of money in the present and at different points in the future is a key component of understanding the material presented in this chapter—and of making important personal financial decisions in your future (see Figure 7.2).

Figure 7.2 The Time Value of Money It is better to be paid today, or you will lose out on the money you would have earned in interest.

The Lump Sum Payment or Receipt

The most basic type of financial transaction involves a simple, one-time amount of cash, which can be either a receipt (inflow) or a payment (outflow). Such a one-time transaction is typically referred to as a lump sum. A lump sum consists of a one-off cash flow that occurs at any single point in time, present or future. Because it is always possible to dissect more complex transactions into smaller parts, the lump sum cash flow is the basis on which all other types of cash flow are treated. According to the general principle of adding value, every type of cash flow stream can be divided into a series of lump sums. For this reason, it is critical to understand the math associated with lump sums if you wish to have a greater appreciation, and a complete understanding, of more complicated forms of cash flow that may be associated with an investment or a capital purchase by a

company.

7.2 Time Value of Money (TVM) Basics

Learning Outcomes

By the end of this section, you will be able to:

- Define *future value* and provide examples.
- Explain how future dollar amounts are calculated using a single-period scenario.
- Describe the impact of compounding.

Because we can invest our money in interest-bearing accounts and investments, its value can grow over time as interest income accrues or returns are realized on our investments. This concept is referred to as **future value (FV)**. In short, future value refers to how a specific amount of money today can have greater value tomorrow.

Single-Period Scenario

Let us start with the following example. Your friend is considering putting money in a bank account that will pay 4% interest per year and is particularly interested in knowing how much money they will have one year from now if they deposit $1,000 in this account. Your friend understands that you are studying finance and turns to you for help. By using the TVM principle of future value (FV), you can tell your friend that the answer is $1,040. The additional $40 that will be in the account after one year will be due to interest earned over that time. You can calculate this amount relatively easily by taking the original deposit (also referred to as the principal) of $1,000 and multiplying it by the annual interest rate of 4% for one period (in this case, one year).

$$\text{Interest Earned} = \$1{,}000 \times 0.04 = \$40.00$$

By taking the interest earned amount of $40 and adding it to the original principal of $1,000, you will arrive at a total value of $1,040 in the bank account at the end of the year. So, the $1,040 one year from today is equal to $1,000 today when working with a 4% earning rate. Therefore, based on the concept of TVM, we can say that $1,040 represents the future value of $1,000 one year from today and at a 4% rate of interest. We will discuss interest rates and their importance in TVM decisions in more detail later in this chapter; for now, we can consider interest rate as a percentage of the principal amount that is earned by the original lender of funds and/or charged to the borrower of these same funds. Following are a few more examples of the single-period scenario.

If a person deposits $300 in an account that pays 5% per year, at the end of one year, they will have

$$\text{FV} = \$300 + (\$300 \times 0.05) = \$315$$

If a company has earnings of $2.50 per share and experiences a 10% increase in the following year, the earnings per share in year two are

$$\$2.50 + \$2.50 \times 0.10 = \$2.75 \text{ per share}$$

If a retail store decides on a 3% price increase for the following year on an item that is currently selling for $50, the new price in the following year will be

$$\$50 + \$50 \times 0.03 = \$51.50$$

The Impact of Compounding

What would happen if your friend were willing to wait one more year to receive their lump sum payment? What would the future dollar value in their account be after a two-year period? Returning to our earlier example, assume that during the second year, your friend leaves the principal ($1,000) and the earned interest ($40) in the account, thereby reinvesting the entire account balance for another year. The quoted interest rate of 4% reflects the interest the account would earn each year, not over the entire two-year savings period. So, during the second year of savings, the $1,000 deposit and the $40 interest earned during the first year would

both earn 4%:

$$\$1{,}000 \times 0.04 + 40 \times 0.04 = \$41.60$$

The additional $1.60 is interest on the first year's interest and reflects the compounding of interest. *Compound interest* is the term we use to refer to interest income earned in subsequent periods that is based on interest income earned in prior periods. To put it simply, compound interest refers to interest that is earned on interest. Here, it refers to the $1.60 of interest earned in the second year on the $40.00 of interest earned in the first year. Therefore, at the end of two years, the account would have a total value of $1,081.60. This consists of the original principal of $1,000 plus the $40.00 interest income earned in year one and the $41.60 interest income earned in year two.

The amount of money your friend would have in the account at the end of two years, $1,081.60, is referred to as the future value of the original $1,000 amount deposited today in an account that will earn 4% interest every year.

Simple interest applies to year 1 while compound interest or "interest on interest" applies to year 2. This is calculated using the following method:

$$\begin{aligned} \text{Year 1:} \quad & 1{,}000 \times 0.04 = 40.00 \\ \text{Year 2:} \quad & 1{,}040 \times 0.04 = 41.60 \end{aligned}$$

So, the total amount that would be in the account after two years, at 4% annual interest, would be $\$1{,}000 + \$40.00 + \$41.60 = \$1{,}081.60$.

To determine any future value of money in an interest-bearing account, we multiply the principal amount by 1 plus the interest rate for each year the money remains in the account. From this, we can develop the future value formula:

$$\text{Future Value} = \text{Original Deposit} \times (1 + r) \times (1 + r)$$

In this formula, the number of times we multiply by $(1 + r)$ depends entirely on the number of years the money will remain in the bank account, earning interest, before it is withdrawn in a final lump sum distribution paid out from the account at the end of the chosen savings period. The 1 in the formula represents the principal amount, or the original $1,000 deposit, which will be included in the final total lump sum payment when the account is closed and all money is withdrawn at the end of the predetermined savings period.

We can write the above equation in a more condensed mathematical form using time value of money notation, as follows:

$$\begin{aligned} \text{FV} &= \text{Future Value} \\ \text{PV} &= \text{Present Value} \\ r &= \text{Interest Rate} \\ n &= \text{Number of Periods} \end{aligned}$$

Using these inputs, we have the following formula:

$$\text{FV} = \text{PV} \times (1 + r)^n$$

With this equation, we can calculate the value of the savings account after any number of years. For example, suppose we are considering 3, 10, and 50 years from the original deposit date at the annual 4% interest rate:

$$\begin{aligned} \text{3 years:} \quad & \text{FV} = \$1{,}000 \times (1.04)^3 = \$1{,}000 \times 1.12486 = \$1{,}124.86 \\ \text{10 years:} \quad & \text{FV} = \$1{,}000 \times (1.04)^{10} = \$1{,}000 \times 1.48024 = \$1{,}480.24 \\ \text{50 years:} \quad & \text{FV} = \$1{,}000 \times (1.04)^{50} = \$1{,}000 \times 7.106683 = \$7{,}106.68 \end{aligned}$$

How can this savings account have grown to be so large after 50 years? This question is answered by the impact of compounding interest. Every year, the interest earned in previous years will also earn interest along

with the initial deposit. This will have the effect of accelerating the growth of the total dollar value of the account.

This is the important effect of the compounding of interest: money grows in larger and larger increments the longer you leave it in an interest-bearing account. In effect, the compounding of interest over time accelerates the growth of money.

In order to determine the FV of any amount of money, it will always be necessary to know the following pieces of information: (1) the principal, initial deposit, or **present value (PV)**; (2) the rate of interest, usually expressed on an annual basis as *r*; and (3) the number of time periods that the money will remain in the account (*n*). The interest rate is often referred to as the **growth rate**, or the annual percentage increase on savings or on an investment. When the rate is raised to the power of the number of periods, the formula $(1 + r)^n$ will yield a number that is commonly referred to as the future value interest factor (FVIF). As a result of this process, as *n* (time, or the number of periods) increases, the future value interest factor will increase. Also, as *r* (interest rate) increases, the FVIF will increases. For these reasons, the future value calculation is directly determined by both the interest rate being used and the total amount of time—specifically, the number of periods—being considered.

THINK IT THROUGH

Calculating Future Values

Here's another example of calculating future values in multiple-period scenarios.

On a recent drive, you spotted your dream home, which is currently listed at $400,000. Unfortunately, you are not in a position to buy it right away and will have to wait at least another six years before you can afford it. If house values are appreciating at an annual rate of inflation of 4%, how much will a similar house cost after six years?

Solution:

In this case, PV is the current cost of the house, or $400,000; *n* is six years; *r* is the average annual inflation rate, or 4%; and we have to solve for FV.

$$\begin{aligned} \text{FV} &= \$400{,}000 \times 1.046 \\ &= \$400{,}000 \times (1.265319) = \$506{,}127.61 \end{aligned}$$

Therefore, under these circumstances, the house will cost $506,127.60 after six years.

How Time Impacts Compounding

We have just seen that time will lead to the growth of our money. As long as the prevailing growth or interest rate of any account we have our money in is positive, the passage of time will have the effect of growing the value of our money. The longer the period of time, the greater the growth and the larger the future value of the money will be. This can be reinforced very clearly with the following example.

Melvin is saving money in an account at a local bank that earns 5% per year. He begins with a deposit in his account of $100 and decides to save his money for exactly one year. He will not be making any further deposits into the account during the year. Melvin will earn $5\% \times \$100,$ or $5, in interest income. Adding this to the original deposit balance of $100 will give him a total of $\$100 + \$5,$ or $105, in the account at the end of one year.

Melvin likes this idea and believes he may be able to keep his money in the account for a longer period of time. How much money will he have in his account, without any further deposits, at the end of years two, three, four, and five?

Using the future value formula, the calculation is as follows:

$$\begin{aligned}
&\text{FV} = \text{PV} \times (1+r)^n \\
\text{Year 2: } &\text{FV} = \$100 \times (1+0.05)^2 = \$110.25 \\
\text{Year 3: } &\text{FV} = \$100 \times (1+0.05)^3 = \$115.76 \\
\text{Year 4: } &\text{FV} = \$100 \times (1+0.05)^4 = \$121.55 \\
\text{Year 5: } &\text{FV} = \$100 \times (1+0.05)^5 = \$127.63
\end{aligned}$$

How the Interest Rate Impacts Compounding

Melvin likes the idea of earning more money over time, but he also believes that what he would earn in interest may not be enough for some of the things he plans to buy in the future. His friend suggests finding an account or some form of investment with a greater interest rate than the 5% he can get at his local bank.

Melvin thinks he can leave his money in an account or investment for a total of five years. He found investments that will provide annual returns of 6%, 7%, 10%, and 12%. Using the $\text{FV} = \text{PV} \times (1+r)^n$ formula, we can complete the following calculations for him:

$$\begin{aligned}
5\%: &\text{FV} = \$100 \times (1+0.05)^5 = \$127.63 \\
6\%: &\text{FV} = \$100 \times (1+0.06)^5 = \$133.82 \\
7\%: &\text{FV} = \$100 \times (1+0.07)^5 = \$140.26 \\
10\%: &\text{FV} = \$100 \times (1+0.10)^5 = \$161.05 \\
12\%: &\text{FV} = \$100 \times (1+0.12)^5 = \$176.23
\end{aligned}$$

Again, Melvin likes this information, and he states that he will try to find the highest interest rate available. This makes sense, but it's important to remember that investments are usually not guaranteed to earn you specific interest rates, or rates of return. Most investments, other than **Treasury investments** such as Treasury bonds, carry some form of **financial risk**, either small or large, and the greater the rate of return, the more likely it is that the risk associated with the investment will also be greater. This risk does not have any effect on the future calculations we have just completed, but it an important factor to bear in mind and consider well before moving ahead and putting your money in any investment or **financial instrument**.

7.3 Methods for Solving Time Value of Money Problems

Learning Outcomes

By the end of this section, you will be able to:

- Explain how future dollar amounts are calculated.
- Explain how present dollar amounts are calculated.
- Describe how discount rates are calculated.
- Describe how growth rates are calculated.
- Illustrate how periods of time for specified growth are calculated.
- Use a financial calculator and Excel to solve TVM problems.

We can determine future value by using any of four methods: (1) mathematical equations, (2) calculators with financial functions, (3) spreadsheets, and (4) FVIF tables. With the advent and wide acceptance and use of financial calculators and spreadsheet software, FVIF (and other such time value of money tables and factors) have become obsolete, and we will not discuss them in this text. Nevertheless, they are often still published in other finance textbooks and are also available on the internet to use if you so choose.

Using Timelines to Organize TVM Information

A useful tool for conceptualizing present value and future value problems is a timeline. A timeline is a visual,

linear representation of periods and cash flows over a set amount of time. Each timeline shows today at the left and a desired ending, or future point (maturity date), at the right.

Now, let us take an example of a future value problem that has a time frame of five years. Before we begin to solve for any answers, it would be a good approach to lay out a timeline like that shown in Table 7.1:

Year	0 (Today)	1	2	3	4	5

Table 7.1

The timeline provides a visual reference for us and puts the problem into perspective.

Now, let's say that we are interested in knowing what today's balance of $100 in our saving account, earning 5% annually, will be worth at the end of each of the next five years. Using the future value formula

$$\text{FV} = \text{PV} \times (1 + r)^n$$

that we covered earlier, we would arrive at the following values: $105 at the end of year one, $110.25 at the end of year two, $115.76 at the end of year three, $121.55 at the end of year four, and $127.63 at the end of year five.

With the numerical information, the timeline (at a 5% interest or growth rate) would look like Table 7.2:

Year	0	1	2	3	4	5
	$100.00	$105.00	$110.25	$115.76	$121.55	$127.63

Table 7.2

Using timelines to lay out TVM problems becomes more and more valuable as problems become more complex. You should get into the habit of using a timeline to set up these problems prior to using the equation, a calculator, or a spreadsheet to help minimize input errors. Now we will move on to the different methods available that will help you solve specific TVM problems. These are the financial calculator and the Excel spreadsheet.

Using a Financial Calculator to Solve TVM Problems

An extremely popular method of solving TVM problems is through the use of a financial calculator. Financial calculators such as the Texas Instruments BAII Plus™ Professional (https://openstax.org/r/baii-plus-professional) will typically have five keys that represent the critical variables used in most common TVM problems: `N`, `I/Y`, `PV`, `FV`, and `PMT`. These represent the following:

N: Number of Periods
I/Y: Interest Rate (Interest per Year)
PV: Present Value of a Lump Sum
V: Future Value of a Lump Sum
PMT: Payment

These are the only keys on a financial calculator that are necessary to solve TVM problems involving a **single payment or lump sum**.

Example 1: Future Value of a Single Payment or Lump Sum

Let's start with a simple example that will provide you with most of the skills needed to perform TVM functions involving a single lump sum payment with a financial calculator.

Suppose that you have $1,000 and that you deposit this in a savings account earning 3% annually for a period of four years. You will naturally be interested in knowing how much money you will have in your account at the end of this four-year time period (assuming you make no other deposits and withdraw no cash).

To answer this question, you will need to work with factors of $1,000, the present value (PV); four periods or years, represented by N; and the 3% interest rate, or I/Y. Make sure that the calculator register information is cleared, or you may end up with numbers from previous uses that will interfere with the solution. The register-clearing process will depend on what type of calculator you are using, but for the TI BA II Plus™ Professional calculator, clearing can be accomplished by pressing the keys 2ND and FV [CLR TVM].

Once you have cleared any old data, you can enter the values in the appropriate key areas: 4 for N, 3 for I/Y, and 1000 for PV. Now you have entered enough information to calculate the future value. Continue by pressing the CPT (compute) key, followed by the FV key. The answer you end up with should be displayed as 1,125.51 (see Table 7.3).

Step	Description	Enter	Display	
1	Clear calculator register	CE/C		0.00
2	Enter present value (as a negative integer)	1000 +|– PV	PV =	-1,000.00
3	Enter interest rate	3 I/Y	I/Y =	3.00
4	Enter time periods	4 N	N =	4.00
5	Indicate no payments or deposits	0 PMT	PMT =	0.00
6	Compute future value	CPT FV	FV =	1,125.51

Table 7.3 Calculator Steps for Finding the Future Value of a Single Payment or Lump Sum[1]

Important Notes for Using a Calculator and the Cash Flow Sign Convention

Please note that the PV was entered as negative $1,000 (or -$1000). This is because most financial calculators (and spreadsheets) follow something called the cash flow sign convention, which is a way for calculators and spreadsheets to keep the relative direction of the cash flow straight. Positive numbers are used to represent cash inflows, and negative numbers should always be used for cash outflows.

In this example, the $1,000 is an investment that requires a cash outflow. For this reason, -1000 is entered as the present value, as you will be essentially handing this $1,000 to a bank or to someone else to initiate the transaction. Conversely, the future value represents a cash inflow in four years' time. This is why the calculator generates a positive 1,125.51 as the end result of this calculation.

Had you entered the present value of $1,000 as a positive number, there would have been no real concern, but the ending future value answer would have been returned expressed as a negative number. This would be correct had you borrowed $1,000 today (cash inflow) and agreed to repay $1,125.51 (cash outflow) four years from now. Also, it is important that you do not change the sign of any input value by using the – (minus) key). For example, on the TI BA II Plus™ Professional, you must use the +|– key instead of the minus key. If you enter 1000 and then hit the +|– key, you will get a negative 1,000 amount showing in the calculator display.

An important feature of most financial calculators is that it is possible to change any of the variables in a problem without needing to reenter all of the other data. For example, suppose that we wanted to find out the future value in our bank account if we left the money from our previous example invested for 20 years instead

1 The specific financial calculator in these examples is the Texas Instruments BA II Plus™ Professional model, but you can use other financial calculators for these types of calculations.

of 4. Before clearing any of the data, simply enter 20 for N and then press the CPT key and then the FV key. After this is done, all other inputs will remain the same, and you will arrive at an answer of $1,806.11.

THINK IT THROUGH

How to Determine Future Value When Other Variables Are Known

Here's an example of using a financial calculator to solve a common time value of money problem. You have $2,000 invested in a money market account that is expected to earn 4% annually. What will be the total value in the account after five years?

Solution:

Follow the recommended financial calculator steps in Table 7.4.

Step	Description	Enter	Display	
1	Clear calculator register	CE/C		0.00
2	Enter present value (as a negative integer)	2000 +|– PV	PV =	-2,000.00
3	Enter interest rate	4 I/Y	I/Y =	4.00
4	Enter time periods	5 N	N =	5.00
5	Indicate no payments or deposits	0 PMT	PMT =	0.00
6	Compute future value	CPT FV	FV =	2,433.31

Table 7.4 Calculator Steps for Determining Future Value

The result of this future value calculation of the invested money is $2,433.31.

Example 2: Present Value of Lump Sums

Solving for the present value (discounted value) of a lump sum is the exact opposite of solving for a future value. Once again, if we enter a negative value for the FV, then the calculated PV will be a positive amount.

Taking the reverse of what we did in our example of future value above, we can enter -1,125.51 for FV, 3 for I/Y, and 4 for N. Hit the CPT and PV keys in succession, and you should arrive at a displayed answer of 1,000.

An important constant within the time value of money framework is that the present value will always be less than the future value unless the interest rate is negative. It is important to keep this in mind because it can help you spot incorrect answers that may arise from errors with your input.

THINK IT THROUGH

How to Determine Present Value When Other Variables Are Known

Here is another example of using a financial calculator to solve a common time value of money problem. You have just won a second-prize lottery jackpot that will pay a single total lump sum of $50,000 five years from now. How much value would this have in today's dollars, assuming a 5% interest rate?

Solution:

Follow the recommended financial calculator steps in Table 7.5.

Step	Description	Enter	Display	
1	Clear calculator register	CE/C		0.00
2	Enter future value (as a negative integer)	50000 +|− FV	FV =	-50,000.00
3	Enter interest rate	5 I/Y	I/Y =	5.00
4	Enter time periods	5 N	N =	5.00
5	Indicate no payments or deposits	0 PMT	PMT =	0.00
6	Compute present value	CPT PV	PV =	39,176.31

Table 7.5 Calculator Steps for Determining Present Value

The present value of the lottery jackpot is $39,176.31.

Example 3: Calculating the Number of Periods

There will be times when you will know both the value of the money you have now and how much money you will need to have at some unknown point in the future. If you also know the interest rate your money will be earning for the foreseeable future, then you can solve for N, or the exact amount of time periods that it will take for the present value of your money to grow into the future value that you will require for your eventual use.

Now, suppose that you have $100 today and you would like to know how long it will take for you to be able to purchase a product that costs $133.82.

After making sure your calculator is clear, you will enter 5 for I/Y, -100 for PV, and 133.82 for FV. Now press CPT N, and you will see that it will take 5.97 years for your money to grow to the desired amount of $133.82.

Again, an important thing to note when using a financial calculator to solve TVM problems is that you must enter your numbers according to the cash flow sign convention discussed above. If you do not make either the PV or the FV a negative number (with the other being a positive number), then you will end up getting an error message on the screen instead of the answer to the problem. The reason for this is that if both numbers you enter for the PV and FV are positive, the calculator will operate under the assumption that you are receiving a financial benefit without making any cash outlay as an initial investment. If you get such an error message in your calculations, you can simply press the CE/C key. This will clear the error, and you can reenter your data correctly by changing the sign of either PV or FV (but not both of these, of course).

THINK IT THROUGH

Determining Periods of Time

Here is an additional example of using a financial calculator to solve a common time value of money problem. You want to be able to contribute $25,000 to your child's first year of college tuition and related expenses. You currently have $15,000 in a tuition savings account that is earning 6% interest every year. How long will it take for this account grow into the targeted amount of $25,000, assuming no additional deposits or withdrawals will be made?

Solution:

Table 7.6 shows the steps you will take.

Step	Description	Enter	Display	
1	Clear calculator register	CE/C		0.0000
2	Enter present value (as a negative integer)	15000 +|− PV	PV =	-15,000.0000
3	Enter interest rate	6 I/Y	I/Y =	6.0000
4	Enter future value	25000 FV	FV =	25,000.0000
5	Indicate no payments or deposits	0 PMT	PMT =	0.0000
6	Compute time periods	CPT N	N =	8.7667

Table 7.6 Calculator Steps for Determining Period of Time

The result of this calculation is a time period of 8.7667 years for the account to reach the targeted amount.

Example 4: Solving for the Interest Rate

Solving for an interest rate is a common TVM problem that can be easily addressed with a financial calculator. Let's return to our earlier example, but in this case, we know that we have $1,000 at the present time and that we will need to have a total of $1,125.51 four years from now. Let's also say that the only way we can add to the current value of our savings is through interest income. We will not be able to make any further deposits in addition to our initial $1,000 account balance.

What interest rate should we be sure to get on our savings account in order to have a total savings account value of $1,125.51 four years from now?

Once again, clear the calculator, and then enter 4 for N, -1,000 for PV, and 1,125.51 for FV. Then, press the CPT and I/Y keys and you will find that you need to earn an average 3% interest per year in order to grow your savings balance to the desired amount of $1,125.51. Again, if you end up with an error message, you probably failed to follow the sign convention relating to cash inflow and outflow that we discussed earlier. To correct this, you will need to clear the calculator and reenter the information correctly.

After you believe you are done and have arrived at a final answer, always make sure you give it a quick review. You can ask yourself questions such as "Does this make any sense?" "How does this compare to other answers I have arrived at?" or "Is this logical based on everything I know about the scenario?" Knowing how to go about such a review will require you to understand the concepts you are attempting to apply and what you are trying to make the calculator do. Further, it is critical to understand the relationships among the different inputs and variables of the problem. If you do not fully understand these relationships, you may end up with an incorrect answer. In the end, it is important to realize that any calculator is simply a tool. It will only do what you direct it to do and has no idea what your objective is or what it is that you really wish to accomplish.

THINK IT THROUGH

Determining Interest or Growth Rate

Here is another example of using a financial calculator to solve a common time value of money problem. Let's use a similar example to the one we used when calculating periods of time to determine an interest or growth rate. You still want to help your child with their first year of college tuition and related expenses. You also still have a starting amount of $15,000, but you have not yet decided on a savings plan to use.

Instead, the information you now have is that your child is just under 10 years old and will begin college at age 18. For simplicity's sake, let's say that you have eight and a half years before you will need to meet your total savings target of $25,000. What rate of interest will you need to grow your saved money from $15,000 to $25,000 in this time period, again with no other deposits or withdrawals?

Solution:

Follow the steps shown in Table 7.7.

Step	Description	Enter	Display	
1	Clear calculator register	CE/C		0.0000
2	Enter present value (as a negative integer)	15000 +|− PV	PV =	-15,000.0000
3	Enter time periods	8.5 N	N =	8.5000
4	Enter future value	25000 FV	FV =	25,000.0000
5	Indicate no payments or deposits	0 PMT	PMT =	0.0000
6	Compute interest rate	CPT I/Y	I/Y =	6.1940

Table 7.7 Calculator Steps for Determining Interest Rate

The result of this calculation is a necessary interest rate of 6.194%.

Using Excel to Solve TVM Problems

Excel spreadsheets can be excellent tools to use when solving time value of money problems. There are dozens of financial functions available in Excel, but a student who can use a few of these functions can solve almost any TVM problem. Special functions that relate to TVM calculations are as follows:

Future Value (FV)

Present Value (PV)

Number of Periods (NPER)

Interest Rate (RATE)

Excel also includes a function called Payment (PMT) that is used in calculations involving multiple payments or deposits (annuities). These will be covered in Time Value of Money II: Equal Multiple Payments.

Future Value (FV)

The Future Value function in Excel is also referred to as FV and can be used to calculate the value of a single lump sum amount carried to any point in the future. The FV function syntax is similar to that of the other four basic time-value functions and has the following inputs (referred to as arguments), similar to the functions listed above:

Rate: Interest Rate

Nper: Number of Periods

Pmt: Payment

PV: Present Value

Lump sum problems do not involve payments, so the value of Pmt in such calculations is 0. Another argument,

Type, refers to the timing of a payment and carries a default value of the end of the period, which is the most common timing (as opposed to the beginning of a period). This may be ignored in our current example, which means the default value of the end of the period will be used.

The spreadsheet in Figure 7.3 shows two examples of using the FV function in Excel to calculate the future value of $100 in five years at 5% interest.

In cell E1, the FV function references the values in cells B1 through B4 for each of the arguments. When a user begins to type a function into a spreadsheet, Excel provides helpful information in the form of on-screen tips showing the argument inputs that are required to complete the function. In our spreadsheet example, as the FV formula is being typed into cell E2, a banner showing the arguments necessary to complete the function appears directly below, hovering over cell E3.

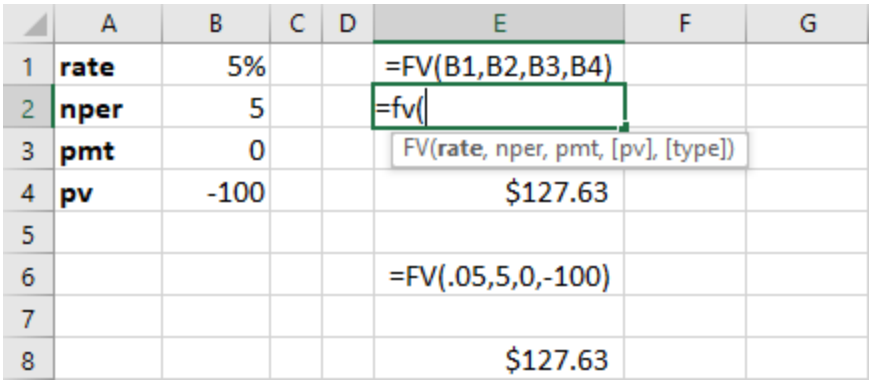


Figure 7.3 Using the FV Function in Excel

Cells E1 and E2 show how the FV function appears in the spreadsheet as it is typed in with the required arguments. Cell E4 shows the calculated answer for cell E1 after hitting the enter key. Once the enter key is pressed, the hint banner hovering over cell E3 will disappear. The second example of the FV function in our example spreadsheet is in cell E6. Here, the actual numerical values are used in the FV function equation rather than cell references. The method in cell E8 is referred to as *hard coding*. In general, it is preferable to use the cell reference method, as this allows for copying formulas and provides the user with increased flexibility in accounting for changes to input data. This ability to accept cell references in formulas is one of the greatest strengths of Excel as a spreadsheet tool.

Download the spreadsheet file (https://openstax.org/r/docs.google_uc_export) containing key Chapter 7 Excel exhibits.

Determining Future Value When Other Variables Are Known. You have $2,000 invested in a money market account that is expected to earn 4% annually. What will be the total value in the account in five years?

$$\text{Present Value (PV)} = (\$2{,}000.00)$$

Note: Be sure to follow the sign conventions. In this case, the PV should be entered as a negative value.

$$\text{Interest Rate (Rate or I/Y)} = 4\%$$

Note: In Excel, interest and growth rates must be entered as percentages, not as whole integers. So, 4 percent must be entered as 4% or 0.04—not 4, as you would enter in a financial calculator.

$$\text{Number of Periods (Nper or N)} = 5.00$$

Note: It is always assumed that if not specifically stated, the compounding period of any given interest rate is annual, or based on years.

$$\text{Future Value (FV)} = \$2{,}433.31$$

Note: The Excel command used to calculate future value is as follows:

```
=FV(rate, nper, pmt, [pv], [type])
```

You may simply type the values for the arguments in the above formula. Another option is to use the Excel insert function option. If you decide on this second method, below are several screenshots of dialog boxes you will encounter and will be required to complete.

1. First, go to Formulas in the upper menu bar, and select the Insert Function option. When you do so, a dialog box will appear that looks like what you see in Figure 7.4.

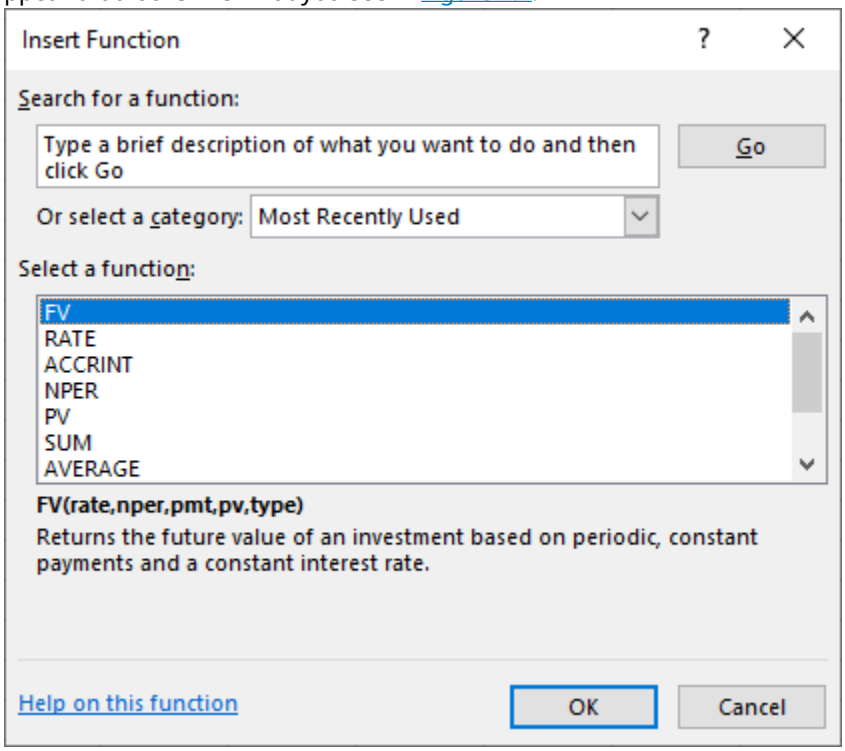


Figure 7.4 Dialog Box to Insert FV Function

   This dialog box allows you to either search for a function or select a function that has been used recently. In this example, you can search for FV by typing this in the search box and selecting Go, or you can simply choose FV from the list of most recently used functions (as shown here with the highlighted FV option).

2. Once you select FV and click the OK button, a new dialog box will appear for you to enter the necessary details. See Figure 7.5.

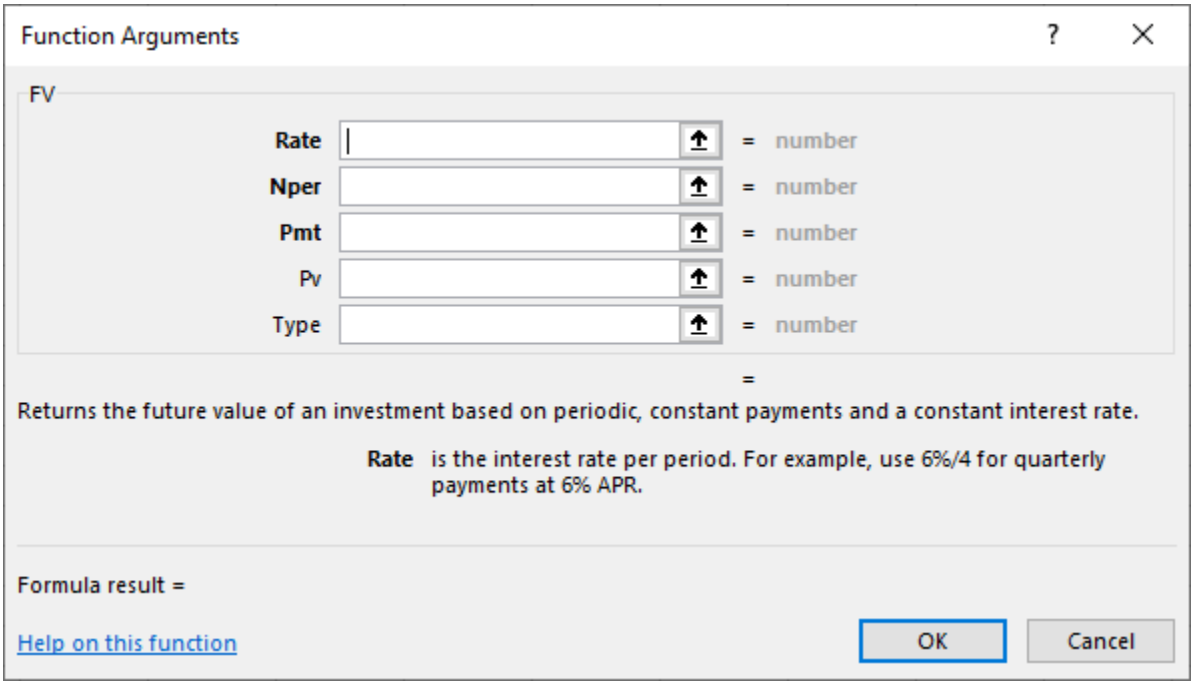


Figure 7.5 New Dialog Box for FV Function Arguments

Figure 7.6 shows the completed data input for the variables, referred to here as "function arguments." Note that cell addresses are used in this example. This allows the spreadsheet to still be useful if you decide to change any of the variables. You may also type values directly into the Function Arguments dialog box, but if you do this and you have to change any of your inputs later, you will have to reenter the new information. Using cell addresses is always a preferable method of entering the function argument data.

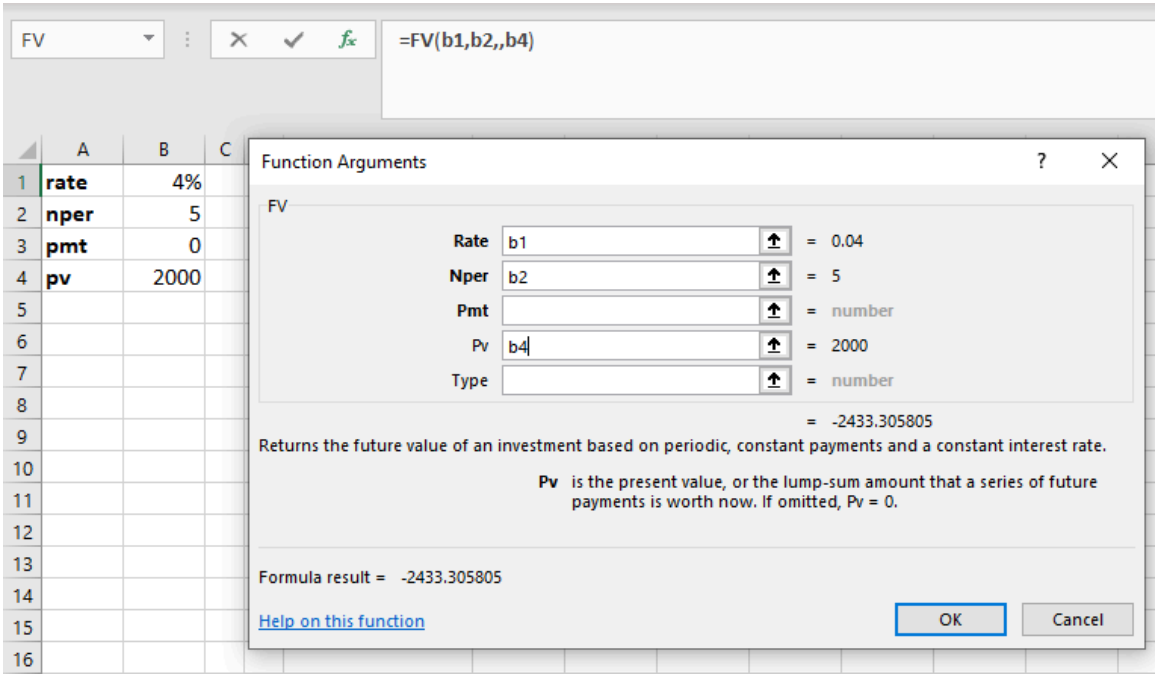


Figure 7.6 Completed Data Entry Menu for FV Function Arguments

Additional notes:

1. The Pmt argument or variable can be ignored in this instance, or you can enter a placeholder value of

zero. This example shows a blank or ignored entry, but either option may be used in problems such as this where the information is not relevant.

2. The Type argument does not apply to this problem. Type refers to the timing of cash flows and is usually used in multiple payment or annuity problems to indicate whether payments or deposits are made at the beginning of periods or at the end. In single lump sum problems, this is not relevant information, and the Type argument box is left empty.
3. When you use cell addresses as function argument inputs, the numerical values within the cells are displayed off to the right. This helps you ensure that you are identifying the correct cells in your function. The final answer generated by the function is also displayed for your preliminary review.

Once you are satisfied with the result, hit the OK button, and the dialog box will disappear, with only the final numerical result appearing in the cell where you have set up the function.

The FV of this present value has been calculated as approximately $2,433.31.

Present Value (PV)

We have covered the idea that present value is the opposite of future value. As an example, in the spreadsheet shown in Figure 7.3, we calculated that the future value of $100 five years from now at a 5% interest rate would be $127.63. By reversing this process, we can safely state that $127.63 received five years from now with a 5% interest (or discount) rate would have a value of just $100 today. Thus, $100 is its present value. In Excel, the PV function is used to determine present value (see Figure 7.7).

	A	B	C	D	E	F	G
1	**rate**	5%			=PV(B1,B2,B3,B4)		
2	**nper**	5			=pv(		
3	**pmt**	0			PV(**rate**, nper, pmt, [fv], [type])		
4	**fv**	-127.6			$100.00		
5							
6					=PV(.05,5,0,-100)		
7							
8					$100.00		

Figure 7.7 Using the PV Function in Excel

The formula in cell E1 uses cell references in a similar fashion to our FV example spreadsheet above. Also similar to our earlier example is the hard-coded formula for this calculation, which is shown in cell E6. In both cases, the answers we arrive at using the PV function are identical, but once again, using cell references is preferred over hard coding if possible.

THINK IT THROUGH

Determining Present Value When Other Variables Are Known

You have just won a second-prize lottery jackpot that will pay a single total lump sum of $50,000 five years from now. You are interested in knowing how much value this would have in today's dollars, assuming a 5% interest rate.

$$\text{Future Value (FV)} = (\$50{,}000.00)$$
$$\text{Interest Rate (Rate or I/Y)} = 5\%$$
$$\text{Number of Periods (Nper or N)} = 5.00$$
$$\text{Present Value (PV)} = \$39{,}176.31$$

Notes:

1. If you wish for the present value amount to be positive, the future value you enter here should be a negative value.
2. In Excel, interest and growth rates must be entered as percentages, not as whole integers. So, 5 percent must be entered as 5% or 0.05—not 5, as you would enter in a financial calculator.
3. It is always assumed that if not specifically stated, the compounding period of any given interest rate is annual, or based on years.
4. The Excel command used to calculate present value is as shown here:

```
=PV(rate, nper, pmt, [fv], [type])
```

Solution:

As with the FV formula covered in the first tab of this workbook, you may simply type the values for the arguments in the above formula. Another option is to again use the Insert Function option in Excel. Figure 7.8, Figure 7.9, and Figure 7.10 provide several screenshots that demonstrate the steps you'll need to follow if you decide to enter the PV function from the Insert Function menu.

1. First, go to Formulas in the upper menu bar, and select Insert Function. When you do so, the Insert Function dialog box will appear (see Figure 7.8).

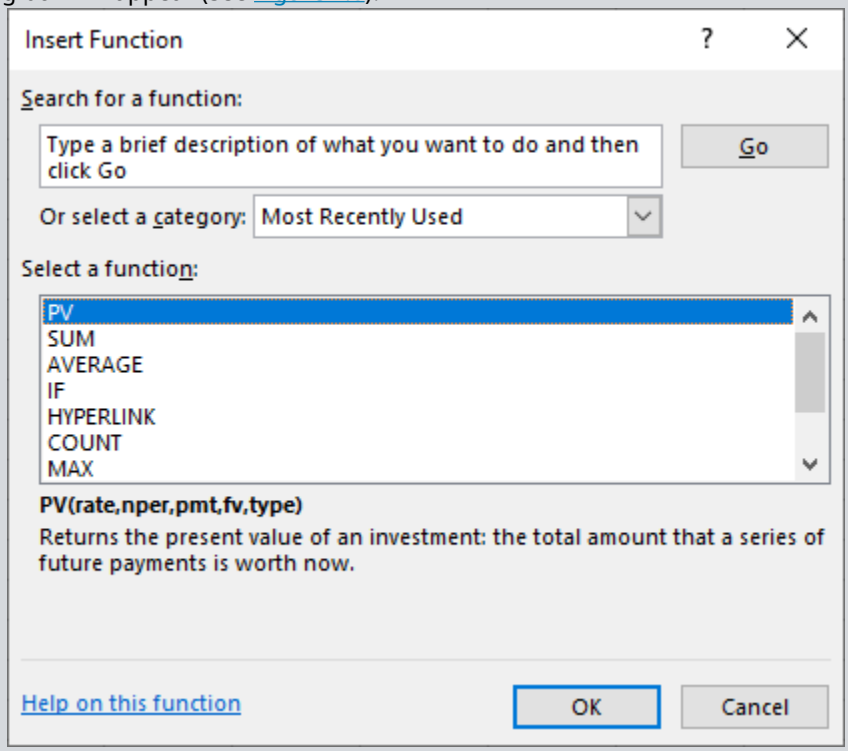


Figure 7.8 Dialog Box to Insert PV Function

   As discussed in the FV function example above, this dialog box allows you to either search for a function or select a function that has been used recently. In this example, you can search for PV by typing this into the search box and selecting Go, or you can simply choose PV from the list of the most recently used functions.

2. Once you have highlighted PV, click the OK button, and a new dialog box will appear for you to enter the necessary details. Similar to our FV function example, it will look like Figure 7.9.

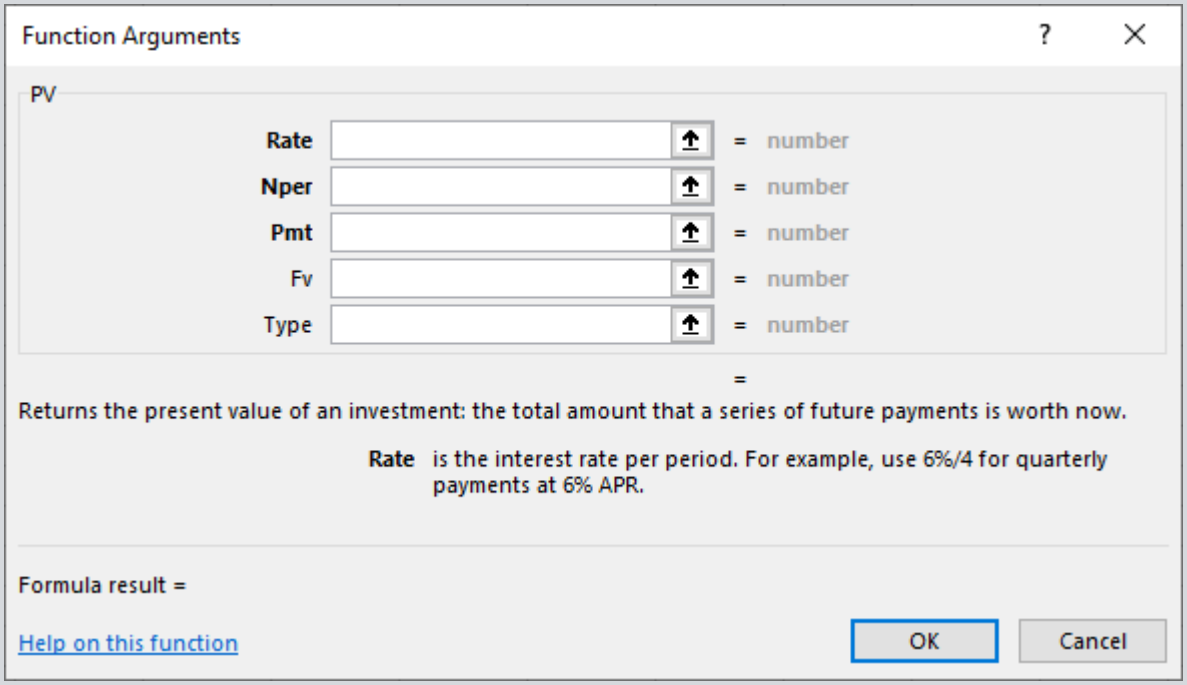


Figure 7.9 New Dialog Box for PV Function Arguments

Figure 7.10 shows the completed data input for the function arguments. Note that once again, cell addresses are used in this example. This allows the spreadsheet to still be useful if you decide to change any of the variables. As in the FV function example, you may also type values directly in the Function Arguments dialog box, but if you do this and you have to change any of your input later, you will have to reenter the new information. Remember that using cell addresses is always a preferable method of entering the function argument data.

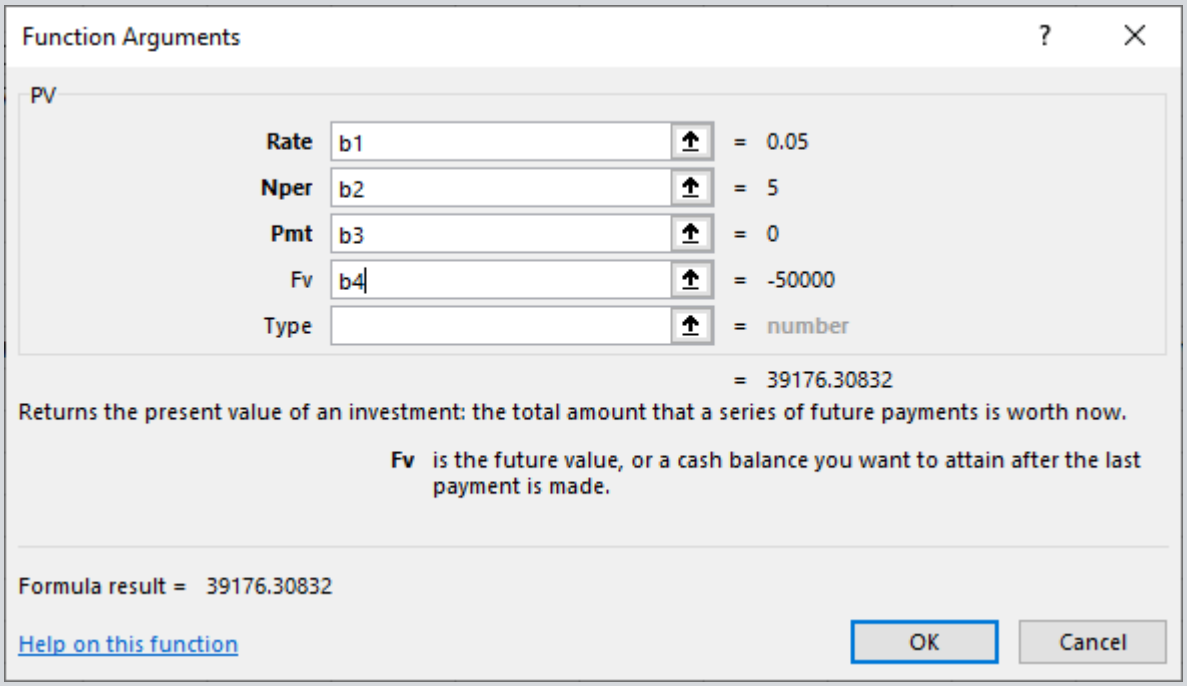


Figure 7.10 Completed Dialog Box for PV Function Arguments

Again, similar to our FV function example, the Function Arguments dialog box shows values off to the

right of the data entry area, including our final answer. The Pmt and Type boxes are again not relevant to this single lump sum example, for reasons we covered in the FV example.

Review your answer. Once you are satisfied with the result, click the OK button, and the dialog box will disappear, with only the final numerical result appearing in the cell where you have set up the function. The PV of this future value has been calculated as approximately $39,176.31.

Periods of Time

The following discussion will show you how to use Excel to determine the amount of time a given present value will need to grow into a specified future value when the interest or growth rate is known.

You want to be able to contribute $25,000 to your child's first year of college tuition and related expenses. You currently have $15,000 in a tuition savings account that is earning 6% interest every year. How long will it take for this account grow into the targeted amount of $25,000, assuming no additional deposits or withdrawals are made?

$$\text{Future Value (FV)} = \$25{,}000.00$$
$$\text{Interest Rate (Rate or I/Y)} = 6\%$$
$$\text{Present Value (PV)} = (\$15{,}000.00)$$
$$\text{Number of Periods (NPER)} = 8.7667$$

Notes:

1. As with our other examples, interest and growth rates must be entered as percentages, not as whole integers. So, 6 percent must be entered as 6% or 0.06—not 6, as you would enter in a financial calculator.
2. The present value needs to be entered as a negative value in accordance with the sign convention covered earlier.
3. The Excel command used to calculate the amount of time, or number of periods, is this:

```
=NPER (rate, pmt, pv, [fv], [type])
```

As with our FV and PV examples, you may simply type the values of the arguments in the above formula, or we can again use the Insert Function option in Excel. If you do so, you will need to work with the various dialog boxes after you select Insert Function.

1. First, go to Formulas in the upper menu bar, and select the Insert Function option. When you do so, the Insert Function dialog box will appear (see Figure 7.11).

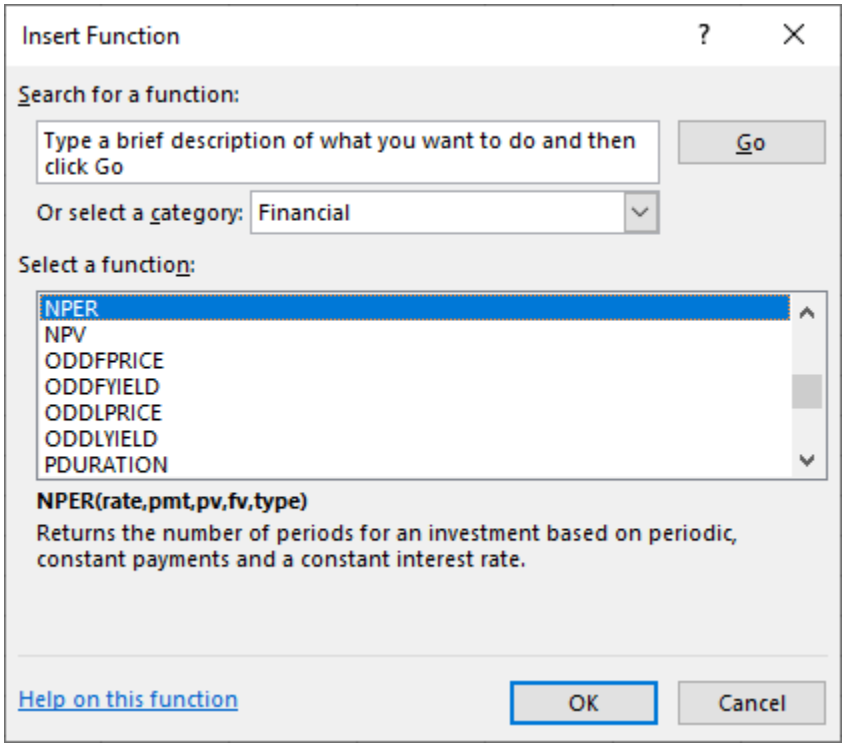


Figure 7.11 Dialog Box to Insert NPER Function

As discussed in our previous examples on FV and PV, this menu allows you to either search for a function or select a function that has been used recently. In this example, you can search for NPER by typing this into the search box and selecting Go, or you can simply choose NPER from the list of most recently used functions.

2. Once you have highlighted NPER, click the OK button, and a new dialog box will appear for you to enter the necessary details. As in our previous examples, it will look like Figure 7.12.

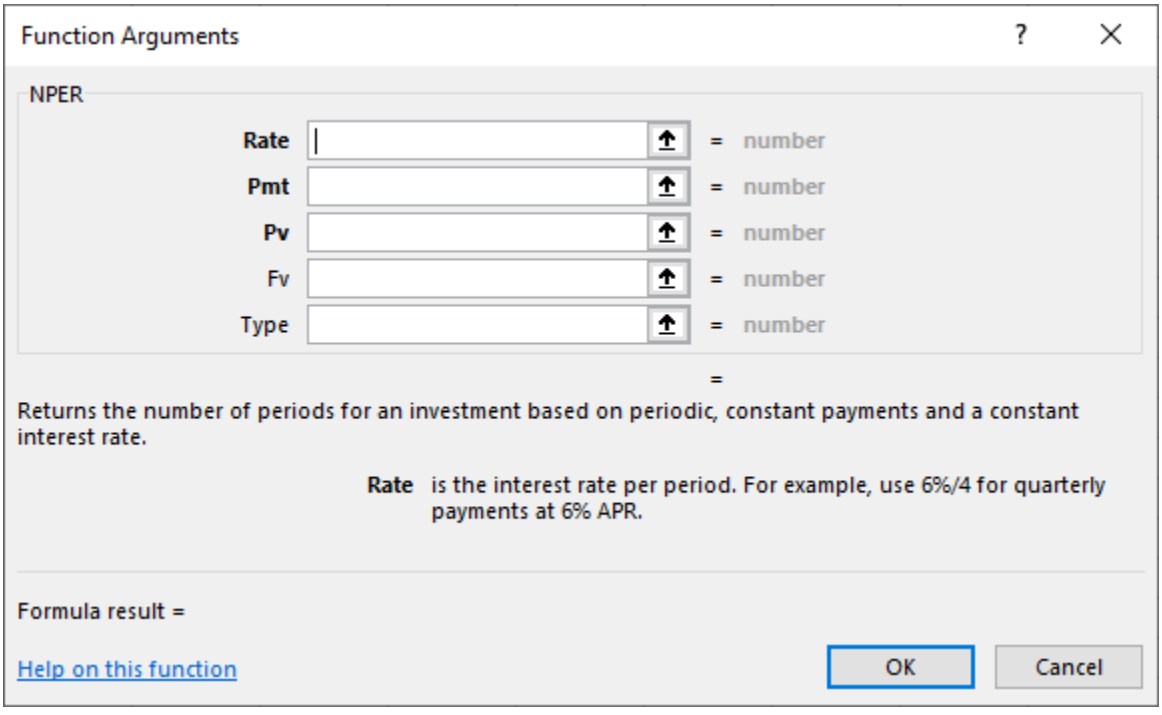


Figure 7.12 New Dialog Box for NPER Function Arguments

Figure 7.13 shows the completed Function Arguments dialog box. Note that once again, we are using cell addresses in this example.

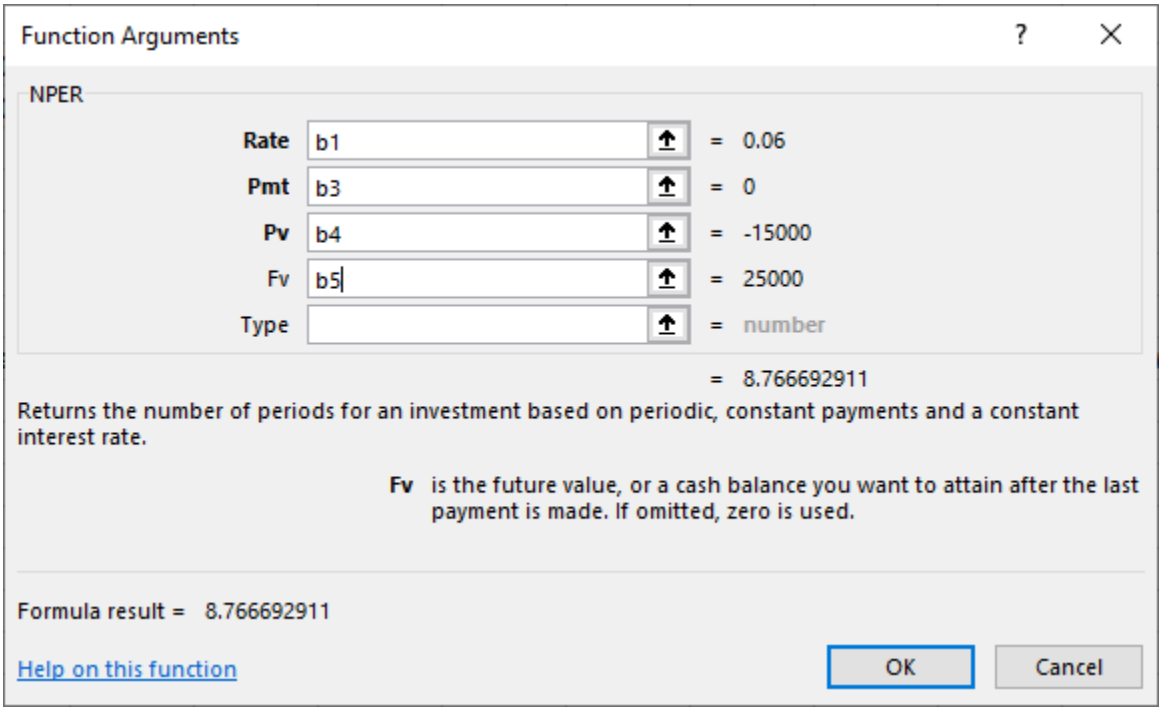


Figure 7.13 Completed Dialog Box for NPER Function Arguments

As in the previous function examples, values are shown off to the right of the data input area, and our final answer of approximately 8.77 is displayed at the bottom. Also, once again, the Pmt and Type boxes are not relevant to this single lump sum example.

Review your answer, and once you are satisfied with the result, click the OK button. The dialog box will disappear, with only the final numerical result appearing in the cell where you have set up the function.

The amount of time required for the desired growth to occur is calculated as approximately 8.77 years.

Interest or Growth Rate

You can also use Excel to determine the required growth rate when the present value, future value, and total number of required periods are known.

Let's discuss a similar example to the one we used to calculate periods of time. You still want to help your child with their first year of college tuition and related expenses, and you still have a starting amount of $15,000, but you have not yet decided which savings plan to use.

Instead, the information you now have is that your child is just under 10 years old and will begin college at age 18. For simplicity's sake, let's say that you have eight and a half years until you will need to meet your total savings target of $25,000. What rate of interest will you need to grow your saved money from $15,000 to $25,000 in this time, again with no other deposits or withdrawals?

$$\text{Future Value (FV)} = \$25{,}000.00$$
$$\text{Number of Periods (Nper or N)} = 8.50$$
$$\text{Present/Value (PV)} = (\$15{,}000.00)$$

Note: The present value needs to be entered as a negative value.

`Interest Rate (RATE)`

Note: The Excel command used to calculate interest or growth rate is as follows:

```
=RATE(nper, pmt, pv, [fv], [type], [guess])
```

As with our other TVM function examples, you may simply type the values for the arguments into the above formula. We also again have the same alternative to use the Insert Function option in Excel. If you choose this option, you will again see the Insert Function dialog box after you click the Insert Function button.

1. First, go to Formulas in the upper menu bar, and select the Insert Function option. When you do so, the Insert Function dialog box will appear (see Figure 7.14).

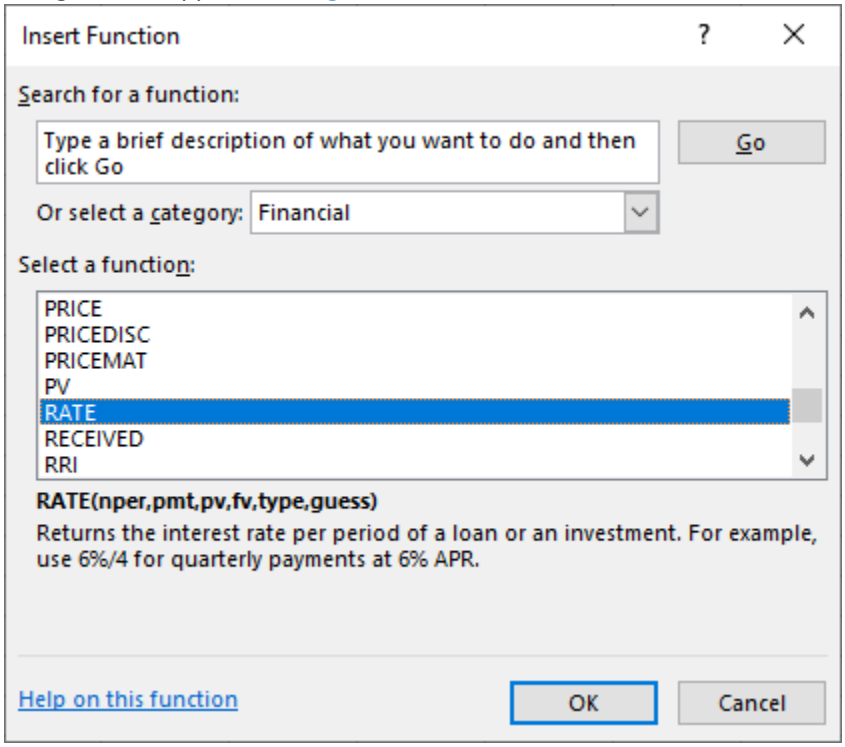


Figure 7.14 Dialog Box to Insert RATE Function

2. This time, find and highlight RATE, and click the OK button once you have done so. The Function Arguments dialog box will look like Figure 7.15.

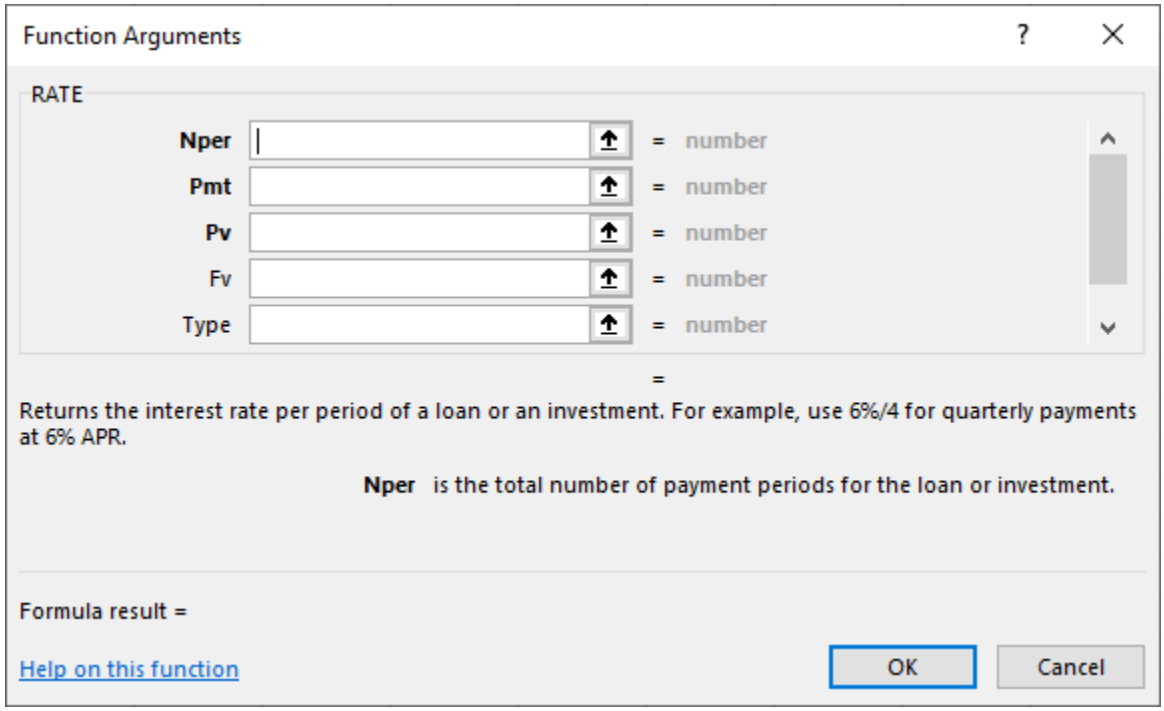


Figure 7.15 New Dialog Box for RATE Function Arguments

Once we complete the input, again using cell addresses for the required argument values, we will see what is shown in Figure 7.16.

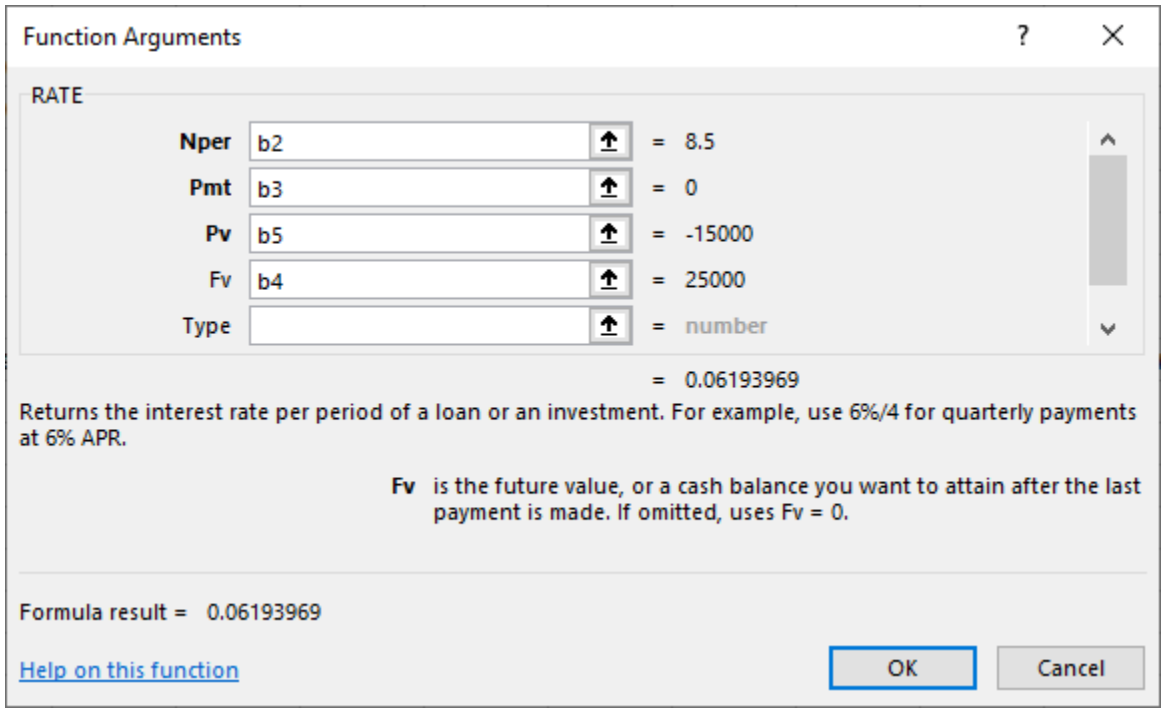


Figure 7.16 Completed Dialog Box for RATE Function Arguments

As in our other examples, cell values are shown as numerical values off to the right, and our answer of approximately 0.0619, or 6.19%, is shown at the bottom of the dialog box.

This answer also can be checked from a logic point of view because of the similar example we worked through when calculating periods of time. Our present value and future value are the same as in that example, and our time period is now 8.5 years, which is just under the result we arrived at (8.77 years) in

the periods example.

So, if we are now working with a slightly shorter time frame for the savings to grow from $15,000 into $25,000, then we would expect to have a slightly greater growth rate. That is exactly how the answer turns out, as the calculated required interest rate of approximately 6.19% is just slightly greater than the growth rate of 6% used in the previous example. So, based on this, it looks like our answer here passes a simple "sanity check" review.

7.4 Applications of TVM in Finance

Learning Outcomes

By the end of this section, you will be able to:

- Explain how the time value of money can impact your personal financial goals.
- Explain how the time value of money is related to inflation.
- Explain how the time value of money is related to financial risk.
- Explain how compounding period frequency affects the time value of money.

Single-Period Scenario

Let's say you want to buy a new car next year, and the one you have your eye on should be selling for $20,000 a year from now. How much will you need to put away today at 5% interest to have $20,000 a year from now? Essentially, you are trying to determine how much $20,000 one year from now is worth today at 5% interest over the year. To find a present value, we reverse the growth concept and lower or *discount* the future value back to the current period.

The interest rate that we use to determine the present value of a future cash flow is referred to as the **discount rate** because it is bringing the money back in time in terms of its value. The discount rate refers to the annual rate of reduction on a future value and is the inverse of the growth rate. Once we know this discount rate, we can solve for the present value (PV), the value today of tomorrow's cash flow. By changing the FV equation, we can turn

$$\text{FV} = \text{PV} \times (1+r)^n$$

into

$$\text{PV} = \text{FV} \times \frac{1}{(1+r)^n}$$

which is the present value equation. The fraction shown above is referred to as the present value interest factor (PVIF). The PVIF is simply the reciprocal of the FVIF, which makes sense because these factors are doing exactly opposite things. Therefore, the amount you need to deposit today to earn $20,000 in one year $(n = 1)$ at 5% interest is

$$\$20{,}000 \times \frac{1}{(1.05)^1} = \$20{,}000 \times 0.95328 = \$19{,}047.62$$

The Multiple-Period Scenario

There will often be situations when you need to determine the present value of a cash flow that is scheduled to occur several years in the future (see Figure 7.17). We can again use the formula for present value to calculate a value today of future cash flows over multiple time periods.

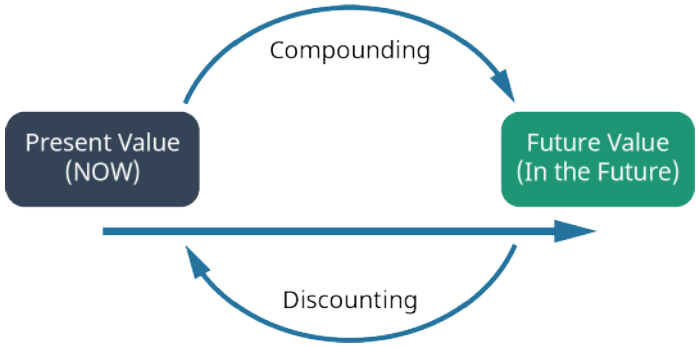


Figure 7.17 Determining Future Cash Flow

An example of this would be if you wanted to buy a savings bond for Charlotte, the daughter of a close friend. The face value of the savings bond you have in mind is $1,000, which is the amount Charlotte would receive in 30 years (the future value). If the government is currently paying 5% per year on savings bonds, how much will it cost you today to buy this savings bond?

The $1,000 face value of the bond is the future value, and the number of years *n* that Charlotte must wait to get this face value is 30 years. The interest rate *r* is 5.0% and is the discount rate for the savings bond. Applying the present value equation, we calculate the current price of this savings bond as follows:

$$\text{PV} = \$1{,}000 \times \frac{1}{(0.05)^{30}} = \$1{,}000 \times 0.231377 = \$231.38$$

So, it would cost you $231.38 to purchase this 30-year, 5%, $1,000 face-valued bond.

What we have done in the above example is reduce, or discount, the future value of the bond to arrive at a value expressed in today's dollars. Effectively, this discounting process is the exact opposite of compounding interest that we covered earlier in our discussion of future value.

An important concept to remember is that *compounding* is the process that takes a present valuation of money to some point in the future, while *discounting* takes a future value of money and equates it to present dollar value terms.

Common applications in which you might use the present value formula include determining how much money you would need to invest in an interest-bearing account today in order to finance a college education for your oldest child and how much you would need to invest today to meet your retirement plans 30 years from now.

TVM, Inflation, Compounding Interest, Investing, Opportunity Costs, and Risk

The time value of money (TVM) is a critical concept in understanding the value of money relative to the amount of time it is held, saved, or invested. The TVM concept and its specific applications are frequently used by individuals and organizations that might wish to better understand the values of financial assets and to improve investing and saving strategies, whether these are personal or within business environments.

As we have discussed, the key element behind the concept of TVM is that a given amount of money is worth more today than that same amount of money will be at any point in the future. Again, this is because money can be saved or invested in interest-bearing accounts or investments that will generate interest income over time, thus resulting in increased savings and dollar values as time passes.

Inflation

The entire concept of TVM exists largely due to the presence of inflation. Inflation is defined as a general increase in the prices of goods and services and/or a drop in the value of money and its purchasing power.

The purchasing power of the consumer dollar is a statistic tracked by the part of the US Bureau of Labor

Statistics and is part of the consumer price index (CPI) data that is periodically published by that government agency. In a way, purchasing power can be viewed as a mirror image or exact opposite of inflation or increases in consumer prices, as measured by the CPI. Figure 7.18 demonstrates the decline in the purchasing power of the consumer dollar over the 13-year period from 2007 to 2020.

With this in mind, we can work with the TVM formula and use it to help determine the present value of money you have in hand today, as well as how this same amount of money may be valued at any specific point in the future and at any specific rate of interest.

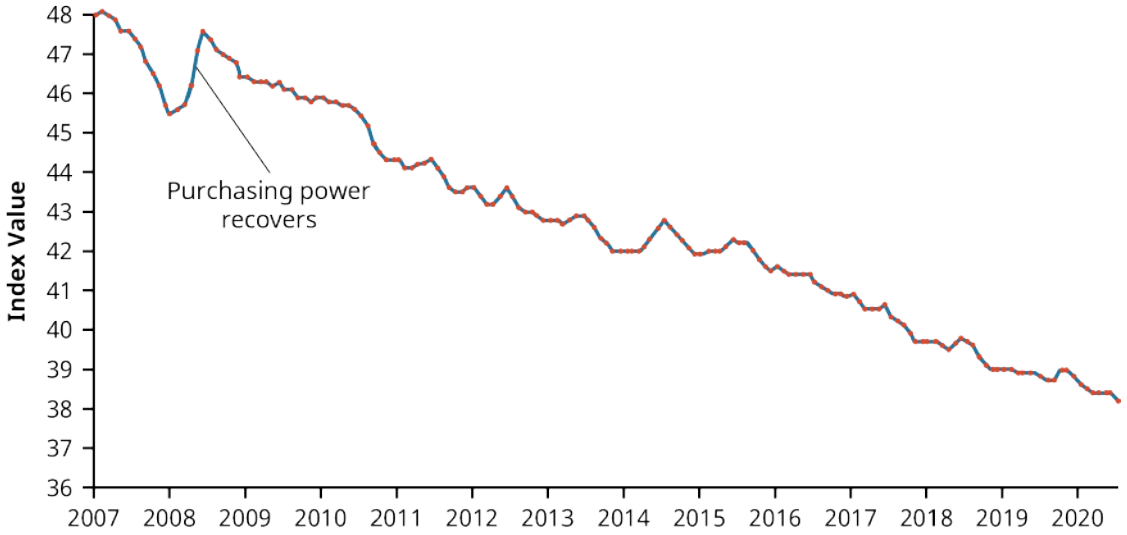


Figure 7.18 Historical Purchasing Power Decline as a Result of Inflation, 2007–2020 (data source: Bureau of Labor Statistics)

The Relationship between TVM and Inflation

As we have seen, the future value formula can be very helpful in calculating the value of a sum of cash (or any **liquid asset**) at some future point in time. One of the important ideas relating to the concept of TVM is that it is preferable to spend money today instead of at some point in the future (all other things being equal) when inflation is positive. However, in very rare instances in our economy when inflation is negative, spending money later is preferable to spending it now. This is because in cases of negative inflation, the purchasing power of a dollar is actually greater in the future, as the costs of goods and services are declining as we move into the future.

Most investors would be inclined to take a payment of money today rather than wait five years to receive a payment in the same amount. This is because inflation is almost always positive, which means that general prices of goods and services tend to increase over the passage of time. This is a direct function and result of normal economic growth. The crux of the concept of TVM is directly related to maintaining the present value of financial assets or increasing the value of these financial assets at different points in the future when they may be needed to obtain goods and services. If a consumer's monetary assets grow at a greater rate than inflation over any period of time, then the consumer will realize an increase in their overall purchasing power. Conversely, if inflation exceeds savings or investment growth, then the consumer will lose purchasing power as time goes by under such conditions.

The Impact of Inflation on TVM

The difference between present and future values of money can be easily seen when considered under the effects of inflation. As we discussed above, inflation is defined as a state of continuously rising prices for goods and services within an economy. In the study of economics, the laws of supply and demand state that increasing the amount of money within an economy without increasing the amount of goods and services available will give consumers and businesses more money to spend on those goods and services. When more money is created and made available to the consuming public, the value of each unit of currency will diminish.

This will then have the effect of incentivizing consumers to spend their money now, or in the very near future, instead of saving cash for later use. Another concept in economics states that this relationship between **money supply** and monetary value is one of the primary reasons why the **Federal Reserve** might at times take steps to inject money into a stagnant, lethargic economy. Increasing the money supply will lead to increased economic activity and consumer spending, but it can also have the negative effect of increasing the costs of goods and services, furthering an increase in the rate of inflation.

Consumers who decide to save their money now and for the foreseeable future, as opposed to spending it now, are simply making the economic choice to have their cash on hand and available. So, this ends up being a decision that is made despite the risk of potential inflation and perhaps losing purchasing power. When inflationary risk is low, most people will save their money to have it available to spend later. Conversely, in times when inflationary risk is high, people are more likely to spend their money now, before its purchasing power erodes. This idea of inflationary risk is the primary reason why savers and investors who decide to save now in order to have their money available at some point in the future will insist they are paid, through interest or return on investment, for the future value of any savings or financial instrument.

Lower interest rates will usually lead to higher inflation. This is because, in a way, interest rates can be viewed as the cost of money. This allows for the idea that interest rates can be further viewed as a tax on holding on to sums of money instead of using it. If an economy is experiencing lower interest rates, this will make money less expensive to hold, thus incentivizing consumers to spend their money more frequently on the goods and services they may require. We have also seen that the more quickly inflation rates rise, the more quickly the general purchasing power of money will be eroded. Rational investors who set money aside for the future will demand higher interest rates to compensate them for such periods of inflation. However, investors who save for future consumption but leave their money **uninvested** or **underinvested** in low-interest-bearing accounts will essentially lose value from their financial assets because each of their future dollars will be worth less, carrying less purchasing power when they end up needing it for use. This relationship of saving and planning for the future is one of the most important reasons to understand the concept of the time value of money.

Nominal versus Real Interest Rates

One of the main problems of allowing inflation to determine interest rates is that current interest rates are actually nominal interest rates. Nominal rates are "stated," not adjusted for the effects of inflation. In order to determine more practical **real interest rates**, the original nominal rate must be adjusted using an inflation rate, such as those that are calculated and published by the **Bureau of Labor Statistics** within the **consumer price index (CPI)**.

A concept referred to as the **Fisher effect**, named for economist Irving Fisher, describes the relationship between inflation and the nominal and real interest rates and is expressed using the following formula:

$$(1 + i) = (1 + R) \times (1 + h)$$

where i is the nominal interest rate, R is the real interest rate, and h is the expected inflation rate.

An example of the Fisher effect would be seen in the case of a bond investor who is expecting a real interest rate of return of 6% on the bond, in an economy that is experiencing an expected inflation rate of 2%. Using the above formula, we have

$$\begin{aligned} i &= (1 + R) \times (1 + h) - 1 \\ i &= (1 + 6\%) \times (1 + 2\%) - 1 \\ i &= 8.12\% \end{aligned}$$

So, the nominal interest rate on the bond amounts to 8.12%, with a real interest rate of 6% within an economy that is experiencing a 2% inflation rate. This is a logical result because in a scenario of positive inflation, a real rate of return would always be expected to amount to less than the stated or nominal rate.

Interest and Savings

Savings are adversely affected by negative real interest rates. A person who holds money in the form of cash is actually losing future purchasing value when real interest rates are negative. A saver who decides to hold $1,000 in the form of cash for one year at a negative real interest rate of −3.65% per year will lose $\$1{,}000 \times -0.0365$ or $36.50, in purchasing power by the end of that year.

Ordinarily, interest rates would rise to compensate for negative real rates, but this might not happen if the Federal Reserve takes steps to maintain low interest rates to help stimulate and stabilize the economy. When interest rates are at such low levels, investors are forced out of Treasury and **money market investments** due to their extremely poor returns.

It soon becomes obvious that the time value of money is a critical concept because of its tremendous and direct impact on the daily spending, saving, and investment decisions of the people in our society. It is therefore extremely important that we understand how TVM and government fiscal policy can affect our savings, investments, purchasing behavior, and our overall personal financial health.

Compounding Interest

As we discussed earlier, compound interest can be defined as interest that is being earned on interest. In cases of **compounding interest**, the amount of money that is being accrued on previous amounts of earned interest income will continue to grow with each **compounding period**. So, for example, if you have $1,000 in a savings account and it is earning interest at a 10% annual rate and is compounded every year for a period of five years, the compounding will allow for growth after one year to an amount of $1,100. This comprises the original principal of $1,000 plus $100 in interest. In year two, you would actually be earning interest on the total amount from the previous compounding period—the $1,100 amount.

So, to continue with this example, by the end of year two, you would have earned $1,210 ($1,100 plus $110 in interest). If you continue on until the end of year five, that $1,000 will have grown to approximately $1,610. Now, if we consider that the highest annual inflation rate over the last 20 years has been 3%, then in this scenario, choosing to invest your present money in an account where interest is being compounded leaves you in a much better position than you would be in if you did not invest your money at all. The concept of the time value of money puts this entire idea into context for us, leading to more informed decisions on personal saving and investing.

It is important to understand that interest does not always compound annually, as assumed in the examples we have already covered. In some cases, interest can be compounded quarterly, monthly, daily, or even continuously. The general rule to apply is that the more frequent the compounding period, the greater the future value of a savings amount, a bond, or any other financial instrument. This is, of course, assuming that all other variables are constant.

The math for this remains the same, but it is important that you be careful with your treatment and usage of rate (*r*) and number of periods (*n*) in your calculations.

For example, $1,000 invested at 6% for a year compounded annually would be worth $\$1{,}000 \times (1.06)^1 = \$1{,}060.00$. But that same $1,000 invested for that same period of time—one year—and earning interest at the same annual rate but compounded monthly would grow to $\$1{,}000 \times (1.005)^{12} = \$1{,}061.67$, because the interest paid each month is earning interest on interest at a 6% rate. Note that we represent *r* as the interest paid per period $\left(\frac{0.06 \text{ annual interest}}{12 \text{ months in a year}} = 0.005\right)$ and *n* as the number of periods (12 months in a year; $12 \times 1 = 12$) rather than the number of years, which is only one.

Continuing with our example, that same $1,000 in an account with interest compounded quarterly, or four times a year, would grow to $\$1{,}000 \times (1.05)^4 = \$1{,}061.36$ in one year. Note that this final amount ends up being greater than the annually compounded future value of $1,060.00 and slightly less than the monthly

compounded future value of $1.061.67, which would appear to make logical sense.

The total differences in future values among annual, monthly, and quarterly compounding in these examples are insignificant, amounting to less than $1.70 in total. However, when working with larger amounts, higher interest rates, more frequent compounding periods, and longer terms, compounding periods and frequency become far more important and can generate some exceptionally large differences in future values.

Ten million dollars at 12% growth for one year and compounded annually amounts to $\$10{,}000 \times (1.12) = \$11{,}200{,}000$, while 10 million dollars on the same terms but compounded quarterly will produce $\$10{,}000{,}000 \times (1.03)^4 = \$11{,}255{,}088.10$. Most wealthy and rational investors and savers would be very pleased to earn that additional $55,088.10 by simply having their funds in an account that features quarterly compounding.

In another example, $200 at 60% interest, compounded annually for six years, becomes $\$200 \times (1.6)^6 = \$3{,}355.44$, while this same amount compounded quarterly grows to $\$200 \times (1.15)^{24} = \$5{,}725.04$.

An amount of $1 at 3%, compounded annually for 100 years, will be worth $\$1 \times (1.03)^{100} = \$19.22$. The same dollar at the same interest rate, compounded monthly over the course of a century, will grow to $\$1 \times (1.0025)^{1{,}200} = \$397.44$.

This would all seem to make sense due to the fact that in situations when compounding increases in frequency, interest income is being received during the year as opposed to at the end of the year and thus grows more rapidly to become a larger and more valuable sum of money. This is important because we know through the concept of TVM that having money now is more useful to us than having that same amount of money at some later point in time.

The Rule of 72

The rule of 72 is a simple and often very useful mathematical shortcut that can help you estimate the impact of any interest or growth rate and can be used in situations ranging from financial calculations to projections of population growth. The formula for the rule of 72 is expressed as the unknown (the required amount of time to double a value) calculated by taking the number 72 and dividing it by the known interest rate or growth rate. When using this formula, it is important to note that the rate should be expressed as a whole integer, not as a percentage. So, as a result, we have

$$\text{Years for an Amount to Double} = \frac{72}{\text{Interest or Growth Rate}}$$

This formula can be extremely practical when working with financial estimates or projections and for understanding how compound interest can have a dramatic effect on an original amount or monetary balance.

Following are just a few examples of how the rule of 72 can help you solve problems very quickly and very easily, often enabling you to solve them “in your head,” without the need for a calculator or spreadsheet.

Let’s say you are interested in knowing how long it will take your savings account balance to double. If your account earns an interest rate of 9%, your money will take $72/9$ or 8, years to double. However, if you are earning only 6% on this same investment, your money will take $72/6$, or 12, years to double.

Now let’s say you have a specific future purchasing need and you know that you will need to double your money in five years. In this case, you would be required to invest it at an interest rate of $72/5$, or 14.4%. Through these sample examples, it is easy to see how relatively small changes in a growth or interest rate can have significant impact on the time required for a balance to double in size.

To further illustrate some uses of the rule of 72, let’s say we have a scenario in which we know that a country’s **gross domestic product** is growing at 4% a year. By using the rule of 72 formula, we can determine that it will

take the economy 72/4, or 18, years to effectively double.

Now, if the economic growth slips to 2%, the economy will double in 72/2, or 36, years. However, if the rate of growth increases to 11%, the economy will effectively double in 72/11, or 6.55, years. By performing such calculations, it becomes obvious that reducing the time it takes to grow an economy, or increasing its rate of growth, could end up being very important to a population, given its current level of technological innovation and development.

It is also very easy to use the rule of 72 to express future costs being impacted by inflation or future savings amounts that are earning interest.

To apply another example, if the inflation rate in an economy were to increase from 2% to 3%, consumers would lose half of the purchasing power of their money. This is calculated as the value of their money doubling in 72/3, or 24, years as compared to 72/2, or 36, years—quite a substantial difference.

Now, let's say that tuition costs at a certain college are increasing at a rate of 7% per year, which happens to be greater than current inflation rates. In this case, tuition costs would end up doubling in 72/7, or about 10.3, years.

In an example related to personal finance, we can say that if you happen to have an annual percentage rate of 24% interest on your credit card and you do not make any payments to reduce your balance, the total amount you owe to the credit card company will double in only 72/24, or 3, years.

So, as we have seen, the rule of 72 can clearly demonstrate how a relatively small difference of 1 percentage point in GDP growth or inflation rates can have significant effects on any short- or long-term economic forecasting models.

It is important to understand that the rule of 72 can be applied in any scenario where we have a quantity or an amount that is in the process of growing or is expected to grow for any period of time into the future. A good nonfinancial use of the rule of 72 might be to apply it to some population projections. For example, an increase in a country's population growth rate from 2% to 3% could present a serious problem for the planning of facilities and infrastructure in that country. Instead of needing to double overall economic capacity in 72/2 or 36, years, capacity would have to be expanded in only 72/3, or 24, years. It is easy to see how dramatic an effect this would be when we consider that the entire schedule for growth or infrastructure would be reduced by 12 years due to a simple and relatively small 1% increase in population growth.

Investing and Risk

Investing is usually a sound financial strategy if you have the money to do so. When investing, however, there are certain risks you should always consider first when applying the concepts of the time value of money. For example, making the decision to take $1,000 and invest it in your favorite company, even if it is expected to provide a 5% return each year, is not a guarantee that you will earn that return—or any return at all, for that matter. Instead, as with any investment, you will be accepting the risk of losing some or even all of your money in exchange for the opportunity to beat inflation and increase your future overall wealth. Essentially, it is risk and return that are responsible for the entire idea of the time value of money.

Risk and return are the factors that will cause a rational person to believe that a dollar risked should end up earning more than that single dollar.

To summarize, the concept of the time value of money and the related TVM formulas are extremely important because they can be used in different circumstances to help investors and savers understand the value of their money today relative to its earning potential in the future. TVM is critical to understanding the effect that inflation has on your money and why saving your money early can help increase the value of your savings dollars by giving them time to grow and outpace the effects of inflation.

Opportunity Costs

The concept of **opportunity cost** arises from the idea that there will always be possible options that are sacrificed with every option we decide on or for every choice that we make. For example, let's consider the decision to go to college after you graduate from high school. This decision, as with just about any other, will involve evaluating opportunity costs. If you choose to go to college, this will result in your sacrificing four years of potential earnings that you could have had if you had decided to take a job instead of attending school. Also, in addition to the lost salary, you would be losing out on four years of work experience that could have had a positive impact on your résumé or your future earnings prospects.

Of course, the entire idea behind furthering one's education is that you are hopeful that by choosing to go to college, you will increase the likelihood of earning a greater salary over the course of your lifetime than you would have if you had chosen to join the workforce directly out of high school. So, this ends up being a bit of a risk, but one that you have considered. The idea is that you are hoping for a more significant payoff down the road than if you had made the decision not to continue with your studies. When it comes to opportunity costs and the time value of money, it is obvious that there will always be costs associated with every forgone financial opportunity we pass on when we make a different choice. The logical individual can only hope that these choices produce a better end result than if we had made different choices and pursued any of our forgone alternatives. This also applies in situations where we may sit idly by and decide to take no action at all.

For example, if you are putting $1,000 in a savings account to save for a house, you may be giving up an opportunity to grow that money in an investment account that would earn a greater rate of return. In another example, being able to calculate the future value of your money will tell you that instead of investing, you probably should be paying down your 24% APR credit card debt that is costing you hundreds of dollars a month—hundreds of dollars more than you might earn from an investment account.

Summary

7.1 Now versus Later Concepts

This section discussed the underlying concepts of the time value of money (TVM). Because it is possible to earn interest income on cash that you decide to deposit in an investment or an interest-bearing account, money that you have now or receive sooner will be more valuable to you than the same amount of money received later.

7.2 Time Value of Money (TVM) Basics

Future value refers to the value that a current amount will eventually grow into at a given interest rate over a specific period of time. The single-period scenario is one way in which future amounts are calculated. Compounding, which is interest earned on interest, also affects the future value of money.

7.3 Methods for Solving Time Value of Money Problems

Calculations can be used to determine future and present dollar amounts, discount and growth rates, and periods of time required for specific growth. Time value of money problems can be solved using mathematical equations, calculators with financial functions, and spreadsheets. A useful tool for conceptualizing present value and future value problems is a timeline. A timeline is a visual, linear representation of the timing of periods and cash flows over a set amount of time.

7.4 Applications of TVM in Finance

The idea of the time value of money is often considered to be the cornerstone concept of the study of finance. TVM can help investors and savers understand the value of money today relative to its earning potential in the future. TVM is critical to understanding the effect that inflation has on money and why saving your money early can help increase the value of your savings dollars by giving them time to grow and outpace the effects of inflation. Of course, it is important to remember that there will always be possible options that are sacrificed with every option you decide on and every choice you make.

Key Terms

Bureau of Labor Statistics a group within the United States Department of Labor that is the primary fact-finding agency for the US government in the fields of labor, statistics, and economics; serves as the principal agency of the US Federal Statistical System

compounding interest the continual addition of interest to the original principal sum of a loan or deposit, often referred to as interest on interest

compounding period the period between points in time when interest is paid or added to the principal

consumer price index (CPI) a measure that examines the weighted average of prices of a basket of consumer goods and services such as transportation, food, and medical care

discount rate the interest rate used to determine the present value of future cash inflows

Federal Reserve the central bank system of the United States

financial instrument an asset or bundle of assets, including monetary contracts between parties, that can be bought, sold, or traded for financial gain

financial risk the possibility of losing money or purchasing power on an investment, business transaction, or venture or simply due to inflation

Fisher effect an economic theory created by economist Irving Fisher that describes the relationship between inflation and both real and nominal interest rates

future value (FV) the value that a current amount will grow to at a given interest rate over a given period of time

gross domestic product (GDP) the total value of goods produced and services provided in a country during one year

growth rate the percentage increase of a specific variable within a specific time period; synonymous with *interest rate* in the context of the time value of money

interest the amount of money that is paid by a borrower to a lender for the use of their money, typically calculated from an annualized rate

investment an asset or item acquired with the goal of generating financial gain through increased income or appreciation in value

liquid asset an asset that can be readily converted into cash within a short period of time

money market investments low-risk financial instruments such as T-bills, federal notes, commercial paper, certificates of deposit (CDs), repurchase agreements (repos), and bankers' acceptances, among others

money supply the total dollar value of legal tender that is available to consumers within an economy at any single point in time

opportunity cost the loss of potential gain from other alternatives when a single alternative is chosen

present value (PV) the current value of a future amount, calculated by discounting the future value back at a known discount or interest rate for a specified period of time

real interest rate a rate of interest that has been adjusted to account for the effects of inflation

single payment or lump sum a single payment or deposit made at one time, as opposed to a number of smaller payments or deposits made in installments

time value of money (TMV) the concept that an amount of money is worth more today than the exact same amount of money at some point in the future

Treasury investments debt obligations such as T-bills (Treasury bills), bonds, and notes issued by the US Department of the Treasury

underinvested describes an insufficient amount of investment or an investment that is earning an insufficient rate of interest

uninvested describes cash that is being held in reserve, is not invested in an account or financial instrument, and is not earning interest or any return

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/cfainstitute_link). Reference with permission of CFA Institute.

Multiple Choice

1. The most basic type of financial transaction involves _____.
   a. an amount of money that is not invested
   b. a series of equal installment amounts paid or received over a period of time
   c. a simple, one-time amount of cash that can be either a receipt or a payment
   d. None of the above

2. If a discount (or interest) rate has a positive value, then the future value of any amount deposited in an interest-bearing account will _____.
   a. be less than the present value
   b. be equal to the present value
   c. be greater than the present value
   d. decline over time

3. If the discount (or interest) rate used to calculate the present value of a future payment increases, the calculated present value will do which of the following?
   a. Increase
   b. Decrease

c. Remain the same
d. Increase as the period of time shortens

4. The discount rate that is required to equate a future payment of $500 in three years to a present value of $400 is _____.
   a. 4.7%
   b. 6.5%
   c. 7.7%
   d. 8.8%

5. If compounding periods increase in frequency and all else remains the same, the dollar values of any resulting future value calculations will _____.
   a. increase
   b. remain the same
   c. decrease
   d. None of the above

Review Questions

1. All other things being the same, would you prefer a bank account that compounds interest quarterly or one that compounds interest semiannually?
2. Briefly describe the concept of future value within the context of the larger overall concept of the time value of money.
3. Which of the following two options will give you the greatest future value: (A) an initial deposit of $100 earning 20% per year, compounded annually and left to grow for 10 years, or (B) an initial deposit of $75 earning 12% per year, compounded monthly and left to grow for 15 years?
4. If a savings account pays interest on a quarterly basis and you are performing future value calculations on deposited amounts, how can you calculate the rate?
5. Briefly describe the relationship among consumer savings, purchasing power, and inflation.

Problems

1. Find the future value of $100 in five years at 5% interest.
2. Find the future value of $1,800 in 3 years at 8% interest.
3. How much would you have to deposit now to have $15,000 in eight years if interest is 7%?
4. What is the present value of $5,000 that will be paid to you eight years from today at 8% interest?
5. How many years will it take a $700 balance to grow into $900 in an account earning 5%?
6. If you borrow $1,000 and pay back $1,728 in three years, what annual rate of interest are you paying?
7. How long will it take you to triple your money at 8%?
8. A company's sales were $250 million in 2019. If sales grow at 6% per year, how large will they be 10 years later, in 2029 (as expressed in millions)?
9. A US government bond in the amount of $1,000 will mature in six years, has no coupon payments, and carries an interest rate of 8%. What is the value of this bond today?
10. You spend $725.00 to purchase a $1,000 bond that will have no coupon payments and matures in 12 years.

What interest rate will you be earning on this bond?

11. At what interest rate would you be ambivalent about receiving either $50,000 10 years from now or $35,000 today?

12. Vance Corporation had earnings last year of $3.25 per share. The company has experienced 8% annual growth over the last several years, and management expects that growth rate to continue. Based on this information, after how long will earnings per share double?

13. What is the amount of total interest dollars earned on a $5,000 deposit earning 6% for 20 years?

14. You have decided that you will sell your $300,000 house when it appreciates in value to $500,000. If houses are appreciating at an average annual rate of 5% in your neighborhood, for approximately how long will you be staying in your house?

15. You just won some money in the lottery and would like to save a portion of it so that you will have $50,000 to put a down payment on a house in five years. Your bank pays a 5% rate of interest. How much money will you have to set aside from the lottery winnings?

16. Bauer Bookstore sells books before they are published. Today, they offered the book *Journeys in Finance* for $14.20, but the book will not be published for another two years. Upon publishing, the price of the book will be $24.00. What is the discount rate Bauer Bookstore is offering its customers for this book?

17. One of your professional goals is to one day earn a six-figure salary ($100,000). You hope to accomplish this objective within the next 30 years. Salaries grow at 3.75% per year in your field of work. What beginning salary will you need in order to reach this 30-year goal?

18. How much will $25,000 grow to in five years at a 5% annual rate that is compounded quarterly?

19. If Eisenberg Industries revenues have increased from $30 million to $90 million over a 10-year period, what has been their annual rate of growth?

20. If you are scheduled to receive $4,000 six years from today and the discount rate is 8.5%, what is the present value of this payment?

21. If you were to open a savings account that earns 3% interest and is compounded quarterly, what would be the total amount in your account after 10 years if you made an opening deposit of $9,500?

22. You are considering four possible options for your new savings account. You plan to deposit $13,000 and leave this amount in the account for 20 years with no additional deposits or withdrawals. All of these account options would earn 6% interest, but each one has a different compounding frequency, listed below. What would be the value of each account at the end of the 20-year period?

a. Annually
b. Semiannually
c. Quarterly
d. Monthly

Video Activity

Time Value of Money Calculations with Financial Calculator

Click to view content (https://openstax.org/r/Time-Value-of-Money-Calculations)

1. Name and describe the five primary keys on a financial calculator that are used to solve time value of money problems.

2. Following the instructions laid out in this video, practice calculating the following TVM variables using these inputs:

Find a Future Value (FV): Calculate FV when

$$\text{PV} = -1{,}000,\ \text{N} = 5,\ \text{I/Y} = 4, \text{ and } \text{PMT} = 0.$$

Find a Present Value (PV): Calculate PV when

$$\text{FV} = 2{,}000,\ \text{N} = 7,\ \text{I/Y} = 5, \text{ and } \text{PMT} = 0.$$

Find the Number of Periods (N) when

$$\text{FV} = 5{,}000,\ \text{PV} = -3{,}000,\ \text{I/Y} = 3, \text{ and } \text{PMT} = 0.$$

Find the Interest Rate (I/Y) when

$$\text{FV} = 6{,}000,\ \text{PV} = -1{,}500,\ \text{N} = 10, \text{ and } \text{PMT} = 2.$$

Find the Payment (PMT) when

$$\text{FV} = 15{,}000,\ \text{PV} = -8{,}000,\ \text{N} = 12, \text{ and } \text{I/Y} = 4.$$

Continue to practice using a financial calculator to solve various time value of money problems using different input factors until you feel comfortable with the process of using a calculator to solve TVM problems.

Time Value of Money Using Excel with 10 Examples

Click to view content (https://openstax.org/r/Money_Using_Excel)

3. Where within the Excel spreadsheet and its different menus (under what menu button option) can you find the different functions that will enable you to solve for different time value of money factors?
4. Following the instructions laid out in this video, practice calculating the following TVM variables in Excel.

   Find a Future Value (FV): Calculate FV when

   $$\text{PV} = -1{,}000,\ \text{N} = 5,\ \text{I/Y} = 4, \text{ and } \text{PMT} = 0.$$

   Find a Present Value (PV): Calculate PV when

   $$\text{FV} = 2{,}000,\ \text{N} = 7,\ \text{I/Y} = 5, \text{ and } \text{PMT} = 0.$$

   Find the Number of Periods (N) when

   $$\text{FV} = 5{,}000,\ \text{PV} = -3{,}000,\ \text{I/Y} = 3, \text{ and } \text{PMT} = 0.$$

   Find the Interest Rate (I/Y) when

   $$\text{FV} = 6{,}000,\ \text{PV} = -1{,}500,\ \text{N} = 10, \text{ and } \text{PMT} = 2.$$

   Find the Payment (PMT) when

   $$\text{FV} = 15{,}000,\ \text{PV} = -8{,}000,\ \text{N} = 12, \text{ and } \text{I/Y} = 4.$$

   Go back and check the answers to these questions that you ended up with under the video *Time Value of Money Calculations with Financial Calculator*. You should get the exact same answers when using both methods (calculator and Excel).

   Continue to practice using Excel to solve various time value of money problems using different input factors until you feel comfortable with the process of using spreadsheets to solve TVM problems.

8

Time Value of Money II: Equal Multiple Payments

Figure 8.1 The value of an investment generally represents our expectations of all future cash flows from that investment, once discounted. (credit: modification of "Money" by Ervins Strauhmanis/flickr CC BY 2.0)

Chapter Outline

Why It Matters

Although this text is directed at business finance students, our daily decisions as consumers are largely based on money and finance to just as great an extent. An old adage in finance claims, “If you aren’t in control of your money, your money is controlling you.” Fortunately, learning to manage your money is not difficult if you’re disciplined and understand some simple techniques. For example, several years ago, the author was negotiating for a three-year auto loan from a well-known regional dealer, who was offering an interest rate of 2%. When the manager left the room for a few minutes, we pulled out a financial calculator and proved in less than a minute that the actual interest rate in the payments he was proposing was nearly double the quoted and advertised rate.

In addition to understanding how the loan process works, which improves your negotiation skills when borrowing, businesses and individuals can better control their investments by understanding basic rules of finance, particularly as seen in this and the preceding chapter. Assume you pledge to invest $1,000 per year at 5% return per year and are curious about how much you will have accumulated by age 60. If you begin at age 30, you will have $69,760; if you begin at age 20, you will have $126,840. Can the extra 10 years make that much of a difference? We’ll see that indeed they can, and the calculations required to prove it can take less than two minutes.

As another example, many professionals confuse *income* and *wealth* during their career growth. In their popular book *The Millionaire Next Door: The Surprising Secrets of America’s Wealthy*, authors Thomas Stanley

and William Danko illustrate these terms with a flowing river. A river is in constant movement, and as the flow or depth increases, this is comparable to one's income increasing through the promotions, salary increases, and bonuses one receives. Unfortunately, many individuals then increase their spending habits in response, justifying a better car, a second home, or more lavish vacations. Wealth, in contrast, is comparable to taking a bucket of water from the river and holding it aside in a tank for oneself. Financial professionals often call this "paying yourself first." Stanley and Danko list this among the "secrets" referenced in the title of their book.

8.1 Perpetuities

Learning Outcomes

By the end of this section, you will be able to:

- Define perpetuity.
- Explain how perpetuities are valued.

In Time Value of Money I, we learned that the value of money changes with the passage of time. Decision-makers consider how investments, projects, and even opportunity costs gain value as we move forward into the future. They similarly consider how value in the future can be reduced to a value in present or past periods. We saw that these value projections are called determination of future value (compounding, moving forward on a timeline) or present value (discounting, moving backward on a timeline). The easiest way to visualize this movement through time, whether forward or backward, is by use of a timeline.

Throughout the first chapter on the time value of money, we were analyzing a single amount. In this chapter, we deal with a stream of payments made periodically—in other words, payments made or received regularly over a span of time. We begin with the illustration of a perpetuity.

What Is a Perpetuity?

A **perpetuity** is a series of payments or receipts that continues forever, or perpetually. One of the best ways to analyze the basics of an *annuity* (the stream of payments to be paid or received in the future) is by starting with a perpetuity. The most common examples of perpetuities in the author's experience are college chair endowments and preferred stock.

If you gift $1,500,000 to a college to name a professor's chair for your family, you might specify that the money must be held in perpetuity and invested by the college to yield a fixed 3%. The college will take those proceeds of the investment, leaving your original $1,500,000 intact, and use the annual interest of $45,000 to fund a portion of the professor's salary.

Another common example is **preferred stock**. Most preferred stock issues carry a fixed and predetermined rate of dividend. If we assume that the dividend will not change in future years, then preferred dividend shareholders will receive a fixed amount of money in future years—assuming, of course, that the company's board of directors declares the dividends sufficient to fund these requirements. If we assume that the dividend is declared and paid and that it remains constant, this represents a perpetuity.

For example, Shaw Inc. has issued 100,000 shares of preferred stock with a stated value of $50 and a 4% dividend. Therefore, if they can fund and decide to declare dividends for the full amount, they will pay out $200,000, or $2.00 per preferred share. Because shares such as these are created with the intention of continuity, the owner of this preferred stock can theoretically expect this dividend income stream in perpetuity.

To place a current market value on this stream of future income, how much should an investor pay for one share of this preferred stock? The calculation is a present value. The amount the investor pays today for that one share is equal to the annual dividend (assuming it is declared and paid) divided by the rate of return. But be careful—it is not the rate on the face of the preferred stock but the **required rate of return**, the "market rate" that investors expect from a stock of this level of risk. We must also note an important fact affecting all

investment valuations: the value of an investment generally represents our expectations of all future cash flows from that investment, discounted to today's dollars.

Because a perpetuity is a stream of payments continuing indefinitely, determining the future value isn't possible. Determining the present value, however, *is* possible, although one might wonder how. As we learned earlier, the greater the amount of time used in a present value calculation, the smaller the amount of dollars needed at the beginning, regardless of the interest rate involved. Therefore, when we discount each payment in an infinite series, remembering that we would then add them together once we discount them to the present, the infinite payments become negligible at some point and will no longer have a significant impact on today's value. To grow to one dollar 70 years from now, even at a growth rate of 5% per year, we would only need $0.0329—not even four cents. Keeping all other facts the same, if we had 100 years to grow an investment to one dollar, we would only need 0.76 cents—not even a whole penny! There is no question that the effect of time is substantial and dramatic.

The study of perpetuities in corporate finance is a first step to understanding valuation models of certain investments, such as the dividend discount model and the constant growth model, to be addressed in other chapters. Our ability to discount future cash flows, even infinite cash flows, to a present value is a clue to the price at which a company's stock might trade. From a personal financial planning perspective, the individual investor is also better able to be certain that they are paying a fair price for holdings in their portfolio. For purposes of long-term or retirement planning, the investor must consider that a fixed and unchanging dividend, such as from preferred stock, might not adequately protect the holder from inflation in times of rising prices.

How to Value a Perpetuity

Given these facts, how do we place a value on a perpetuity? Let's keep the preferred stock example for Shaw Inc. in mind. The holder of one share will expect to receive a $2.00 dividend for every share owned. Although a perpetuity may allow for growth of that dividend, we will hold that constant now. We must know one additional fact: the required rate of return. This is our random variable, which can cause fluctuation in the price of the preferred stock. Let's assume that the required rate of return, which we'll call R_S, is 7%. This is the rate of return that the market expects in order to take on the risk of an investment such as Shaw.

Determination of the price of Shaw's preferred stock becomes quite simple because the expected annual cash flow should not change, making it a **constant perpetuity**. The constant perpetuity formula is

$$\text{PV} = \frac{C}{R_S}$$

where PV is the price of the preferred stock, C is the constant dividend, and R_s is the required rate of return.

By substitution,

$$\text{PV} = \frac{\$2.00}{0.07} = \$28.57$$

The price one should pay for a share of Shaw's preferred stock is $28.57.

Here's another constant perpetuity to try. The preferred stock of Rooney Corporation pays an annual dividend of $1.75 per share. If the required rate of return in the market for shares such as Rooney's is 5.8%, at what price should these preferred shares be trading? The answer is $\frac{\$1.75}{0.058}$, or $30.17.

Some investments might involve a **growing perpetuity**. In this case, some degree of change in the amount of the dividend is expected. The formula is altered slightly to include a rate of growth in the denominator, noted as G, making the growing perpetuity formula

$$\text{PV} = \frac{C}{R_S - G}$$

To illustrate a growing perpetuity, let's revisit Rooney Corp.'s stock, with its annual dividend of $1.75 and a required rate of return in the market of 5.8%. If the expected dividend growth rate *G* is 1.2%, then the value changes to $\frac{\$1.75}{0.058 - 0.021}$, or $38.04. The expectation of growth in the dividend provides incentive for the investor to pay a higher price.

THINK IT THROUGH

A Growing Perpetuity

Savo Corporation. While we think of perpetuities as being static, with a constant benefit or dividend, as seen above, they might have the possibility of growth. Let's assume that our preferred stock in Savo Corporation is expected to grow at a rate of 0.2% per year. Its annual dividend per share is $4.00, and its required rate of return in the market is 3%. If this is a constant dividend stock, like most preferred stock, its price would be expected to approximate

$$\text{PV} = \frac{C}{R_s}$$

or

$$\frac{\$4.00}{0.03} = \$133.33$$

When we factor in the 0.2% annual growth in the dividend, what does the price per share become?

Solution:

$$\text{PV} = \frac{4}{(0.03 - 0.002)} = \$142.86.86$$

THINK IT THROUGH

College Endowment

In the case of an endowment for a college chair, as noted in the beginning of this section, instead of a dividend amount for a preferred stock, we would use the desired amount of the distribution that the chair would receive as part of their compensation package. Assume the college can invest this money at a fixed 3.5% annual rate. If you wish to gift the college enough funds to be held in perpetuity to produce $75,000 each year for that professor, how would you calculate this?

Solution:

We modify the constant perpetuity formula:

$$\text{Gift} = \frac{\text{Annual Distribution}}{R_s}$$

$$\text{Gift} = \frac{\$75{,}000}{0.035} = \$2{,}142{,}857$$

In one year, $2,142,857 grows to

$$\$2{,}142{,}857 \times 1.035 = \$2{,}217{,}857$$

The earnings (gift) of $75,000 are withdrawn to compensate the professor, and we are left with the amount originally endowed, $2,142,857:

$$\$2{,}217{,}857 - \$75{,}000 = \$2{,}142{,}857$$

8.2 Annuities

Learning Outcomes

By the end of this section, you will be able to:

- Define annuity.
- Distinguish between an ordinary annuity and an annuity due.
- Calculate the present value of an ordinary annuity and an annuity due.
- Explain how annuities may be used in lotteries and structured settlements.
- Explain how annuities might be used in retirement planning.

Calculating the Present Value of an Annuity

An **annuity** is a stream of fixed periodic payments to be paid or received in the future. Present or future values of these streams of payments can be calculated by applying time value of money formulas to each of these payments. We'll begin with determining the present value.

Before exploring present value, it's helpful to analyze the behavior of a stream of payments over time. Assume that we commit to a program of investing $1,000 at the *end* of each year for five years, earning 7% compounded annually throughout. The high rate is locked in based partly on our commitment beginning today, even though we will invest no money until the end of the first year. Refer to the timeline shown in Table 8.1.

Year	0	1	2	3	4	5
Balance Forward ($)	0.00	0.00	1,000.00	2,070.00	3,214.90	4,439.94
Interest Earned ($)		0.00	70.00	144.90	225.04	310.80
Principal Added ($)		1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
New Balance ($)		**1,000.00**	**2,070.00**	**3,214.90**	**4,439.94**	**5,750.74**

Table 8.1

At the end of the first year, we deposit the first $1,000 in our fund. Therefore, it has not yet had an opportunity to earn us any interest. The "new balance" number beneath is the cumulative amount in our fund, which then carries to the top of the column for the next year. In year 2, that first amount will earn 7% interest, and at the end of year 2, we add our second $1,000. Our cumulative balance is therefore $2,070, which then carries up to the top of year 3 and becomes the basis of the interest calculation for that year. At the end of the fifth year, our investing arrangement ends, and we've accumulated $5,750.74, of which $5,000 represents the money we invested and the other $750.74 represents accrued interest on both our invested funds and the accumulated interest from past periods.

Notice two important aspects that might appear counterintuitive: (1) we've "wasted" the first year because we deposited no funds at the beginning of this plan, and our first $1,000 begins working for us only at the beginning of the second year; and (2) our fifth and final investment earns no interest because it's deposited at the end of the last year. We will address these two issues from a practical application point of view shortly.

Keeping this illustration in mind, we will first focus on finding the present value of an annuity. Assume that you wish to receive $25,000 each year from an existing fund for five years, beginning one year from now. This stream of annual $25,000 payments represents an annuity. Because the first payment will be received one year from now, we specifically call this an **ordinary annuity**. We will look at an alternative to ordinary annuities later. How much money do we need in our fund today to accomplish this stream of payments if our remaining balance will always be earning 8% annually? Although we'll gradually deplete the fund as we withdraw periodic payments of the same amount, whatever funds remain in the account will always be earning interest.

Before we investigate a formula to calculate this amount, we can illustrate the objective: determining the present value of this future stream of payments, either manually or using Microsoft Excel. We can take each of the five payments of $25,000 and discount them to today's value using the simple present value formula:

$$\text{PV} = \frac{\text{FV}}{(1+r)^n}$$

where FV is the future value, PV is the present value, *r* is the interest rate, and *n* is the number of periods.

For example, the first $25,000 is discounted by the equation as follows:

$$\text{PV} = \frac{\$25{,}000}{(1+0.08)^1}$$

$$\text{PV} = \frac{\$25{,}000}{1.08} = \$23{,}148.15$$

Proof that $23,148.15 will grow to $25,000 in one year at 8% interest:

$$\$23{,}148.15 \times 1.08 = \$25{,}000$$

If we use this same method for each of the five years, increasing the exponent *n* for each year, we see the result in Table 8.2.

Year	Calculation	Result
1	$\$25{,}000 \div (1.08)^1$	$23,148.15
2	$\$25{,}000 \div (1.08)^2$	$21,433.47
3	$\$25{,}000 \div (1.08)^3$	$19,846.81
4	$\$25{,}000 \div (1.08)^4$	$18,375.75
5	$\$25{,}000 \div (1.08)^5$	$17,014.58
TOTAL		**$99,818.76**

Table 8.2 Present Value of Future Payments

We begin with the amount calculated in our table, $99,818.76. Before any money is withdrawn, a year's worth of interest at 8% is compounded and added to our balance. Then our first $25,000 is withdrawn, leaving us with $82,804.26. This process continues until the end of five years, when, aside from a minor rounding difference, the fund has "done its job" and is equal to zero. However, we can make this simpler. Because each payment withdrawn (or added, as we will see later) is the same, we can calculate the present value of an annuity in one step using an equation. Rather than the multiple steps above, we will use the following equation:

$$\text{PVa} = \text{PYMT} \times \frac{\left[1 - \frac{1}{(1+r)^n}\right]}{r}$$

where PVa is the present value of the annuity and PYMT is the amount of one payment.

In this example, PYMT is $25,000 at the end of each of five years. Note that the greater the number of periods and/or the size of the amount borrowed, the greater the chances of large rounding errors. We have used six decimal places in our calculations, though the actual time value of money factor, combining interest and time, can be much longer. Therefore, our solutions will often use ≅ rather than the equal sign.

By substitution, and then following the proper order of operations:

$$\begin{aligned}
\text{PVa} &= \$25{,}000 \times \frac{\left[1 - \frac{1}{(1 + 0.08)^5}\right]}{0.08} \\
\text{PVa} &= \$25{,}000 \times \frac{\left(1 - \frac{1}{1.469328}\right)}{0.08} \\
\text{PVa} &= \$25{,}000 \times \frac{1 - 0.680583}{0.08} \\
\text{PVa} &= \$25{,}000 \times \frac{0.319417}{0.08} \\
\text{PVa} &= \$25{,}000 \times 3.9927125 \\
\text{PVa} &\approx \$99{,}817.81
\end{aligned}$$

In both cases, barring a rounding difference caused by decimal expansion, we come to the same result using the equation as when we calculate each of multiple years. It's important to note that rounding differences can become significant when dealing with larger multipliers, as in the financing of a multimillion-dollar machine or facility. In this text, we will ignore them.

In conclusion, five payments of $25,000, or $125,000 in total, can be funded today with $99,817.81, with the difference being obtained from interest always accumulating on the remaining balance at 8%. The running balance is obtained by calculating the year's interest on the previous balance, adding it to that balance, and subtracting the $25,000 that is withdrawn on the last day of the year. In the last (fifth) year, just enough interest will accrue to bring the balance to the $25,000 needed to complete the fifth payment.

A common use of the PVa is with large-money lotteries. Let's assume you win the North Dakota Lottery for $1.2 million, and they offer you $120,000 per year for 10 years, beginning one year from today. We will ignore taxes and other nonmathematical considerations throughout these discussions and problems. The Lottery Commission will likely contact you with an alternative: would you like to accept that stream of payments … or would you like to accept a **lump sum** of $787,000 right now instead? Can you complete a money-based analysis of these alternatives? Based purely on the dollars, no, you cannot. The reason is that you can't compare future amounts to present amounts without considering the effect of time—that is, the time value of money. Therefore, we need an interest rate that we can use as a discounting factor to place these alternatives on the same playing field by expressing them in terms of today's dollars, the present value. Let's use 9%. If we discount the future stream of fixed payments (an ordinary annuity, as the payments are identical and they begin one year from now), we can then compare that result to the cash lump sum that the Lottery Commission is offering you instead.

By substitution, and following the proper order of operations:

$$\begin{aligned}
\text{PVa} &= \$120{,}000 \times \frac{\left[1 - \frac{1}{(1 + 0.09)^{10}}\right]}{0.09} \\
\text{PVa} &= \$120{,}000 \times \frac{\left(1 - \frac{1}{2.3673637}\right)}{0.09} \\
\text{PVa} &= \$120{,}000 \times \frac{1 - 0.4224108}{0.09} \\
\text{PVa} &= \$120{,}000 \times \frac{0.5775892}{0.09} \\
\text{PVa} &= \$120{,}000 \times 6.4176578 \\
\text{PVa} &\approx \$770{,}119
\end{aligned}$$

All things being equal, that expected future stream of ten $120,000 payments is worth approximately $770,119 today. Now you can compare like numbers, and the $787,000 cash lump sum is worth more than the discounted future payments. That is the choice one would accept without considering such aspects as taxation, desire, need, confidence in receiving the future payments, or other variables.

Calculating the Present Value of an Annuity Due

Earlier, we defined an ordinary annuity. A variation is the **annuity due**. The difference between the two is one period. That's all—just one additional period of interest. An ordinary annuity assumes that there is a one-period lag between the start of a stream of payments and the actual first payment. In contrast, an annuity due assumes that payments begin immediately, as in the lottery example above. We would assume that you would receive the first annual lottery check of $120,000 immediately, not a year from now. In summary, whether calculating future value (covered in the next section) or present value of an annuity due, the one-year lag is eliminated, and we begin immediately.

Since the difference is simply one additional period of time, we can adjust for this easily by taking the formula for an ordinary annuity and multiplying by one additional period. One more period, of course, is $(1 + i)$. Recall from Time Value of Money I that the formula for compounding is $(1 + i)^N$, where i is the interest rate and N is the number of periods. The superscript N does not apply because it represents 1, for one additional period, and the power of 1 can be ignored. Therefore, faced with an annuity due problem, we solve as if it were an ordinary annuity, but we multiply by $(1 + i)$ one more time.

In our original example from this section, we wished to withdraw $25,000 each year for five years from a fund that we would establish now. We determined how much that fund should be worth today if we intend to receive our first payment one year from now. Throughout this fund's life, it will earn 8% annually. This time, let's assume we'll withdraw our first payment immediately, at point zero, making this an annuity due. Because we're trying to determine how much our starting balance should be, it makes sense that we must begin with a larger number. Why? Because we're pulling our first payment out immediately, so less money will remain to start compounding to the amount we need to fund all five of our planned payments! Our rule can be stated as follows:

Whether one is calculating present value or future value, the result of an annuity due must always be larger than that of an ordinary annuity, all other facts remaining constant. Here is the stream of solutions for the example above, but please notice that we will multiply by $(1 + i)$, one additional period, following the same order of operations:

$$\begin{aligned}
\text{PVa} &= \$25{,}000 \times \frac{\left[1 - \frac{1}{(1 + 0.08)^5}\right]}{0.08} \times (1 + 0.08) \\
\text{PVa} &= \$25{,}000 \times \frac{\left(1 - \frac{1}{1.469328}\right)}{0.08} \times 1.08 \\
\text{PVa} &= \$25{,}000 \times \frac{1 - 0.680583}{0.08} \times 1.08 \\
\text{PVa} &= \$25{,}000 \times \frac{0.319417}{0.08} \times 1.08 \\
\text{PVa} &= \$25{,}000 \times 3.9927125 \times 1.08 \\
\text{PVa} &\approx \$107{,}803.24
\end{aligned}$$

That's how much we must start our fund with today, before we earn any interest or draw out any money. Note that it's larger than the $99,817.81 that would be required for an ordinary annuity. It must be, because we're about to diminish our compounding power with an immediate withdrawal, so we have to begin with a larger amount.

We notice several things:

1. The formula must change because the annual payment is subtracted first, prior to the calculation of annual interest.
2. We accomplish the same result, aside from an insignificant rounding difference: the fund is depleted once the last payment is withdrawn.
3. The last payment is withdrawn on the first day of the final year, not the last. Therefore, no interest is earned during the fifth and final year.

To reinforce this, let's use the same approach for our lottery example above. Reviewing the facts, you have a choice of receiving 10 annual payments of your $1.2 million winnings, each worth $120,000, and you discount at a rate of 9%. The only difference is that this time, you can receive your first $120,000 right away; you don't have to wait a year. This is now an annuity due. We solve it just as before, except that we multiply by one additional period of interest, $(1 + i)$:

$$\begin{aligned}
\text{PVa} &= \$120{,}000 \times \frac{\left[1 - \frac{1}{(1 + 0.09)^{10}}\right]}{0.09} \times 1.09 \\
\text{PVa} &= \$120{,}000 \times \frac{\left(1 - \frac{1}{2.3673637}\right)}{0.09} \times 1.09 \\
\text{PVa} &= \$120{,}000 \times \frac{1 - 0.4224108}{0.09} \times 1.09 \\
\text{PVa} &= \$120{,}000 \times \frac{0.5775892}{0.09} \times 1.09 \\
\text{PVa} &= \$120{,}000 \times 6.4176578 \times 1.09 \\
\text{PVa} &\approx \$839{,}429
\end{aligned}$$

Again, this result must be larger than the amount we determined when this was calculated as an ordinary annuity.

The calculations above, representing the present values of ordinary annuities and annuities due, have been presented on an annual basis. In Time Value of Money I, we saw that compounding and discounting calculations can be based on non-annual periods as well, such as quarterly or monthly compounding and discounting. This aspect, quite common in periodic payment calculations, will be explored in a later section of this chapter.

Calculating Annuities Used in Structured Settlements

In addition to lottery payouts, annuity calculations are often used in **structured settlements** by attorneys at law. If you win a $450,000 settlement for an insurance claim, the opposing party may ask you to accept an annuity so that they can pay you in installments rather than a lump sum of cash. What would a fair cash distribution by year mean? If you have a preferred **discount rate** (the percentage we all must know to calculate the time value of money) of 6% and you expect equal distributions of $45,000 over 10 years, beginning one year from now, you can use the present value of an annuity formula to compare the alternatives:

$$\text{PVa} = \text{PYMT} \times \frac{\left[1 - \frac{1}{(1 + r)^n}\right]}{r}$$

By substitution:

$$\begin{aligned}
\text{PVa} &= \$45{,}000 \times \frac{\left[1 - \frac{1}{(1 + 0.06)^{10}}\right]}{0.06} \\
\text{PVa} &= \$45{,}000 \times \frac{\left(1 - \frac{1}{1.790848}\right)}{0.06} \\
\text{PVa} &= \$45{,}000 \times \frac{0.4416053}{0.06} \\
\text{PVa} &= \$45{,}000 \times 7.360089 \\
\text{PVa} &\approx \$331{,}204
\end{aligned}$$

If the opposing attorney offered you a lump sum of cash less than that, all things equal, you would refuse it; if

the lump sum were greater than that, you would likely accept it.

What if you negotiate the first payment to be made to you immediately, turning this ordinary annuity into an annuity due? As noted above, we simply multiply by one additional period of interest, (1 + 0.06). Repeating the last step of the solution above and then multiplying by (1 + 0.06), we determine that

$$\text{PVa} = \$45{,}000 \times 7.360089 \times 1.06$$
$$\text{PVa} \approx \$351{,}076$$

You would insist on that number as an absolute minimum before you would consider accepting the offered stream of payments.

To further verify that ordinary annuity can be converted into an annuity due by multiplying the solution by one additional period's worth of interest before applying the annuity factor to the payment, we can divide the difference between the two results by the value of the original annuity. When the result is expressed as a percent, it must be the same as the rate of interest used in the annuity calculations. Using our example of an annuity with five payments of $25,000 at 8%, we compare the present values of the ordinary annuity of $99,817.81 and the annuity due of $107,803.24.

$$\frac{\$107{,}803.24 - \$99{,}817.81}{\$99{,}817.81} = 0.08 = 8\%$$

The result shows that the present value of the annuity due is 8% higher than the present value of the ordinary annuity.

Calculating the Future Value of an Annuity

In the previous section, we addressed discounting a periodic stream of payments from the future to the present. We are also interested in how to project the future value of a series of payments. In this case, an investment may be made periodically. Keeping with the definition of an annuity, if the amount of periodic investment is always the same, we may take a one-step shortcut to calculate the future value of that stream by using the formula presented below:

$$\text{FVa} = \text{PYMT} \times \frac{(1+r)^N - 1}{r}$$

where FVa is the future value of the annuity, PYMT is a one-time payment or receipt in the series, r is the interest rate, and n is the number of periods.

As we did in our section on present values of annuities, we will begin with an ordinary annuity and then proceed to an annuity due.

Let's assume that you lock in a contract for an investment opportunity at 4% per year, but you cannot make the first investment until one year from now. This is counterintuitive for an investor, perhaps, but because it is the basis of the formula and procedures for ordinary annuities, we will accept this assumption. You plan to invest $3,000 at the end of each year. How much money will you have at the end of five years?

Let's start by placing this on a timeline like the one appearing earlier in this chapter (see Table 8.3):

Year	0	1	2	3	4	5
Balance Forward ($)	0.00	0.00	3,000.00	6,120.00	9,364.80	12,739.39
Interest Earned ($)		0.00	120.00	244.80	374.59	509.58
Principal Added ($)		3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
New Balance ($)		**3,000.00**	**6,120.00**	**9,364.80**	**12,739.39**	**16,248.97**

Table 8.3

As we explained earlier when describing ordinary annuities, the payment for year 1 is not invested until the last day of that year, so year 1 is wasted as a compounding opportunity. Therefore, the amount only compounds for four years rather than five. Also, our fifth payment is not made until the last day of our contract in year 5, so it has no chance to earn a compounded future value. The investor has lost on both ends. In the table above, we have made five calculations, and for a longer-term contract such as 10, 25, or 40 years, this would be tedious. Fortunately, as with present values, this ordinary annuity can be solved in one step because all payments are identical.

Repeating the formula, and then by substitution:

$$\begin{aligned}
\text{FVa} &= \text{PYMT} \times \frac{(1+r)^N - 1}{r} \\
\text{FVa} &= \$3{,}000 \times \frac{(1+0.04)^5 - 1}{0.04} \\
\text{FVa} &= \$3{,}000 \times \frac{1.216653 - 1}{0.04} \\
\text{FVa} &= \$3{,}000 \times 5.416325 \\
\text{FVa} &= \$16{,}248.98
\end{aligned}$$

This proof emphasizes that year 1 is wasted, with no compounding because the payment is made on the last day of year 1 rather than immediately. We lose compounding through this ordinary annuity in another way: year 5's investment is made on the last day of this five-year contract and has no chance to accumulate interest. A more intuitive method would be to enter a contract for an annuity due so that our first payment can be made immediately. In this way, we don't waste the first year, and all five payments work in year 5 as well. As stated previously, this means that annuities due will yield larger results than ordinary annuities, whether one is discounting (PVa) or compounding (FVa).

Let's hold all facts constant with the previous example, except that we will invest at the beginning of each year, starting immediately upon locking in this five-year contract. We follow the same technique as in the present value section: we multiply by one additional period to convert this ordinary annuity factor into a factor for an annuity due. Whether one is solving for a future value or a present value, the result of an annuity due must always be larger than an ordinary annuity. With future value, we begin investing immediately, so the result will be larger than if we waited for a period to elapse. With present value, we begin extracting funds immediately rather than letting them work for us during the first year, so logically we would have to start with more.

Continuing our example but converting it to an annuity due, we will multiply by one additional period, $(1 + i)$. All else remains the same:

$$\begin{aligned}
\text{FVa} &= \$3{,}000 \times \frac{(1+0.04)^5 - 1}{0.04} \times 1.04 \\
\text{FVa} &= \$3{,}000 \times \frac{1.216653 - 1}{0.04} \times 1.04 \\
\text{FVa} &= \$3{,}000 \times 5.416325 \times 1.04 \\
\text{FVa} &\approx \$16{,}898.93
\end{aligned}$$

Let's provide one additional example of each. Assume that you have a chance to invest $15,000 per year for 10 years, earning 8% compounded annually. What amount would you have after the 10 years? If we can only make our first payment at the end of each year, our ending value will be

$$\begin{aligned}
\text{FVa} &= \$15{,}000 \times \frac{(1+0.08)^{10} - 1}{0.08} \\
\text{FVa} &= \$15{,}000 \times \frac{2.158925 - 1}{0.08} \\
\text{FVa} &= \$15{,}000 \times 14.486563 \\
\text{FVa} &\approx \$217{,}298
\end{aligned}$$

However, if we can make our first payment immediately and then make subsequent payments at the start of

each following year, we modify the formula above by multiplying the annual payment by one additional period:

$$\text{FVa} = \$15{,}000 \times 14.486563 \times 1.08$$
$$\text{FVa} \approx \$234{,}682$$

THINK IT THROUGH

Begin an Investing Program at Age 20 or 30?

In this chapter's introductory section, Why It Matters, we posed a question about pledging to invest $1,000 each year until you reach age 60. If you can earn a 5% annual rate of interest, how much will you have if you begin at age 20? What if you delay this program until age 30? The additional 10 years can make a surprisingly large difference. How can you calculate that difference?

Solution:

Perform two separate calculations comparable to the chapter examples above, using the formula for the future value of an ordinary annuity. You plan to make the first investment immediately, making this an annuity due, so you will multiply by one additional period, (1 + 0.05). Notice that the only difference between the two calculations is the exponent *N*, representing the number of periods.

Thirty years (starting at age 30):

$$\text{FVa} = \$1{,}000 \times \frac{(1 + 0.05)^{30} - 1}{0.05} \times 1.05$$
$$\text{FVa} = \$1{,}000 \times 66.438848 \times 1.05$$
$$\text{FVa} \approx \$69{,}761$$

Forty years (starting at age 20):

$$\text{FVa} = \$1{,}000 \times \frac{(1 + 0.05)^{40} - 1}{0.05} \times 1.05$$
$$\text{FVa} = \$1{,}000 \times 120.799774 \times 1.05$$
$$\text{FVa} \approx \$126{,}840$$

Waiting 10 years before committing to this program comes with a surprisingly high cost—a loss of almost 82% of the potential value.

How Annuities Are Used for Retirement Planning

On a final note, how might annuities be used for **retirement planning**? A person might receive a lump-sum windfall from an investment, and rather than choosing to accept the proceeds, they might decide to invest the sum (ignoring taxes) in an annuity. Their intention is to let this invested sum produce annual distributions to supplement Social Security payments. Assume the recipient just received $75,000, again ignoring tax effects. They have the chance to invest in an annuity that will provide a distribution at the end of each of the next five years, and that annuity contract provides interest at 3% annually. Their first receipt will be one year from now. This is an ordinary annuity.

We can also solve for the payment given the other variables, an important aspect of financial analysis. If the person with the $75,000 windfall wants this fund to last five years and they can earn 3%, then how much can they withdraw from this fund each year? To solve this question, we can apply the present value of an annuity formula. This time, the payment (PYMT) is the unknown, and we know that the PVa, or the present value that they have at this moment, is $75,000:

$$\begin{aligned}
\text{PVa} &= \text{PYMT} \times \frac{\left[1 - \frac{1}{(1+r)^n}\right]}{r} \\
\$75{,}000 &= \text{PYMT} \times \frac{\left[1 - \frac{1}{(1+0.03)^5}\right]}{0.03} \\
\$75{,}000 &= \text{PYMT} \times \frac{\left(1 - \frac{1}{1.159274}\right)}{0.03} \\
\$75{,}000 &= \text{PYMT} \times 4.579705 \\
\text{PYMT} &= \$75{,}000 \div 4.579705 \\
\text{PYMT} &\approx \$16{,}376.60
\end{aligned}$$

The person can withdraw this amount every year beginning one year from now, and when the final payment is withdrawn, the fund will be depleted. Interest accrues each year on the beginning balance, and then $16,376.60 is withdrawn at the end of each year.

LINK TO LEARNING

Another View of Annuities

Many examples of annuities are available, with presentations as varied as the opinions as to how appropriate they are for investors, especially retirees. Math Is Fun (https://openstax.org/r/Math_Is_Fun) is particularly interesting and potentially helpful for understanding how to apply this knowledge.

8.3 Loan Amortization

Learning Outcomes

By the end of this section, you will be able to:

- Distinguish between different types of loans.
- Explain how amortization works.
- Create an amortization schedule.
- Calculate the cost of borrowing.

Types of Loans

Funds can be loaned to businesses of any type, including corporations, partnerships, limited liability companies, and proprietorships. Bankers often refer to these lending structures as *facilities*, and they can be tailored to the specific needs of the borrower in a number of ways. Similarly, lenders develop loans and lines of credit for individuals. Whether for a business or an individual, the purpose of the loan, method of repayment, interest rate, specific terms, and time involved must all be tailored to the goals of the borrower and the lender. In this chapter, we will focus on fixed-rate loans, although other alternatives exist.

Typical business loans include the following:

- Term loans generally bear a maturity date and a set rate of interest and are typically used to finance investments in assets such as equipment, buildings, and possibly other acquired firms. The length of the term loan is generally designed to match the useful life of the asset being financed, and it will usually be repaid on a monthly schedule. It's common for a term loan to be backed by collateral, such as the asset itself or other assets of the business.
- Revolving lines of credit (revolvers), are used to finance the short-term working capital needs of a business. Revolvers will have a specific maximum but no set schedule of monthly payments. Interest accrues on the amount of cash that a company has drawn down from the facility. These credit lines may be secured by accounts receivable, inventory, other assets of the business, or sometimes simply the good

faith and credit of the company if the firm is strong, creditworthy, and established with the lender. Revolvers must often be fully repaid and unused for a short period of time to assure the lender that the borrower is not using this facility for longer-term needs.

Personal loans also come in several types, designed for the purpose the borrower (consumer) has in mind, with assistance from the lender in determining the appropriate structure:

- Personal lines of credit are similar to lines of credit on bank cards, with interest being charged on the outstanding balance of the credit line. These are available on the basis of personal credit scores, with data being supplied by the three best-known credit reporting firms: Experian, Equifax, and TransUnion. Individuals should check their scores with each of these companies at least once per year, which they can do for no charge. Additional requests from the same company require a small fee.
- An unsecured personal loan is an installment loan, initially drawn for a fixed amount and repaid on a periodic schedule with interest, as we have seen in our annuity examples. Unsecured means that the loan is not secured by collateral but is instead based on the strong credit history of the borrower.
- In contrast, a secured personal loan has an asset backing up the unpaid amount, and if the consumer defaults on the debt, the asset can be seized by the lender to satisfy their claim. A common example is an auto loan, which is secured by the car being purchased; nonpayment or default on the loan can lead to the borrower's car being repossessed.
- A mortgage loan is another type of secured personal loan, but for a longer period, such as 20, 25, or even 30 years. The home being purchased or built is the collateral, and the home may be foreclosed upon if the borrower defaults. Full title to the home typically remains with the lender as long as an unpaid balance remains on the debt.
- Student loans are borrowings intended to fund college or career education, and they can come from a financial institution or the federal government. Interest rates on these loans are generally low and advantageous, and repayment does not begin until after the borrower's education is complete (or if they drop below a certain level of time status, such as becoming a half-time student).

Calculating Loan Payments Using Simple Amortization

Loan amortization refers to a schedule of how and when a debt will be repaid with interest. As noted, we will focus on fixed-rate debts, such as auto loans, personal loans with installment payments, or mortgages. Before entering into a borrowing agreement, the borrower can use any of a number of tools to verify the terms being offered, such as the monthly payment on a car loan financed by the dealer. In many cases, this is accomplished by using the present value of an annuity formula:

$$\text{PVa} = \text{PYMT} \times \frac{\left[1 - \frac{1}{(1+r)^n}\right]}{r}$$

We've already reviewed the present value of ordinary annuities in several examples. Before we look into business or consumer loans and their repayment, we must review an area of Time Value of Money I.

We're not likely to make annual payments on a home mortgage or auto loan, as these are commonly paid on a monthly basis. Fortunately, our formulas are easily adjusted from annual to non-annual periods. You will recall that we solve for non-annual periods in the same way, with two adjustments: (1) we divide the annual interest rate by the number of periods in the year, and (2) we multiply the time periods by the number of those periods within a year. Therefore, in the case of monthly debt service, including interest and principal, we use 12 periods.

Given a three-year car loan at 6%, rather than using 6% and 3 periods in our formula, we would instead use 0.5% (6% ÷ 12) and 36 periods (3 years × 12), and then apply the present value of an annuity formula in the same way. Let's say the three-year, 6% auto loan is for $32,000. You need to know if you can squeeze the monthly payment into your budget. For our examples, we will ignore any other charges, fees, taxes, or extras that your lender might include in these payments, and we will focus only on interest and principal repayment.

You will make the first payment one month from now, making this an ordinary annuity. What is the amount of your monthly debt service? In this case, you would be solving for a different unknown: the payment amount.

By substitution into the present value of an annuity formula, adjusting for monthly payments as noted:

$$\$32{,}000 = \text{PYMT} \times \frac{\left[1 - \frac{1}{(1 + 0.005)^{36}}\right]}{0.005}$$
$$\$32{,}000 = \text{PYMT} \times \frac{\left(1 - \frac{1}{1.196681}\right)}{0.005}$$
$$\$32{,}000 = \text{PYMT} \times \frac{1 - 0.835645}{0.005}$$
$$\$32{,}000 = \text{PYMT} \times \frac{0.164355}{0.005}$$
$$\$32{,}000 = \text{PYMT} \times 32.871$$

Dividing both sides by 32.781 to isolate the payment amount (PYMT) gives us

$$\text{PYMT} = \frac{\$32{,}000}{32.871}$$
$$\text{PYMT} \approx \$973.50$$

Solving for the payment, we find that it's approximately $973.50 per month. You consult your monthly budget and find that you can cover this monthly payment, so you conclude the deal. Ask the salesperson for the amortization table on this debt to show how your 36 payments of $973.50 will cover your interest plus repayment of the principal amount of the debt. At this point, you know how to complete your own table. Using a financial calculator or Microsoft Excel simplifies the operation above to a few keystrokes, as presented later in this chapter.

Two extracts from an amortization table are shown in Table 8.4.

Month	Payment	Interest	Principal	Remaining Balance
1	973.50	160.00	813.50	31,186.50
2	973.50	155.93	817.57	30,368.93
3	973.50	151.84	821.66	29,547.27
4	973.50	147.74	825.77	28,721.51
5	973.50	143.61	829.89	27,891.61
...continued...				
33	973.50	19.23	954.27	2,891.54
34	973.50	14.46	959.04	1,932.50
35	973.50	9.66	963.84	968.66
36	973.50	4.84	968.66	0.00
Total	**35,046.00**	**3,046.08**	**32,000.00**	

Table 8.4 Extracts from an Amortization Table ($)

This table resembles proofs we have seen of annuities, but let's focus on some details:

1. Each fixed payment contains both interest and principal repayment.
2. Because the payments are fixed and the amount of remaining debt is decreasing, the monthly interest portion is always decreasing, and the amount of principal payment therefore must be increasing.

We can conclude that the lender is making more of their revenue (interest) in the early months than in the later months. In addition, the debt is decreasing slowly in the early months and more rapidly in the later

months. We can all agree that lenders are compensated for the risks they take earlier rather than later. Of the 36 payments of $973.50, $32,000 has been repaid as the principal borrowed. The remaining $3,046.08 is the lender's revenue, the cost of credit.

For an additional example, one that drives home the point that more interest is paid in the early months of a long-term loan, we will consider a 20-year home mortgage. Home mortgage payments are typically made monthly, and again, we will ignore additional charges by the lender, such as real estate tax and homeowner's insurance. Let's assume you buy a $200,000 home, pay $60,000 as a cash deposit, and will finance the remaining $140,000 over 20 years. The bank offers you a 3.6% annual interest rate. What will the amount of your monthly payment be for the interest and principal repayment? The bank will tell you, of course, but let's prove it for ourselves. We'll do it in exactly the same fashion as the car loan above, using the present value of an annuity formula. Remember that you are not financing the entire $200,000 purchase; you pay $60,000 in cash, so you are only financing the remaining $140,000.

We modify the periods from years to months by multiplying by 12, and we modify the annual rate to a monthly rate by dividing by 12, resulting in

$$n = 240 \text{ months}$$
$$r = 0.3\%$$

By substitution into the present value of an annuity formula:

$$\$140{,}000 = \text{PYMT} \times \frac{\left[1 - \frac{1}{(1 + 0.003)^{240}}\right]}{0.003}$$
$$\$140{,}000 = \text{PYMT} \times \frac{\left(1 - \frac{1}{2.052220}\right)}{0.003}$$
$$\$140{,}000 = \text{PYMT} \times \frac{1 - 0.487277}{0.003}$$
$$\$140{,}000 = \text{PYMT} \times \frac{0.512723}{0.003}$$
$$\$140{,}000 = \text{PYMT} \times 170.907667$$

We divide both sides by 170.907667 to isolate the payment amount (PYMT):

$$\text{PYMT} = \frac{\$140{,}000}{170.907667}$$
$$\text{PYMT} \approx \$819.16$$

Your monthly mortgage payment is $819.16. As in our auto loan example, we'll complete an amortization table of our own—though, of course, you'll remember to ask your lender for their version. Extracts from a full 240-month table are shown in Table 8.5 below. The front-end packing of interest revenue is more obvious here because of the longer time period.

Month	Payment	Interest	Principal	Remaining Balance
				140,000.00
1	819.16	420.00	399.16	139,600.84
2	819.16	418.80	400.36	139,200.48
3	819.16	417.60	401.56	138,798.92
4	819.16	416.40	402.76	138,396.16
5	819.16	415.19	403.97	137,992.19
6	819.16	413.98	405.18	137,587.01
7	819.16	412.76	406.40	137,180.61

Table 8.5 Amortization Table for a Mortgage ($)

Month	Payment	Interest	Principal	Remaining Balance
8	819.16	411.54	407.62	136,772.99
9	819.16	410.32	408.84	136,364.15
...continued....				
236	819.16	12.17	806.99	3,250.84
237	819.16	9.75	809.41	2,441.44
238	819.16	7.32	811.84	1,629.60
239	819.16	4.89	814.27	815.33
240	819.16	2.45	816.71	(1.38)
Total	**196,598.40**	**56,597.02**	**140,001.38**	**(Rounding)**

Table 8.5 Amortization Table for a Mortgage ($)

As with your car loan, earlier payments contain more interest than loan repayment, so the lender's revenue is at a significant peak in the early years. The length of the loan, coupled with the frequent compounding, emphasizes this. In month 10, the interest and principal amounts "pass" each other, and now the loan balance is dropping at a quicker rate. Finally, note that you will pay more than $56,000 to finance this $140,000 borrowing. If you pay off this mortgage over 240 months as planned, the interest cost represents an additional 28% of the full cost of the home!

If the borrower has the means to make an accelerated payment against this debt—for example, due to a bonus or other windfall—doing so can make a significant difference in the total cost of financing over the life of the loan. Assume that after three years (month 36), you receive a bonus of $2,000 and decide to apply the entire amount to prepay the remaining balance. Your loan agreement allows you to apply the entire amount to the remaining unpaid balance of the mortgage. While this might seem equal to just 2.5 months' worth of payment, the debt is fully paid off almost 6 months ahead of schedule, and total interest is reduced from over $56,000 to $55,000. The ability to prepay long-term debts such as this is clearly worth negotiating initially.

8.4 Stated versus Effective Rates

Learning Outcomes

By the end of this section, you will be able to:

- Explain the difference between stated and effective rates.
- Calculate the true cost of borrowing.

The Difference between Stated and Effective Rates

If you look at the bottom of your monthly credit card statement, you could see language such as "The interest rate on unpaid balances is 1.5% per month." You might think to yourself, "So, that's 12 months times 1.5%, or 18% per year." This is a fine example of the difference between *stated* and *effective* annual interest rates. The **effective interest rate** reflects compounding within a one-year period, an important distinction because we tend to focus on annual interest rates. Because compounding occurs more than once per year, the true annual rate is higher than appears. Please remember that if interest is calculated and compounded annually, the stated and effective interest rates will be the same. Keep in mind that the following principles work whether you are the debtor paying off an obligation or an investor hoping for more frequent compounding. The dynamics of the time value of money apply in either direction.

Effective Rates and Period of Compounding

Let's remain with our example of a credit card statement that indicates an interest rate of 1.5% per month on

unpaid balances. If you use this card only once, to make a $1,000 purchase in January, and then fail to pay the bill when it comes due, the issuer will bill you $15. Now you owe them $1,015. Assume you completely ignore this bill and never pay it throughout the rest of the year. The monthly calculation of interest starts to compound on past interest assessments in addition to the $1,000 initial purchase (see Table 8.6).

Month	Interest	Balance
		1,000.00
1	15.00	1,015.00
2	15.23	1,030.23
3	15.45	1,045.69
4	15.69	1,061.36
5	15.92	1.077.28
6	16.16	1,093.44
7	16.40	1,109.84
8	16.65	1,126.49
9	16.90	1,143.39
10	17.15	1,160.54
11	17.41	1,177.95
12	17.67	1,195.62

Table 8.6 Compounded Interest on a Credit Card Statement ($)

Because interest compounds monthly rather than annually, the effective annual rate is 19.56%, not the intuitive rate of the stated 1.5% times 12 months, or 18%. Our basic compounding formula of *(1+i)^n* by substitution shows:

$$(1 + 0.015)^{12} = 1.19562$$

To isolate the effective annual rate, we then deduct 1 because our interest calculations are based on the value of $1:

$$(1 + 0.015)^{12} - 1 = 1.19562 - 1 = 0.19562 = 19.562\%$$

Therefore, it falls to the consumer/borrower to understand the true cost of borrowing, especially when larger dollar amounts are involved. If we had been dealing with $10,000 rather than $1,000, the annual difference would be more than $156.

LINK TO LEARNING

A Helpful Demonstration . . .

From the Corporate Finance Institute (https://openstax.org/r/Corporate_Finance_Institute) comes a fine visual of a similar example. Here, we see the effective annual rate that results from taking a nominal annual rate of 12%, with a benefit to an investor if they have the benefit of monthly compounding.

One example of the importance of understanding effective interest rates is an invention from the early 1990s:

the payday advance loan (PAL). The practice of offering such loans can be controversial because it can lead to very high rates of interest, perhaps even illegally high, in an act known as usury. Although some states have outlawed PALs and others place limits on them, some do not. A PAL is a short-term loan in anticipation of a person's next paycheck. A person in need of money for short-term needs will write a check on Thursday but date the check *next* Thursday, which is their normal payday; assume this transaction is for $200. The lender, typically operating from a storefront, will advance the $200 cash and hold the postdated check. The lender charges a fee—let's say $14—as their compensation. The following Thursday, the borrower is expected to pay off the advance, and if they do not, the lender can deposit the postdated check. If that check has insufficient funds, more fees and penalties will likely be assessed.

One primary reason that arrangements such as these are controversial is the excessively high nominal (stated) interest rate that they can represent. For a one-week loan of $200, the borrower is paying $14, or 7% of the borrowed amount. If this is annualized, with 52 seven-day periods in a year, the stated rate is 364%! While a PAL might seem to be an effective immediate solution to a cash shortfall, the mathematics behind the true cost of borrowing simply do not make sense, and a person who uses such arrangements regularly is placing themselves at a dreadful financial disadvantage.

THINK IT THROUGH

How Tempting Is That Refund Anticipation?

Refund anticipation loans (RALs) began in 1987, and they are still available (though not from banks) and used by millions of people.[1] Now, RALs come from private lending chains. These loans allow you to determine your April 15 personal income tax liability through a preparer and receive an advance against your expected refund.[2] But beware: your ability to analyze the true cost of money is always critical. Like all loans, RALs bear a rate of interest. Let's assume that the firm that prepared your tax return determines that you're entitled to an $800 refund. Once they advance that amount to you, it will bear interest at a certain rate; we'll assume 0.5% per week. You might expect a tax refund in four weeks. Half a percent of $800 doesn't sound like much, but what happens when you annualize it into an effective rate, assuming your tax refund arrives exactly four weeks from when you accept the loan? Assume no compounding during those four weeks.

Solution:

A weekly rate of 0.5% on the $800 advance is $4 per week, so for four full weeks, you've paid $16 for the use of $800. Of course, that totals 2% of the amount advanced. There are 13 four-week periods in a year, so even though the interest rate appears to be small, it amounts to 26% when annualized! We assumed no compounding to keep the illustration simple, but we further assume that you are not using this advance throughout the year. If you were, then periodic compounding would drive the effective rate even higher, to just over 29.3%.

1 Michelle Singletary. "Another Reason Not to Opt for a Tax Refund Loan: It May Delay Your Next Stimulus Payment." *Washington Post*, February 16, 2021. https://www.washingtonpost.com/business/2021/02/16/tax-refund-loan-problems/
2 Amelia Josephson. "What Is a Refund Anticipation Loan?" SmartAsset. March 18, 2021. https://smartasset.com/taxes/what-is-a-refund-anticipation-loan

8.5 Equal Payments with a Financial Calculator and Excel

Learning Outcomes

By the end of this section, you will be able to:

- Use a financial calculator and Excel to solve perpetuity problems.
- Use a financial calculator and Excel to solve annuity problems.
- Calculate an effective rate of interest.
- Schedule the amortization of a loan repayment.

Solving Time Value of Money Problems Using a Financial Calculator

Since the 1980s, many convenient and inexpensive tools have become available to simplify business and personal calculations, including personal computers with financial applications and handheld/desktop or online calculators with many of the functions we've studied already. This section will explore examples of both, beginning with financial calculators. While understanding and mastery of the use of time value of money equations are part of a solid foundation in the study of business and personal finance, calculators are rapid and efficient.

We'll begin with the constant perpetuity that we used to illustrate the constant perpetuity formula. A share of preferred stock of Shaw Inc., pays an annual $2.00 dividend, and the required rate of return that investors in this stock expect is 7%. The simple technique to solve this problem using the calculator is shown in Table 8.7.

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Enter formula	2 ÷ 7 % =		28.57

Table 8.7 Calculator Steps to Find the Required Rate of Return[3]

Earlier we solved for the present value of a 5-year ordinary annuity of $25,000 earning 8% annually. We then solved for an annuity due, all other facts remaining the same. The two solutions were $99,817.50 and $107,802.50, respectively. We enter our variables as shown in Table 8.8 to solve for an ordinary annuity:

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Enter number of payments	5 N	N =	5.00
3	Enter interest rate per payment period	8 I/Y	I/Y =	8.00
4	Enter payment amount	25000 +/− PMT	PMT =	-25,000.00
5	Compute present value	CPT PV	PV =	99,817.75

Table 8.8 Calculator Steps to Solve for an Ordinary Annuity

Note that the default setting on the financial calculator is END to indicate that payment is made at the end of a period, as in our ordinary annuity. In addition, we follow the payment amount of $25,000 with the +/- keystroke—an optional step to see the final present value result as a positive value.

To perform the same calculation as an annuity due, we can perform the same procedures as above, but with two additional steps after Step 1 to change the default from payments at the end of each period to payments at the beginning of each period (see Table 8.9).

3 The specific financial calculator in these examples is the Texas Instruments BA II Plus™ Professional model, but you can use other financial calculators for these types of calculations.

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Change default to payment at end of period	2ND [BGN] 2ND [SET]	BGN	0.00
3	Return to calculator mode	2ND [QUIT]		0.00
4	Enter number of payments	5 N	N =	5.00
5	Enter interest rate per payment period	8 I/Y	I/Y =	8.00
6	Enter payment amount	25000 +/− PMT	PMT =	-25,000.00
7	Compute present value	CPT PV	PV =	107,803.17

Table 8.9 Calculator Steps to Solve for an Annuity Due

The procedures to find future values of both ordinary annuities and annuities due are comparable to the two procedures above. We begin with the ordinary annuity, with reminders that this is the default for the financial calculator and that entering the payment as a negative number produces a positive result (see Table 8.10).

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Enter number of payments	5 N	N =	5.00
3	Enter interest rate per payment period	4 I/Y	I/Y =	4.00
4	Enter payment amount	3000 +/− PMT	PMT =	-3,000.00
5	Compute future value	CPT FV	FV =	16,248.97

Table 8.10 Calculator Steps to Find the Future Value of an Ordinary Annuity

Solving for an annuity due with the same details requires the keystrokes listed in Table 8.11.

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Change default to payment at end of period	2ND [BGN] 2ND [SET]	BGN	0.00
3	Return to calculator mode	2ND [QUIT]		0.00
4	Enter number of payments	5 N	N =	5.00
5	Enter interest rate per payment period	4 I/Y	I/Y =	4.00
6	Enter payment amount	3000 +/− PMT	PMT =	-3,000.00
7	Compute future value	CPT FV	FV =	16,898.93

Table 8.11 Calculator Steps to Find the Future Value of an Annuity Due

Earlier in the chapter, we explored the effect of interannual compounding on the true cost of money, recalling the basic compounding formula:

$$(1+i)^N$$

We saw that when modified for monthly compounding at a stated rate of 1.5%, the actual (effective) rate of interest per year was 19.56%. One simple way to prove this is by using the calculator keystrokes listed in Table

8.12.

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Set the display to four decimal places	2ND [FORMAT] 4 ENTER	DEC =	4.0000
3	Return to calculator mode	2ND [QUIT]		0.0000
4	Enter (1 + the monthly interest rate)	1.015 Y^X		1.0150
5	Enter the number of months	12 Y^X		1.1956

Table 8.12 Calculator Steps to Prove the Actual Rate of Interest per Year

Had we assumed that the stated monthly interest rate of 1.5% could be simply multiplied by 12 months for an annual rate of 18%, we would be ignoring the effect of more frequent compounding. As indicated above, the annual interest on the money that we spent initially, accumulating at a rate of 1.5% *per month*, is 19.56%, not 18%:

$$1.1956 - \$1 \text{ spent intially} = 0.1956 = 19.56\%$$

The final example in this chapter will represent the amortization of a loan. Using a 36-month auto loan for $32,000 at 6% per year compounded monthly, we can easily find the monthly payment and the amortization of this loan on our calculator using the following procedures and keystrokes.

First, we find the monthly payment (see Table 8.13).

Step	Description	Enter	Display	
1	Set all variables to defaults	2ND [RESET] ENTER	RST	0.00
2	Set payments per year to 12	2ND [P/Y] 12 ENTER	P/Y =	12.00
3	Return to calculator mode	2ND [QUIT]		0.00
4	Enter number of payments with the payment multiplier	3 2ND [xP/Y] N	N =	36.00
5	Enter annual interest rate	6 I/Y	I/Y =	6.00
6	Enter loan amount	32000 PV	PV =	32,000.00
7	Compute the monthly payment	CPT PMT	PMT =	-973.50

Table 8.13 Calculator Steps to Find the Monthly Payment of a Loan

We've verified the amount of our monthly debt service, including both the interest and repayment of the principal, as $973.50. The next step with our calculator is to verify our amortization at any point (see Table 8.14).

Step	Description	Enter	Display	
1	Set previous work as an amortization worksheet	2ND [AMORT]	P1 =	1.00
2	Set beginning period to 1	1 ENTER	P1 =	1.00
3	Set ending period to 12	↓ 12 ENTER	P2 =	12.00
4	Display amortization data at the end of month 12	↓	BAL =	21,965.02
5		↓	PRN =	-10,034.98

Table 8.14 Calculator Steps to Verify Amortization at the End of One Year

Step	Description	Enter	Display	
6		↓	INT =	-1,647.02

Table 8.14 Calculator Steps to Verify Amortization at the End of One Year

Without resetting the calculator, we will try a second example, this time reviewing the second full year of amortization at the end of 24 months (see Table 8.15).

Step	Description	Enter	Display	
1	Set previous work as an amortization worksheet	2ND [AMORT]	P1 =	1.00
2	Change beginning period to month 13	13 ENTER	P1 =	13.00
3	Change ending period to month 24	↓ 24 ENTER	P2 =	24.00
4	Display amortization data at the end of month 24	↓	BAL =	11,311.13
5		↓	PRN =	-10,653.89
6		↓	INT =	-1,028.11

Table 8.15 Calculator Steps to Verify Amortization at the End of Two Years

Solving Time Value of Money Problems Using Excel

Microsoft's popular spreadsheet program Excel is arguably one of the most common and powerful numeric and data analysis products available. Yet while mastery of Excel requires extensive study and practice, enough basics can be learned in two or three hours to provide the user with the ability to solve problems quickly and conveniently, including extensive financial capability. Most of the calculations in this chapter were prepared with Excel.

The boxes in the Excel gridwork, known individually as cells (located at the intersection of a column and a row), can contain numbers, text, and very powerful formulas (or functions) for calculations and data analytics. Cells, rows, columns, and groups of cells (ranges) are easily moved, formatted, and replicated. In the mortgage amortization table for 240 months seen in Section 8.3.2, only the formulas for month 1 were typed in. With one simple command, that row of formulas was replicated 239 more times, with each line updating itself with relevant number adjustments automatically. With some practice, a long table such as that can be constructed by even a relatively new user in less than 10 minutes.

In this section, we will illustrate how to use Excel to solve problems from earlier in the chapter, including perpetuities, ordinary annuities, effective interest rates, and loan amortization. We will omit the basic dynamics of an Excel spreadsheet because they were presented sufficiently in preceding chapters.

Revisiting the constant perpetuity from Section 8.1, in which our shares of Shaw Inc., preferred stock pay an annual fixed dividend of $2.00 and the required rate of return is 7%, we do not use an Excel function for this simple operation. The two values are entered in cells B3 and B4, respectively.

We enter a formula in cell B6 to perform the division and display the result in that cell. The actual contents of cell B6 are typed below it for your reference, in cell B8 (see Figure 8.2).

	A	B
1		
2		
3	**Indefinite Dividend per Share ($)**	2.00
4	**Required Rate of Return (%)**	0.07
5		
6	**Price per Share**	$ 28.57
7		=B3/B4

Figure 8.2 Excel Spreadsheet for Valuing a Perpetuity

Download the spreadsheet file (https://openstax.org/r/spreadsheet_file_Chapter08_finance) containing key Chapter 8 Excel exhibits.

To find the present value of an ordinary annuity, we revisit Section 8.2.1. You will draw $25,000 at the end of each year for five years from a fund earning 8% annually, and you want to know how much you need in that fund today to accomplish this. We accomplish this in Excel easily with the PV function. The format of the PV command is

```
=PV(rate,periods,payment,0,0)
```

Only the first three arguments inside the parentheses are used. We'll place them in cells and refer to those cells in our PV function. As an option, you could also type the numbers into the parentheses directly. Notice the slight rounding error because of decimal expansion. Also, the payment must be entered as a negative number for your result to be positive; this can be accomplished either by making the $25,000 in cell B5 a negative amount or by placing a minus sign in front of the B5 in the formula's arguments. In cell B3, you must enter the percent either as 0.08 or as 8% (with the percent sign). We repeated the formula syntax and the actual formula inputs in column A near the result, for your reference (see Figure 8.3).

	A	B
1		
2		
3	**Rate (%)**	0.08
4	**Periods**	5
5	**Payment**	(25,000)
6		
7	**=PV(rate,periods,payment,0,0)**	$ 99,817.75
8	**=PV(B3,B4,B5,0,0)**	
9		

Figure 8.3 Excel Spreadsheet Showing the Present Value of an Ordinary Annuity

We also found the present value of an annuity due. We use the same information from the ordinary annuity problem above, but you will recall that the first of five payments happens immediately at the start of year 1, not at the end. We follow the same procedures and inputs as in the previous example, but with one change to the PV function: the last argument in the parentheses will change from 0 to 1. This is a toggle switch that commands the PV function to treat this as an annuity due instead of an ordinary annuity (see Figure 8.4).

	A	B
1		
2		
3	**Rate (%)**	0.08
4	**Periods**	5
5	**Payment**	(25,000)
6		
7	**=PV(rate,periods,payment,0,1)**	$ 107,803.17
8	**=PV(B3,B4,B5,0,1)**	

Figure 8.4 Excel Spreadsheet Showing the Present Value of an Annuity Due

Section 8.2 introduced us to future values. Comparable to the PV function above, Excel provides the FV function. Using the same information—$3,000 invested annually for five years, starting one year from now, at 4%—we'll solve using Excel (see Figure 8.5). The format of the command is

```
=FV(rate,periods,payment,0,0)
```

	A	B
1		
2		
3	**Rate (%)**	0.04
4	**Periods**	5
5	**Payment**	(3,000)
6		
7	**=FV(rate,periods,payment,0,0)**	$ 16,248.97
8	**=FV(B3,B4,B5,0,0)**	

Figure 8.5 Excel Spreadsheet Showing the Future Value of an Ordinary Annuity

As with present values, using the same data but solving for an annuity due requires the fifth argument inside the parentheses to be changed from 0 to 1; all other values remain the same (see Figure 8.6).

	A	B
1		
2		
3	**Rate (%)**	0.04
4	**Periods**	5
5	**Payment**	(3,000)
6		
7	**=FV(rate,periods,payment,0,1)**	$ 16,898.93
8	**=FV(B3,B4,B5,0,1)**	

Figure 8.6 Excel Spreadsheet Showing the Future Value of an Annuity Due

In Section 8.4, we explained the difference between stated and effective rates of interest to show the true cost of borrowing, in this case for a one-year period, if interest is compounded for periods within a year. The syntax for the Excel effect function to calculate this rate is

```
=EFFECT(rate,periods)
```

where *rate* is the nominal rate and *periods* represents the number of periods within a year.

Earlier, our example showed that 1.5% compounded monthly results in not 18% per year but actually over 19.56% (see Figure 8.7).

	A	B	C
1			
2			
3	**Nominal Annual Rate**	18.00%	
4			
5			
6	**Period Type**	**Periods per Year**	**Effective Interest**
7	Annual	1	18.00%
8	Quarterly	4	19.25%
9	Monthly	12	19.56%

Figure 8.7 Excel Spreadsheet Showing Effective Interest Rate

Note several things: First, the nominal interest rate is entered as a percent. Second, the actual effect function in C7 is typed as =EFFECT(rate,B7); we use the word *rate* because we actually assigned a name to cell B3, so Excel can use it in a function and replicate it without it changing. When cell C7 is replicated to C8 and C9, *rate* remains the same, but the formulas automatically adjust to use B8 and B9 for the periods.

To assign a name to a cell, keep in mind that every cell has column-row coordinates. We want cell B3 to be the anchor of our effective rate calculations. Rather than referring to cell B3, we can name it, and in this case, we use the name *rate*, which we can then use in formulas like any other Excel cell letter-number reference. Place the cursor in cell B3. Now, look at cell A1 on the grid: right above that cell, you see a box displaying B3, the current cursor location. If you click in that box and type “rate” (without the quotation marks), as we did, then hit the enter key, the value in that box will change to *rate*. Now, if you type “rate” (again, without quotation marks) into a formula, Excel knows to use the contents of cell B3.

Excel provides convenient tools for figuring out amortization. We’ll revisit our 36-month auto loan for $32,000 at 6% per year, compounded monthly. A loan amortization table for a fixed interest rate debt is usually formatted as follows, with the Interest and Principal columns interchangeable:

```
Period     Payment     Interest     Principal     Balance
```

In Excel, a table is completed by using the function PMT. The individual steps follow.

1. List the information about the loan in the upper left of the worksheet, and create the column headings for the schedule of amortization. Type “B5” (without the quotation marks) in cell E9 to begin the schedule. Then enter 1 for the first month under the Payment # (or Month) column, in cell A10 (see Figure 8.8).

	A	B	C	D	E
1		**Actual**	**Use**		
2	**Annual Interest Rate**	6%	0.50%		
3	**Years**	3	36		
4	**Payments per Year**	12			
5	**Loan Amount**	$ 32,000			
6					
7					Remaining
8	Payment # (or Month)	Payment	Interest	Principal	Balance
9					$32,000.00

Figure 8.8 Step 1 of Creating an Amortization Table

2. Next, in cell B10, the payment is derived from the formula =PMT(rate,periods,pv), with PV representing the present value, or the loan amount. Because we are compounding monthly, enter C$2 and C$3 for the rate and periods, respectively. Cell B5 is used for the loan amount, but notice the optional minus sign placed in front of the entry B$5; this causes the results in the schedule to be displayed as positive numbers. The dollar sign ($) inserted in the cell references forces Excel to "freeze" those locations so that they don't attempt to update when we replicate them later; this is known in spreadsheet programs as an *absolute reference* (see Figure 8.9).

	A	B	C	D	E
1		**Actual**	**Use**		
2	**Annual Interest Rate**	6%	0.50%		
3	**Years**	3	36		
4	**Payments per Year**	12			
5	**Loan Amount**	$ 32,000			
6					
7					Remaining
8	Payment # (or Month)	**Payment**	Interest	Principal	Balance
9					32,000.00
10	1	**973.50**			
11		**=PMT(C$2,C$3,-B$5)**			

Figure 8.9 Step 2 of Creating an Amortization Table

3. The next step is to calculate the interest. We take the remaining balance from the previous line, in this case cell E9, and multiply it by the monthly interest rate in cell C2, typing C$2 to lock in the reference. The remaining balance of the loan should always be multiplied by this monthly percentage (see Figure 8.10).

	A	B	C	D	E
1		**Actual**	**Use**		
2	**Annual Interest Rate**	6%	0.50%		
3	**Years**	3	36		
4	**Payments per Year**	12			
5	**Loan Amount**	$ 32,000			
6					
7					Remaining
8	Payment # (or Month)	Payment	**Interest**	Principal	Balance
9					32,000.00
10	1	973.50	**160.00**		
11			**=E9*C$2**		

Figure 8.10 Step 3 of Creating an Amortization Table

4. Because this is a fixed-rate loan, whatever is left from each payment after first deducting the interest represents principal, the amount by which the balance of the outstanding loan balance is reduced. Therefore, the contents of cell D10 represent B10, the total payment, minus C10, the interest portion (see Figure 8.11). No dollar signs are included because this cell reference can adjust to each row into which this formula is replicated, as will be seen in the following examples.

	A	B	C	D	E
1		**Actual**	**Use**		
2	**Annual Interest Rate**	6%	0.50%		
3	**Years**	3	36		
4	**Payments per Year**	12			
5	**Loan Amount**	$ 32,000			
6					
7					Remaining
8	Payment # (or Month)	Payment	Interest	**Principal**	Balance
9					32,000.00
10	1	973.50	160.00	**813.50**	
11				**=B10-C10**	

Figure 8.11 Step 4 of Creating an Amortization Table

5. Because our principal portion of the last payment has reduced our outstanding balance, it is subtracted from the preceding balance in cell E9 (see Figure 8.12). The command therefore is `=E9-D10`.

	A	B	C	D	E
1		**Actual**	**Use**		
2	**Annual Interest Rate**	6%	0.50%		
3	**Years**	3	36		
4	**Payments per Year**	12			
5	**Loan Amount**	$ 32,000			
6					
7					**Remaining**
8	Payment # (or Month)	Payment	Interest	Principal	**Balance**
9					32,000.00
10	1	973.50	160.00	813.50	**31,186.50**
11					**=E9-D10**

Figure 8.12 Step 5 of Creating an Amortization Table

Now that the first full row is defined, an amortization schedule is easily developed by Excel's replication abilities. Place the cursor on cell A10, hold down the left mouse button, and drag the cursor to cell E10. Cells A10 through E10 in row 10 should now be highlighted. Release the mouse button. Then "grab" the tiny square symbol at the bottom right of cell E10 and drag it downward as far as you need; in this case, you'll need 35 more rows because this is a 36-month loan, so it will end at row 45. We added a line for totals.

This is now a complete loan amortization schedule (see Figure 8.13). The first several periods display, followed by the last few periods, to prove that the schedule is complete (data rows for month 4 to month 22 are hidden).

	A	B	C	D	E
1		**Actual**	**Use**		
2	**Annual Interest Rate**	6%	0.50%		
3	**Years**	3	36		
4	**Payments per Year**	12			
5	**Loan Amount**	$ 32,000			
6					
7					**Remaining**
8	**Payment # (or Month)**	**Payment**	**Interest**	**Principal**	**Balance**
9					32,000.00
10	1	973.50	160.00	813.50	31,186.50
11	2	973.50	155.93	817.57	30,368.93
12	3	973.50	151.84	821.66	29,547.27
42	(continued)				
43	33	973.50	19.23	954.27	2,891.54
44	34	973.50	14.46	959.04	1,932.50
45	35	973.50	9.66	963.84	968.66
46	36	973.50	4.84	968.66	0.00
47	**Totals**	**$ 35,046.07**	**$ 3,046.07**	**$ 32,000.00**	

Figure 8.13 Completed Amortization Schedule

This will look familiar; it's the same amortization table used as a proof in Section 8.3 (see Table 8.4). There is no rounding error because Excel uses the full decimal expansion in its calculations.

This chapter has explored the time value of money by expanding on the concepts discussed in Time Value of Money I with additional funds being periodically added to or subtracted from our investment, either compounding or discounting them according to the situation. In all cases, the payments in the stream were identical. If they had not been identical, a separate set of operators would be required, and these will be addressed in the next chapter.

Summary

8.1 Perpetuities

A perpetuity is an investment that is intended to provide an expected return indefinitely, either remaining constant or growing by an incremental amount. Preferred stock is a common example with a preestablished dividend formula. An indefinite stream of payments cannot be compounded into a future value, but it can be discounted to a present value, providing an opportunity to determine the amount an investor should be willing to pay for a share of that stock.

8.2 Annuities

An annuity is a stream of fixed periodic payments that is expected to be paid or received. Calculations of future value or present value are commonly performed on these payment streams for a wide number of reasons in business and personal financial analysis, as seen in the chapter focusing on single amounts, particularly in loan repayment. Annuities may be ordinary annuities, in which the first cash flow of a series occurs at the end of the first period, or annuities due, if the first cash flow occurs at the beginning point of the first period.

8.3 Loan Amortization

Loans are contracts between a lender and a borrower. Failure to observe the rules of that contract, such as payment of interest or repayment of the amount owed, can subject the borrower to substantial penalties as well as damage to their credit. Loan agreements bearing a fixed rate of interest have a scheduled amortization, or rate and time of repayments with interest. Several types of business and personal loans were described.

8.4 Stated versus Effective Rates

For a borrower to understand the true cost of financing, they must be familiar with interannual compounding, which can cause a stated interest rate that appears to be annual to actually be higher. The effective rate of interest was demonstrated to understand that true cost.

8.5 Equal Payments with a Financial Calculator and Excel

The use of two tools for managing and understanding the time value of money and its many applications was discussed: a professional financial calculator and the popular Microsoft Office Suite spreadsheet application Excel.

Key Terms

annuity a stream of regular, periodic payments to be received or paid

annuity due a stream of periodic payments in which the payment or receipt occurs at the beginning of each period

constant perpetuity a stream of periodic payments that is expected to continue indefinitely with no change in the amount paid or received

discount rate an interest rate used in time value of money calculations to determine present value; may derive from several sources, such as stated contract rates, costs to borrow, or expected rates of return on investments

effective interest rate the interest rate that results when compounding occurs multiple times within a year; the true cost of borrowing

growing perpetuity a stream of periodic payments that is expected to continue indefinitely with growth of the amount paid or received in the future, usually by a fixed percentage

loan amortization the scheduling of periodic repayment of a debt, typically involving regular payments or receipts of amounts that include both interest payment and repayment of the principal of the amount owed

lump sum a single cash payment made in lieu of a series of future payments, such as a lottery payout or a

legal settlement

ordinary annuity a stream of periodic payments in which the payment or receipt occurs at the end of each period

perpetuity a stream of periodic payments that is expected to continue indefinitely

preferred stock shares of ownership in a corporation that typically entitle the holder to a fixed dividend per share, if declared by the corporation, with priority over holders of that corporation's common stock

required rate of return the minimum amount of return that an investor will accept on an investment given the level of risk involved

retirement planning the process of determining one's objectives for retirement, including one's finances, and developing strategies and tactics to achieve them

structured settlements monetary legal settlements that are paid out in installments, such as an annuity, rather than a lump sum cash amount

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/CFA_Level_I_Study_Session2). Reference with permission of CFA Institute.

Multiple Choice

1. The best example of a constant perpetuity would most likely be _____.
   a. an annuity due
   b. dividends from common stock
   c. preferred stock
   d. an ordinary annuity

2. You wish to endow a university chair of accounting for a salary of $100,000 per year to the recipient. The university will withdraw $100,000 each year for the recipient's salary. The amount of your gift will remain untouched indefinitely, in perpetuity. The university can lock in a fixed rate for your investment of 2.8% per year. In order to achieve this, what is the approximate amount of the gift you would have to make now?
   a. $3,103,569
   b. $3,571,429
   c. $4,101,218
   d. $4,227,827

3. Preferred stock in Blue Agate Inc. is issued for dividends of $3.00 per share. The dividends will increase each year at 0.178%, a growing perpetuity. The required rate of return on a stock such as this is 2.5%. At what approximate price will this preferred stock most likely sell today?
   a. $117.21
   b. $119.87
   c. $120.00
   d. $129.20

4. Julio's attorney negotiates a structured settlement after an injury, consisting of seven equal payments to Barry of $150,000 each. The first payment is due today, and the remaining payments will be received in annual amounts, with the second payment occurring one year from now. What is the approximate value of this settlement in today's dollars if Barry uses a discount rate of 5%?
   a. $911,352
   b. $867,960
   c. $746,235

d. $1,050,000

5. What is the approximate present value of an ordinary annuity (beginning one year from now) of a stream of 12 annual payments of $87,000 if you use a discount rate of 6%?
a. $773,154.04
b. $747,278.92
c. $729,394.95
d. $718,974.58

6. If Maria invests $2,700 at the end of each six-month period for six years at an annual rate of 4%, what is the approximate future value of her ordinary annuity? Review Chapter 7 for the techniques of interannual compounding.
a. $17,909.10
b. $20,248.23
c. $31,755.54
d. $36,212.67

7. Assume all of the same facts as in exercise 6 above, except that Maria begins immediately and makes each of her payments at the beginning of each 6-month period instead of the end. What is the approximate future value of her annuity due at the end of the six years?
a. $17,909.10
b. $36,936.92
c. $32,707.24
d. $22,997.88

8. Rather than spending her $48,000 in casino winnings, Christy places the money in an investment that will earn her 5% per year, compounded annually. She will withdraw the money in four equal annual installments beginning one year from today. What must the approximate amount of each annual withdrawal be for this investment to be fully depleted in four years?
a. $11,136.38
b. $12,892.56
c. $12,243.47
d. $13,536.61

9. Your friend Jamal borrows $5,000 from you, agreeing to pay you back with 8% annual interest, with the first payment due to you one year from today. You ask that you be fully repaid over the next four years. However, to lower his annual payment, Jamal asks you to extend the period over five full years instead. What will be the approximate **difference** in his total payments to you, including interest and principal, if the debt is amortized over five years rather than four?
a. Jamal will pay $544 less.
b. Jamal will pay $544 more.
c. Jamal will pay $223 less.
d. Jamal will pay $223 more.

10. Your new El Supremo credit card arrangement indicates that you will owe interest on unpaid balances at a nominal (stated) rate of 1.2% per month. If the interest rate is compounded monthly, what is the approximate effective annual rate of interest?
a. 15.39%
b. 12.00%
c. 14.02%

d. 14.40%

Problems

Use four decimal places on time value of money factors unless otherwise specified. Approximations and minor differences because of rounding are acceptable. Ignore the effect of taxes. Assume that all percentages are annual rates and that compounding occurs annually unless indicated otherwise.

1. Steve purchases preferred stock in Berklee Corporation, with each share paying a $2.50 dividend. This dividend will remain constant. If the public's required rate of return for Berklee stock is 8%, at what price should this company's stock sell?
2. Donna enters into an investment contract that will guarantee her 4% per year if she deposits $3,500 each year for the next 10 years. She must make the first deposit one year from today, the day she signs the agreement. How much will she have when she makes her last payment 10 years from now?
3. Assume the same facts as in problem 2 above, except that Donna negotiates the chance to make her first payment now and continue to pay at the beginning of each year for the 10-year period. How much will she have accumulated?
4. Bill will receive a royalty payment of $18,000 per year for the next 25 years, beginning one year from now, as a result of a book he has written. If a discount rate of 10 percent is applied, should he be willing to sell out his future rights now for $160,000? How about $162,500? $165,000?
5. Debbie won the $60 million lottery. She is to receive $1 million a year for the next 50 years beginning one year from now, plus an additional lump sum payment of $10 million after 50 years. The discount rate is 10 percent. How much cash would she need to be offered today to tempt her to take a lump-sum cash offer instead, all things equal?
6. Kim started a paper route on January 1, 2016. Every three months, she deposited $300 in her new bank account, which earned 4 percent annually but was compounded quarterly. On December 31, 2019, she placed the entire balance in her bank account in an investment that earned 5 percent annually. How much will she have on December 31, 2022?
7. You hire Thomas to work for you for five years, and you agree to put away enough money as a lump sum now to fund an annuity for him. At the end of those five years, he will retire and may begin drawing out $20,000 per year for five years, starting on the last day of each year (in this case, the end of year 6, from when this arrangement began, through year 10). How much must you invest today if your guaranteed interest rate is 3% compounded annually for all 10 years?
8. Your new boss doesn't have a pension or 401(k) plan for your retirement, but she agrees to place aside $12,000 every year once a year for four years. She gives you the option of either starting immediately on your first day of work or starting one year from now. That makes this the difference between an ordinary annuity and an annuity due. If the plan earns 5% per year, compounded annually, what will be the difference between the two approaches after the four years / four payments?
9. Jada is borrowing $40,000 from you today. She agrees to pay you back in annual installments beginning a year from now over eight years, with interest at 3%. What would her annual payment amount be, including both interest and principal?
10. You agree to finance your new SUV with an auto loan of $38,000. This loan will be repaid over three years with monthly payments (and compounding) at a 4% annual interest rate (0.33% per month). What will your monthly loan payment be?

Video Activity

Future Value of Ordinary Annuities

Click to view content (https://openstax.org/r/Future_Value_of_an_Annuity)

1. What is the primary difference between this demonstration and our chapter examples, keeping the chapter "Time Value of Money I" in mind?
2. Explain the significance of Dr. van Biezen's comment at 4:32 regarding a difference when payments are made at the beginning of each pay period rather than the end.

Practical Example of Annuities

Click to view content (https://openstax.org/r/What_is_an_annuity?)

3. What is the primary difference between a fixed annuity and a variable annuity?
4. Annuities are often recommended to retirees and seniors. Why would a fixed annuity be more attractive to such a person than a variable annuity?

9

Time Value of Money III: Unequal Multiple Payment Values

Figure 9.1 Capital investment in production equipment such as this robotic arm requires extensive analysis of the benefits the investment is likely to produce over time. (credit: modification of "Webb Telescope Crew Flexes Robotic Arm at NASA" by Chris Gunn/NASA/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

Baseball legend Ted Williams once said, "Baseball is the only field of endeavor where a man can succeed three times out of ten and be considered a good performer."[1] On routine or unimportant decisions, business managers might aspire to do as well as Ted Williams, making the right decisions only 30% of the time. But a professional decision maker must "hit it out of the park" when making major capital investment choices and recommendations.

As a student in a course of business studies and career development, it is highly likely that you will be a decision maker about projects that are likely to generate future cash flows but will also require a large initial expense. When you ask your manager to invest $500,000 or more in a new piece of equipment that could help your department meet or exceed its goals, you must be prepared to defend your request. Competing managers and departments will be asking for similar funding, and there simply might not be enough for everyone. This decision process requires financial analysis.

Mark Cuban of *Shark Tank* fame enjoys citing the series' catchphrase: "Know thy numbers." As a business professional, you must be able to assess potential profit against expenditures to be successful. In most cases, this is based on our understanding of *cash flow*. A major capital investment might seem initially like a gamble, but it is a gamble that can be hedged in your favor with understanding, analysis, and knowledge of your numbers.

The purpose of this chapter is to give you information and instruction on how this is done. The techniques we will discuss in this chapter will clarify decisions that must be made in the process of investing in a business. We

1 Pete Palmer and Gary Gillette, eds. *The 2006 ESPN Baseball Encyclopedia*. New York: Sterling Publishing, 2006, 5.

focus first on decisions we make about our own money as investors if uneven cash receipts or payments are involved.

9.1 Timing of Cash Flows

Learning Outcomes

By the end of this section, you will be able to:

- Describe how multiple payments of unequal value are present in everyday situations.
- Calculate the future value of a series of multiple payments of unequal value.
- Calculate the present value of a series of multiple payments of unequal value.

Multiple Payments or Receipts of Unequal Value: The Mixed Stream

At this point, you are familiar with the time value of money of single amounts and annuities and how they must be managed and controlled for business as well as personal purposes. If a stream of payments occurs in which the amount of the payments changes at any point, the techniques for solving for annuities must be modified. Shortcuts that we have seen in earlier chapters cannot be taken. Fortunately, with tools such as financial or online calculators and Microsoft Excel, the method can be quite simple.

The ability to analyze and understand **cash flow** is essential. From a personal point of view, assume that you have an opportunity to invest $2,000 every year, beginning next year, to save for a down payment on the purchase of your first home seven years from now. In the third year, you also inherit $10,000 and put it all toward this goal. In the fifth year, you receive a large bonus of $3,000 and also dedicate this to your ongoing investment.

The stream of regular payments has been interrupted—which is, of course, good news for you. However, it does add a new complexity to the math involved in finding values related to time, whether compounding into the future or discounting to the present value. Analysts refer to such a series of payments as a **mixed stream**. If you make the first payment on the first day of next year and continue to do so on the first day of each following year, and if your investment will always be earning 7% interest, how much cash will you have accumulated—principal plus earned interest—at the end of the seven years?

This is a future value question, but because the stream of payments is mixed, we cannot use annuity formulas or approaches and the shortcuts they provide. As noted in previous chapters, when solving a problem involving the time value of money, a timeline and/or table is helpful. The cash flows described above are shown in Table 9.1 . Remember that all money is assumed to be deposited in your investment at the beginning of each year. The cumulative cash flows do not yet consider interest.

Year	0	1	2	3	4	5	6	7
Cash Invested	$0.00	$2,000	$2,000	$2,000	$12,000	$2,000	$5,000	$2,000
Cumulative Cash Flows		$2,000	$4,000	$6,000	$18,000	$20,000	$25,000	$27,000

Table 9.1

By the end of seven years, you have invested $27,000 of your own money before we consider interest:

- Seven years times $2,000 each year, or $14,000
- The extra $10,000 you received in year 3 (which is invested at the start of year 4)
- The extra $3,000 you received in year 5 (which is invested at the start of year 6)

These funds were invested at different times, and time and interest rate will work for you on all accumulated balances as you proceed. Therefore, focus on the line in your table with the cumulative cash flows. How much cash will you have accumulated at the end of this investment program if you're earning 7% compounded

annually? You could use the *future value of a single amount* equation, but not for an annuity. Because the amount invested changes, you must calculate the future value of each amount invested and add them together for your result.

Recall that the formula for finding the future value of a single amount is $\text{FV} = \text{PV} \times (1 + i)^n$, where FV is the future value we are trying to determine, PV is the value invested at the start of each period, *i* is the interest rate, and *n* is the number of periods remaining for compounding to take effect.

Let us repeat the table with your cash flows above. Table 9.2 includes a line to show for how many periods (years, in this case) each investment will compound at 7%.

Year	0	1	2	3	4	5	6	7
Cash Invested	$0.00	$2,000	$2,000	$2,000	$12,000	$2,000	$5,000	$2,000
Cumulative Cash Flows		$2,000	$4,000	$6,000	$18,000	$20,000	$25,000	$27,000
Years to Compound		7	6	5	4	3	2	1

Table 9.2

The $2,000 that you deposit at the start of year 1 will earn 7% interest for the entire seven years. When you make your second investment at the start of year 2, you will now have spent $4,000. However, the interest from your first $2,000 investment will have earned you $\$2{,}000 \times 0.07 = \$140$, so you will begin year 2 with $4,140 rather than $4,000.

Before we complicate the problem with a schedule that ties everything together, let's focus on years 1 and 2 with the original formula for the future value of a single amount. What will your year 1 investment be worth at the end of seven years?

$$\text{FV}_1 = \$2{,}000 \times (1 + 0.07)^7 \approx \$3{,}211.56$$

You need to address the year 2 investment separately at this point because you've calculated the year 1 investment and its compounding on its own. Now you need to know what your year 2 investment will be worth in the future, but it will only compound for six years. What will it be worth?

$$\text{FV}_2 = \$2{,}000 \times (1 + 0.07)^6 \approx \$3{,}001.46$$

You can perform the same operation on each of the remaining five invested amounts, remembering that you invest $12,000 at the start of year 4 and $5,000 at the start of year 6, as per the table. Here are the five remaining calculations:

$$\begin{aligned}
\text{FV}_3 &= \$2{,}000 \times (1 + 0.07)^5 \approx \$2{,}805.10 \\
\text{FV}_4 &= \$12{,}000 \times (1 + 0.07)^4 \approx \$15{,}729.55 \\
\text{FV}_5 &= \$2{,}000 \times (1 + 0.07)^3 \approx \$2{,}450.09 \\
\text{FV}_6 &= \$5{,}000 \times (1 + 0.07)^2 \approx \$5{,}724.50 \\
\text{FV}_7 &= \$2{,}000 \times (1 + 0.07)^1 \approx \$2{,}140.00
\end{aligned}$$

Notice how the exponent representing *n* decreases each year to reflect the decreasing number of years that each invested amount will compound until the end of your seven-year stream. For clarity, let us insert each of these amounts in a row of Table 9.3 :

Year	0	1	2	3	4	5	6	7
Cash Invested	$0.00	$2,000	$2,000	$2,000	$12,000	$2,000	$5,000	$2,000
Cumulative Cash Flows		$2,000	$4,000	$6,000	$18,000	$20,000	$25,000	$27,000

Table 9.3

Year	0	1	2	3	4	5	6	7
Years to Compound		7	6	5	4	3	2	1
Compounded Value at End of Year 7		$3,211.56	$3,001.46	$2,805.10	$15,729.55	$2,450.09	$5,724.50	$2,140.00

Table 9.3

The solution to the original question—the value of your seven different investments at the end of the seven-year period—is the total of each individual investment compounded over the remaining years. Adding the compounded values in the bottom row provides the answer: $35,062.26. This includes the $27,000 that you invested plus $8,062.26 in interest earned by compounding.

It's important to note that throughout these sections on the time value of money and compounded or discounted values of mixed streams and their analysis, we are placing the valuation at the end or beginning of a period for simplicity in the examples. In reality, businesses might consider valuations happening within the period to allow for a degree of regularity in the revenue streams provided by the asset being considered. However, because this is a technique of forecasting, which is inherently uncertain, we will continue with analysis by period.

THINK IT THROUGH

Future Value of a Mixed Stream

Assume that you can invest five annual payments of $10,000, beginning immediately, but you believe you will be able to invest additional amounts of $5,000 at the beginning of years 4 and 5. This investment is expected to earn 4% each year. What is the anticipated future value of this investment after the full five years?

Solution:

Year	0	1	2	3	4	5
Cash Invested	$0.00	$10,000	$10,000	$10,000	$15,000	$15,000
Cumulative Cash Flows		$10,000	$20,000	$30,000	$45,000	$60,000
Years to Compound		5	4	3	2	1
Compounded Value at End of Year 5		$12,166.53	$11,698.59	$11,248.64	$16,224.00	$15,600.00

Table 9.4

The equations to calculate each individual year's compounded value at the end of the five years are as follows:

$$\begin{aligned} \text{FV}_1 &= \$10{,}000 \times (1+0.04)^5 \approx \$12{,}166.53 \\ \text{FV}_2 &= \$10{,}000 \times (1+0.04)^4 \approx \$11{,}698.59 \\ \text{FV}_3 &= \$10{,}000 \times (1+0.04)^3 \approx \$11{,}248.64 \\ \text{FV}_4 &= \$15{,}000 \times (1+0.04)^2 \approx \$16{,}224.00 \\ \text{FV}_5 &= \$15{,}000 \times (1+0.04)^5 \approx \$15{,}600.00 \end{aligned}$$

The sum of these individual calculations is $66,937.76, which is the total value of this stream of invested amounts plus compounded interest.

Let's take the example above and review it from a different angle. Keeping in mind that we have not yet explored the use of Excel, is there another way to view our solution? The problem above takes each annual investment and compounds it into the future, then adds the results of each calculation to find the total future value of the stream of payments.

But when you break the problem down, another way to look at the problem is as a five-year annuity of $10,000 per year *plus* added payments in years 4 and 5. Can we solve for the future value of an annuity first and then perform two separate calculations on the additional amounts ($5,000 each in years 4 and 5)? Yes, we can.

Let's summarize:

- Future value of a $10,000 annuity due, 4%, 5 years, *plus*
- Future value of a single payment of $5,000, 4%, 2 years, *plus*
- Future value of a single payment of $5,000, 4%, 1 year

This must give us the same result. The formula for the future value of an annuity due is

$$\text{FVa} = \text{PYMT} \times \frac{(1+i)^n - 1}{i} \times (1 + \text{i})$$

This problem can be solved in the three steps of the summary above.

Step 1:

$$\text{FVa} = \$10{,}000 \times \frac{(1+0.04)^5 - 1}{0.04} \times (1 + 0.04)$$

$$\text{FVa} = \$10{,}000 \times 5.416323 \times 1.04 \approx \$56{,}329.76$$

Step 2:

$$\text{FV}_{\text{Year 4}} = \$5{,}000 \times (1 + 0.04)^2 = \$5{,}408.00$$

Step 3:

$$\text{FV}_{\text{Year 5}} = \$5{,}000 \times (1 + 0.04)^1 = \$5{,}200.00$$

Combining the results from each of the three steps gives us

$$56{,}329.76 + 5{,}408.00 + 5{,}200.00 = \$66{,}937.76$$

It works. Whether you view this problem as five separate periods that can be compounded separately and then combined or as a combination of one or more annuities and/or single payment problems, we always arrive at the same solution if we are diligent about the time, the interest, and the stream of payments.

The Present Value of a Mixed Stream

Now that we've seen the calculation of a **future value**, consider a **present value**. We will begin with a personal example. You win a cash windfall through your state's lottery. You would like to take a portion of the funds and place them in a fixed investment so that you can draw $17,000 per year starting one year from now and continue to do so for the next two years. At the end of year 4, you want to withdraw $17,500, and at the end of year 5, you will withdraw the last $18,000 to close the account. When you take your last payment of $18,000, your fund will be totally depleted. You will always be earning 6% annually. How much of your cash windfall should you set aside today to accomplish this?

Let us break down the problem, remembering that we are thinking in reverse from the earlier problems that involved future values. In this case, we're bringing future values back in time to find their present values. You will recall that this process is called *discounting* rather than *compounding*.

Regardless of how we solve this, the question remains the same: How much money must we invest today (present value) to achieve this? And remember that we will always be earning 6% compounded annually on any invested balances.

We are calculating present values as we did in previous chapters, given a known future value "target," in order to determine how much money you need today to achieve that goal. Let us break this down by first reviewing the relevant equations from previous chapters.

Present value of an ordinary annuity:

$$\text{PVa} = \text{PYMT} \times \frac{\left[1 - \frac{1}{(1+i)^n}\right]}{i}$$

Present value of a single amount:

$$\text{PV} = \text{FV} \times \frac{1}{(1+i)^n}$$

where PVa is the present value of an annuity, PYMT is one payment in a consistent stream (an annuity), *i* is the interest rate (annual unless otherwise specified), *n* is the number of periods, PV is the present value of a single amount, and FV is the future value of a single amount.

You want to find out how much money you need to set aside today to accomplish your goal. You can also find out how much money you need to set aside in each period to accomplish this goal. Therefore, we can address this problem in increments. Let us look at potential solutions.

First, we will break this down into the cash flows of each year. Table 9.5 shows the timing of the future cash flows you're expecting:

Year	0	1	2	3	4	5
Expected Amount to Be Withdrawn at End of Year	$0.00	$17,000	$17,000	$17,000	$17,500	$18,000

Table 9.5

One method is to take each year's cash flows, which happen at the end of the year, and discount them to today using the present value formula for a single amount:

$$\text{PV} = \text{FV} \times \frac{1}{(1+i)^n}$$

$$\text{PV}_1 = \$17{,}000 \times \frac{1}{(1+0.06)^1} \approx \$16{,}037.74$$

Because year 1's withdrawal from your fund only has one year to earn interest, we discounted it for one year. The second amount is discounted for two years:

$$\text{PV}_2 = \$17{,}000 \times \frac{1}{(1+0.06)^2} \approx \$15{,}129.94$$

The next three years are discounted in the same way, for three, four, and five years, respectively:

$$\text{PV}_3 = \$17{,}000 \times \frac{1}{(1+0.06)^3} \approx \$14{,}273.53$$

$$\text{PV}_4 = \$17{,}500 \times \frac{1}{(1+0.06)^4} \approx \$13{,}861.64$$

$$\text{PV}_5 = \$18{,}000 \times \frac{1}{(1+0.06)^5} \approx \$13{,}450.65$$

Notice how we reverse our thinking on the exponent *n* from our approach to future value. This time, it increases each period because we discount each future amount for a longer period to arrive at the value in today's dollars.

When we add all five discounted present value amounts from above, we derive today's value of $72,753.49. Expressed more simply, if you wanted to extract the specified stream of cash flows at the end of each year

($17,000 for three years, then $17,500, then $18,000), you would have to begin with $72,753.49. The thing to remember is that any amounts remaining in this fund, regardless of how you deplete it, will always be earning 6% annually. See Table 9.6.

Year	0	1	2	3	4	5
Withdrawn at End of Year		$17,000.00	$17,000.00	$17,000.00	$17,500.00	$18,000.00
Interest on Balance		$4,365.21	$3,607.12	$2,803.55	$1,951.76	$1,018.87
Remaining Balance	$72,753.49	$60,118.70	$46,725.82	$32,529.37	$16,981.13	$0.00

Table 9.6

Let us try another approach. Because the amount of cash withdrawn in the first three years remains constant at $17,000, it can be viewed as an annuity—specifically, a three-period annuity of $17,000 and two single payments of $17,500 and $18,000. Therefore, we could also discount (bring to present value) an annuity of $17,000 for three years (the first three) and then combine it with the year 4 discounted amount and the year 5 discounted amount. We can try it using the formulas for PVa and PVused above. In Step 1, we will discount the first three years as an annuity (ordinary, as the first withdrawal is not made until one year from now); in Step 2, we will discount the year 4 single payment amount; and in Step 3, we will do the same for the year 5 single payment amount. Then we can add them together.

Step 1: Find the present value of the annuity using the PVa formula:

$$\text{PVa} = \$17{,}000 \times \frac{\left[1 - \frac{1}{(1 + 0.06)^3}\right]}{0.06}$$

$$\text{PVa} = \$17{,}000 \times \frac{1 - 0.839619}{0.06}$$

$$\text{PVa} = \$17{,}000 \times 2.673017 \approx \$45{,}441.29$$

Step 2: Discount the year 4 amount using the formula for the present value of a single amount:

$$\text{PV}_{(\text{Year } 4)} = \$17{,}500 \times \frac{1}{(1 + 0.06)^4} \approx \$13{,}861.64$$

Step 3: Perform the same operation as in Step 2 for the year 5 amount:

$$\text{PV}_{(\text{Year } 5)} = \$18{,}000 \times \frac{1}{(1 + 0.06)^5} \approx \$13{,}450.65$$

Now that all three amounts have been discounted to today's value, we can add them:

$$45{,}441.20 + 13{,}861.64 + 13{,}450.65 = \$72{,}753.49$$

Calculating the present value of cash flows is very common and critical in the analysis of **capital investments** in business for two compelling reasons: first, the investment is likely quite significant, and second, the risk will usually encompass a longer time frame. When the author of this chapter would purchase a large machine, it would likely take several years for that machine to justify its purchase with the revenues it would generate. This is one of the primary reasons that accountants require us to depreciate the cost of an asset over time: to assess the cost against the time it will take for that asset to produce profits and cash flow.

THINK IT THROUGH

Present Value of a Mixed Stream

Assume that you decide to invest $450,000. All cash flows are discounted at 4%. You are told by your financial advisor to expect cash inflows from your investment of $100,000 in year 1, $125,000 in year 2, $175,000 in year 3, $90,000 in year 4, and $50,000 in year 5. Would you agree to this plan based only on the numbers? Each amount will be withdrawn at the end of every year, and interest will be compounded annually.

Solution:

Year	0	1	2	3	4	5
Expected Amount to Be Withdrawn at End of Year	$0.00	$100,000	$125,000	$175,000	$90,000	$50,000

Table 9.7

Applying the formula for the present value of a single amount, we discount each amount and then add the discounted amounts. We will simplify this approach with Excel shortly, but we must understand the reasoning behind discounting uneven cash flow streams with a direct solution.

$$\begin{aligned}
PV_1 &= \$100{,}000 \times \frac{1}{(1+0.04)^1} \approx \$96{,}153.85 \\
PV_2 &= \$125{,}000 \times \frac{1}{(1+0.04)^2} \approx \$115{,}569.53 \\
PV_3 &= \$175{,}000 \times \frac{1}{(1+0.04)^3} \approx \$155{,}574.36 \\
PV_4 &= \$90{,}000 \times \frac{1}{(1+0.04)^4} \approx \$76{,}932.38 \\
PV_5 &= \$50{,}000 \times \frac{1}{(1+0.04)^5} \approx \$41{,}096.36
\end{aligned}$$

By combining the five discounted amounts above, we get a total present value of $485,326.48. This amount represents the value today of the five expected cash inflows for as long as our remaining balance is earning 4%.

CONCEPTS IN PRACTICE

Thoughts on Cash Flow from Irina Simmons

In 2013, the author interviewed Irina Simmons, senior vice president, chief risk officer, and former treasurer of EMC Corporation. The importance and understanding of cash flow analysis is fundamental to this text, and several of her insights are highly relevant to our content and procedures here.

AA: Ms. Simmons, why is cash management so important to an existing or start-up firm, and how does it compare to the more basic and traditional focus on profitability?

Simmons: While profitability is very useful for analysis by investors to measure performance, an organization's cash flow provides superior measurement. Cash flow is easy to understand, provides a transparent way of assessing a firm's health, and is not subject to any qualifications. By focusing upon cash flow, any firm—whether it is mature or a start-up organization—can have a clear picture of its health and success.

AA: In your bio, you mention liquidity management. Can you elaborate on this and why liquidity management is so important to a firm?

Simmons: Just as effective forecasting can provide superior cash management, the same holds true for liquidity management. For example, if you are able to confidently predict levels and timing of cash, then based on that forecast, you can make effective short- and long-term borrowing decisions. A disciplined approach to projecting one's cash position means that instead of investing cash in the money market to maximize day-to-day liquidity, you can look into longer-term investments that can provide a significantly higher return. This is essential to the effective matching of cash inflows and outflows for the firm.

AA: In summary, do you have any words of advice to students who might have an eye to entrepreneurial ventures?

Simmons: "Cash is king," don't forget that. Understand how cash moves through a business. It is also very important to implement and retain a cash management discipline. Never put that off until later. Many times, start-ups will say, "Well, I have all this venture money, and we can start making things happen and worry about being good cash managers later." But what I've seen is that the longer companies wait, the harder it is to break bad habits. Making cash management a priority now will serve entrepreneurs in perfect stead as their business starts to gain traction.

We closed this excellent interview with agreement that we were "kindred spirits" regarding the importance of cash flow analysis, including capital decisions such as those mentioned in this chapter. We confirmed with each other the core belief that "cash flow is the axis upon which the world of business spins."

(source: *Business Finance: A Clear View*, 3rd edition, by Alan S. Adams. LAD Publishing, 2015.)

LINK TO LEARNING

Analyst Training Materials

These materials, developed to help professionals prepare for an analyst certification exam, describe the sources of return from investing in a bond (https://openstax.org/r/return-investing-bond).

9.2 Unequal Payments Using a Financial Calculator or Microsoft Excel

Learning Outcomes

By the end of this section, you will be able to:

- Calculate unequal payments using a financial calculator.
- Calculate unequal payments using Microsoft Excel.

Using a Financial Calculator

A financial calculator provides utilities to simplify the analysis of uneven mixed cash streams (see Table 9.8).

Earlier, we explored the future value of a seven-year mixed stream, with $2,000 being saved each year, plus an additional $10,000 in year 4 and an additional $3,000 in year 6. All cash flows and balances earn 7% per year compounded annually, and the payments are made at the start of each year. We proved that this result totals approximately $35,062.26. We begin by clearing all memory functions and then entering each cash flow as follows:

Step	Description	Enter	Display	
1	Clear cash flow memory	CF 2ND [CLR WORK]	CF0	0.00
2	Enter 0 for cash flow at Time 0	ENTER ↓	CF0	0.00
3	Move to next entry	↓	C01	0.00
4	Enter first cash flow	2000 ENTER	C01 =	2000.00
5	Move to next entry	↓ ↓	C02	0.00
6	Enter second cash flow	2000 ENTER ↓	C02 =	2000.00
7	Move to next entry	↓ ↓	C03	0.00
8	Enter third cash flow	2000 ENTER	C03 =	2000.00
9	Move to next entry	↓ ↓	C04	0.00
10	Enter fourth cash flow	12000 ENTER	C04 =	12000.00
11	Move to next entry	↓ ↓	C05	0.00
12	Enter fifth cash flow	2000 ENTER	C05 =	2000.00
13	Move to next entry	↓ ↓	C06	0.00
14	Enter sixth cash flow	5000 ENTER	C06 =	5000.00
15	Move to next entry	↓ ↓	C07	0.00
16	Enter seventh cash flow	2000 ENTER	C07 =	2000.00
17	Press NPV	NPV	I	0.00
18	Enter interest rate	7 ENTER	I =	7.00
19	Press down arrow to show current NPV rate	↓	NPV	0.00
20	Press CPT to find net present value	CPT	NPV	20,406.56

Table 9.8 Steps for Calculating Uneven Mixed Cash Flows[2]

At this point, we have found the net present value of this uneven stream of payments. You will recall, however, that we are not trying to calculate present values; we are looking for future values. The TI BA II Plus™ Professional calculator does not have a similar function for future value. This means that either we can find the future value for each payment in the stream and combine them, or we can take the net present value we just calculated and easily project it forward using the following keystrokes. Note the net present value solution in Step 20 above. We will use that and then use the simpler of the two approaches to calculate future value (see Table 9.9).

Step	Description	Enter	Display	
21	Enter NPV from Step 20	20406.56	PV =	20,406.56
22	Enter number of compounding periods	8 N	N =	8.00
23	Enter interest rate	7 I/Y	I/Y =	7.00
24	Calculate future value	CPT FV	FV =	-35,062.27

Table 9.9 Steps for Calculating Uneven Mixed Cash Flows, Continued

2 The specific financial calculator in these examples is the Texas Instruments BA II Plus™ Professional model, but you can use other financial calculators for these types of calculations.

This is consistent with the solution we found earlier, with a difference of one cent due to rounding error.

We may also use the calculator to solve for the present value of a mixed cash stream. Earlier in this chapter, we asked how much money you would need today to fund the following five annual withdrawals, with each withdrawal made at the end of the year, beginning one year from now, and all remaining money earning 6% compounded annually:

Year	1	2	3	4	5
	$17,000	$17,000	$17,000	$17,500	$18,000

Table 9.10

We determined these withdrawals to have a total present value of $72,753.30. Here is an approach to a solution using a financial calculator. In this example, we will store all cash flows in the calculator and perform an operation on them as a whole (see Table 9.11). Because we will use the NPV function (to be explored in more detail in a later chapter), we enter our starting point as 0 because we do not withdraw any cash until one year after we begin.

Step	Description	Enter	Display	
1	Clear cash flow memory	CF 2ND [CLR WORK]	CF0	0.00
2	Enter 0 for cash flow at Time 0	ENTER ↓	CF0	0.00
3	Move to next entry	↓	C01	0.00
4	Enter first cash flow	17000 ENTER	C01 =	17000.00
5	Move to next entry	↓ ↓	C02	0.00
6	Enter second cash flow	17000 ENTER	C02 =	17000.00
7	Move to next entry	↓ ↓	C03	0.00
8	Enter third cash flow	17000 ENTER	C03 =	17000.00
9	Move to next entry	↓ ↓	C04	0.00
10	Enter fourth cash flow	17500 ENTER	C04 =	17500.00
11	Move to next entry	↓ ↓	C05	0.00
12	Enter fifth cash flow	18000 ENTER	C05 =	18000.00
13	Press NPV	NPV	I	0.00
14	Enter interest rate	6 ENTER	I =	6
15	Press down arrow to show current NPV rate	↓	NPV	0.00
16	Press CPT to find net present value	CPT	NPV =	72,753.49

Table 9.11 Steps for Calculating the Present Value of a Mixed Cash Stream

This result, you will remember, was calculated earlier in the chapter by the formula approach.

Using Microsoft Excel

Several of the exhibits already in this chapter have been prepared with Microsoft Excel. While full mastery of Excel requires extensive study and practice, enough basics can be learned in two or three hours to provide the user with the ability to quickly and conveniently solve problems, including extensive financial applications. Potential employers and internship hosts have come to expect basic Excel knowledge, something to which you

are exposed in college.

We will demonstrate the same two problems using Excel rather than a calculator:

1. The future value of a mixed cash stream for a seven-year investment
2. The present value of a mixed cash stream of five withdrawals that you wish to make from a fund to be established today

Beginning with the future value problem, we created a simple matrix to lay out the mixed stream of future cash flows, starting on the first day of each year, with all funds earning 7% throughout. Our goal is to determine how much money you will have saved at the end of this seven-year period.

Table 9.12 repeats the data from earlier in the chaper for your convenience.

Year	0	1	2	3	4	5	6	7
Cash Invested	$0.00	$2,000	$2,000	$2,000	$12,000	$2,000	$5,000	$2,000
Cumulative Cash Flows		$2,000	$4,000	$6,000	$18,000	$20,000	$25,000	$27,000
Years to Compound		7	6	5	4	3	2	1

Table 9.12

Figure 9.2 is an Excel matrix that parallels Table 9.12 above.

	A	B	C	D	E	F	G	H	I	J
1	Assumed Interest Rate		7.00%							
2	**Year**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
3	Amount Invested at Start of Year		2,000.00	2,000.00	2,000.00	12,000.00	2,000.00	5,000.00	2,000.00	**27,000.00**
4	Interest on Balance		140.00	289.80	450.09	1,321.59	1,554.10	2,012.89	2,293.79	**8,062.27**
5	Cumulative Cash Flow		2,140.00	4,429.80	6,879.89	20,201.48	23,755.58	30,768.47	35,062.27	**35,062.27**

Figure 9.2 Compound Interest Example

Download the spreadsheet file (https://openstax.org/r/chapter9-excel-exhibits) containing key Chapter 9 Excel exhibits.

We begin by entering the cash flow as shown in Figure 9.2. The assumed interest rate is 7%. The interest on the balance is calculated as the amount invested at the start of the year multiplied by the assumed interest rate. The cumulative cash flows of each year are calculated as follows: for year 1, the amount invested plus the interest on the balance; for years 2 through 7, the amount invested plus the interest on the balance plus the previous year's running balance. By adding up the amount invested and the interest on the balance, you should arrive at a total of $35,062.27.

We can use Excel formulas to solve time value of money problems. For example, if we wanted to find the present value of the amount invested at 7% over the seven-year time period, we could use the NPV function in Excel. The dialog box for this function (Rate, Value 1, Value2) is shown in Figure 9.3.

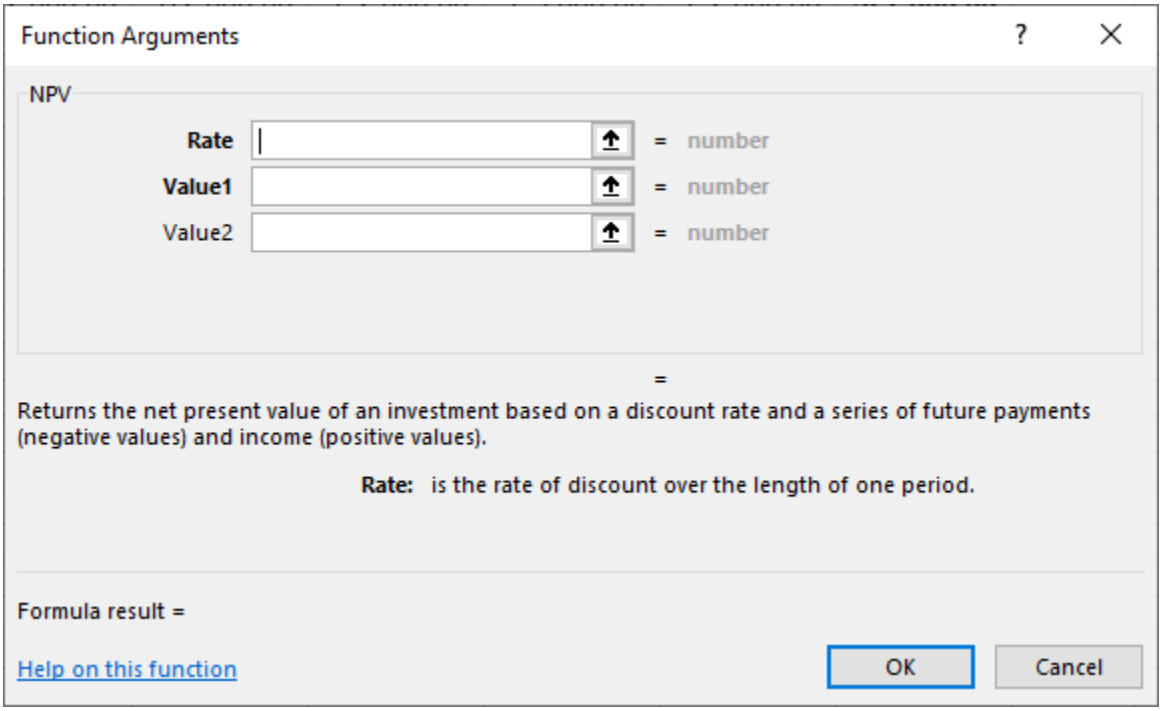


Figure 9.3 Dialog Box for NPV Function, Problem 1

The function argument Rate is the interest rate; Value1, Value2, and so on are the cash flows; and "Formula result" is the answer.

We can apply the NPV function to our problem as shown in Figure 9.4.

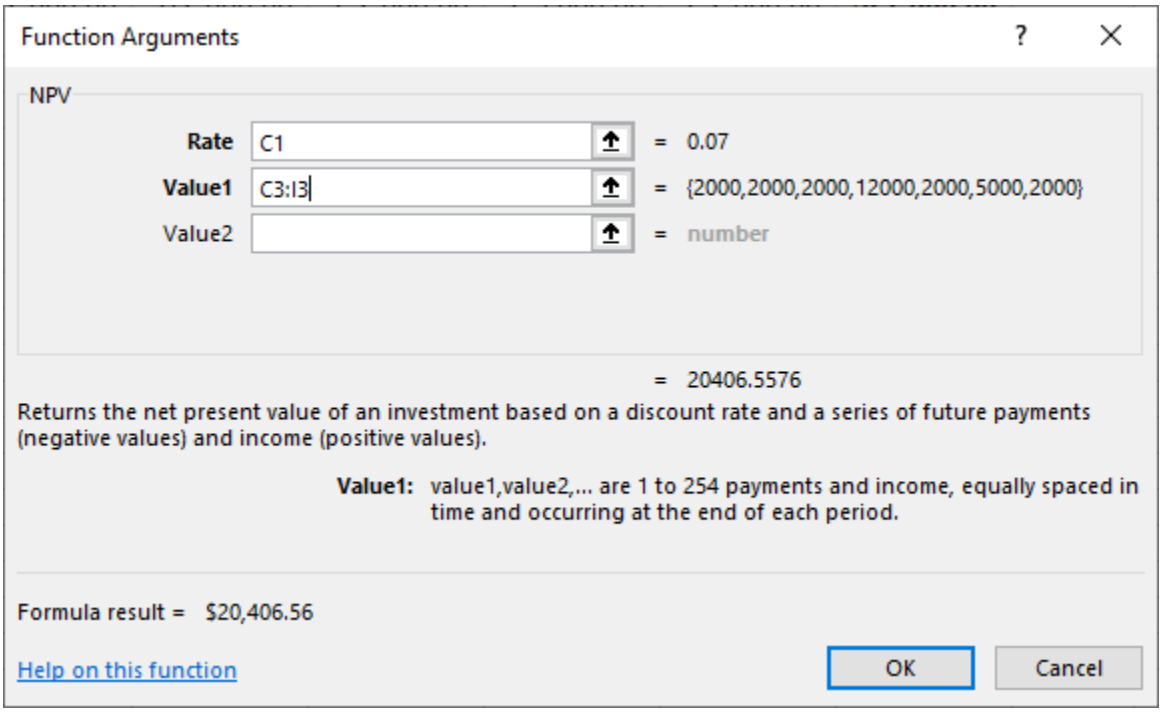


Figure 9.4 Applying the NPV Function, Problem 1

Please note that the Rate cell value (C1) and the Value1 cell range (C3:I3) will vary depending on how you set up your spreadsheet.

The non-Excel version of the problem, using an assumed interest rate of 7%, produces the same result.

Year	1	2	3	4	5	6	7
Amount Invested at Start	$2,000	$2,000	$2,000	$12,000	$2,000	$5,000	$2,000
NPV	$20,406.56						

Table 9.13

We conclude with the second problem addressed earlier in this chapter: finding the present value of an uneven stream of payments. We can use Excel's NPV function to solve this problem as well (see Figure 9.5).

Year	0	1	2	3	4	5
Expected Amount to Be Withdrawn at End of Year	$0.00	$17,000	$17,000	$17,000	$17,500	$18,000

Table 9.14

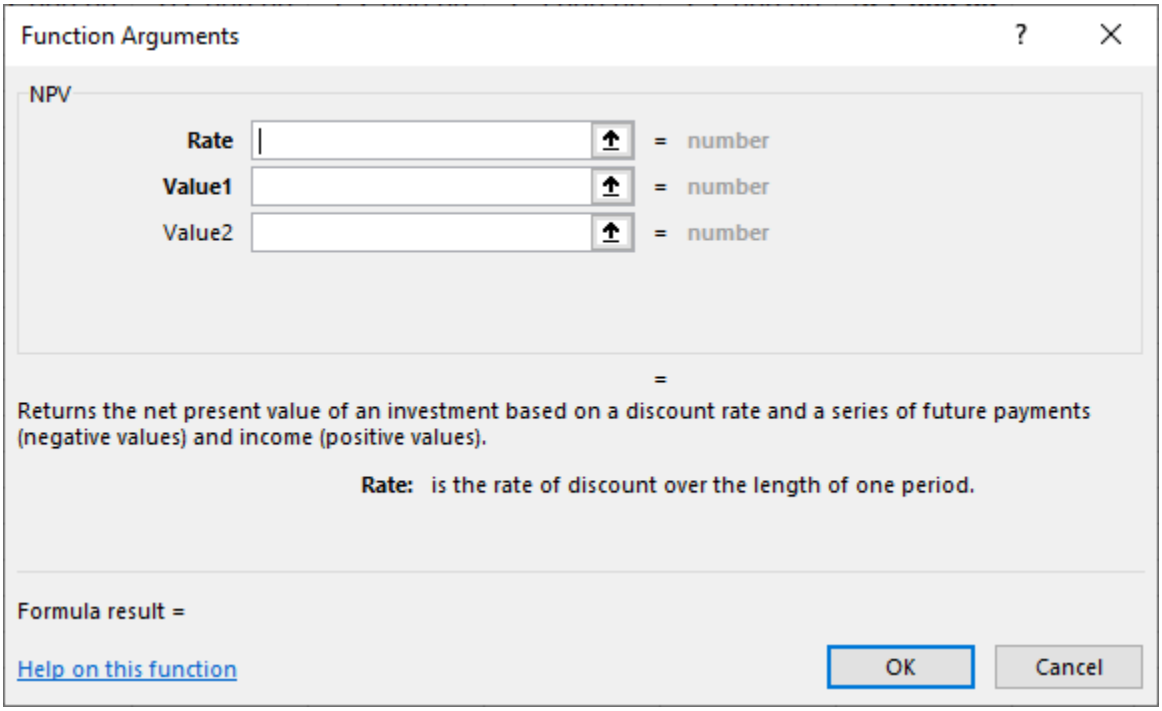


Figure 9.5 Dialog Box for NPV Function, Problem 2

Again, Rate is the interest rate; Value1, Value 2, and so on are the cash flows; and "Formula result" is the answer.

Let us apply the NPV function to our problem, as shown in Figure 9.6 and Figure 9.7.

	A	B	C	D	E	F	G
1	**Year**	**0**	**1**	**2**	**3**	**4**	**5**
2	Desired Withdrawals Each Year		17,000.00	17,000.00	17,000.00	17,500.00	18,000.00
3	Interest Rate	6.00%					
4		**NPV**	**72,753.49**				

Figure 9.6 Applying the NPV Function, Problem 2: Excel Data

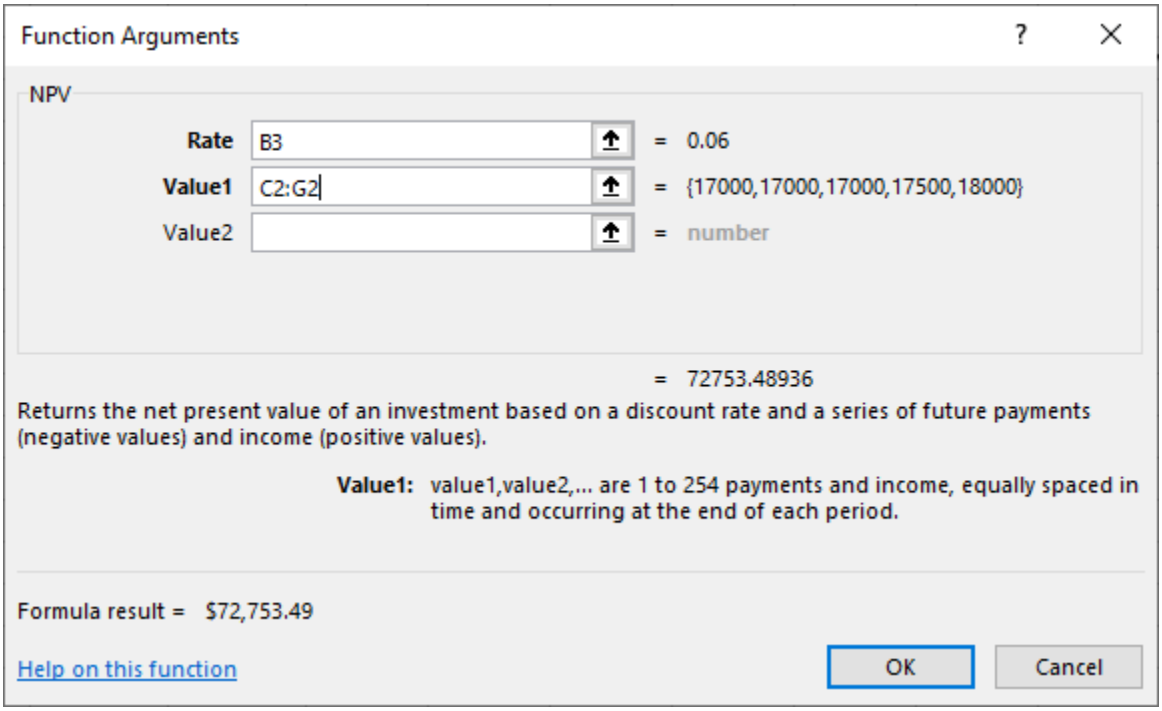


Figure 9.7 Applying the NPV Function, Problem 2: Function Argument

Please note that the Rate cell value (B3) and the Value1 cell range (C2:G2) will vary depending on how you set up your spreadsheet.

The non-Excel version of the problem produces the same result: an NPV of $72,753.49.

Year	0	1	2	3	4	5
Desired Withdrawals Each Year	$17,000	$17,000	$17,000	$17,500	$18,000	
Interest Rate	0.06					
NPV						**$72,753.49**

Table 9.15

Summary

9.1 Timing of Cash Flows

To understand the true value and strength of cash, it is necessary to consider its timing. This is relevant for investments for the future and for analyses of the value of projects that require investment today to produce expected flows of cash later. These future cash flows could involve inflows or outflows of cash in unequal amounts. This section analyzed the determination of present and future value of these uneven or mixed cash flows.

9.2 Unequal Payments Using a Financial Calculator or Microsoft Excel

This section discussed the use of two tools for managing and understanding the time value of money and its many applications when the flows of cash are unequal: the TI BA II Plus™ Professional financial calculator and the spreadsheet application Excel.

Key Terms

capital investment a major expenditure that requires a large up-front investment and is expected to generate substantial cash inflow in return

cash flow the amount of cash actually flowing into and out of a business, as opposed to *income* (which is based on accounting rules, accruals, and reports)

future value the value of an asset or holding at a point in the future based on expectations of that asset's growth at a certain rate of return

mixed stream a set of cash flows over a period of time that can vary in amount from one period to the next

present value the value of an asset in today's dollars based on future growth expectations at an assumed interest rate

CFA Institute

This chapter supports some of the Learning Outcome Statements (LOS) in this CFA® Level I Study Session (https://openstax.org/r/cfa-level1-study-session). Reference with permission of CFA Institute.

Multiple Choice

General instructions: Approximations and minor differences because of rounding are acceptable. Ignore the effect of taxes. Please assume that all percentages are annual rates and compounding occurs annually unless otherwise indicated.

1. For which of the following situations would you NOT be able to use the one-step shortcut provided by an annuity calculation?
   a. Planning an amortization table for a three-year car loan at 2%
   b. Investing $2,000 per year for 10 years at 5%
   c. Calculating the monthly payment on a 20-year home mortgage of $150,000 at 3%
   d. Finding the present value of a fund that will pay $1,000 the first year, $2,000 in the second year, and $3,500 in the third year

2. If you invest $3,000 today, $5,000 one year from now, and $3,000 two years from now, approximately how much money will you have at the end of the third year if you invest in a fund paying 7%?
   a. $11,770.24
   b. $12,609.63
   c. $13,187.79
   d. $14,274.50

3. You intend to invest four annual payments, starting immediately: $10,000 now, another $10,000 at the end of year 1, $12,000 at the end of year 2, and $15,000 at the end of year 3. How much will you have at the end of year 4 if the fund is always earning 6% compounded annually?
   a. $53,918.13
   b. $54,417.52
   c. $57,685.30
   d. $57,894.77

4. You can invest a windfall of $40,000 today at 4% compounded annually. You don't believe you can make another investment one year from now, but you believe that you can save enough that two years from now, you can deposit another $10,000 in the same investment, which will still be earning 4% compounded annually. How much will you have accumulated in this investment three years from now?
   a. $50,400.00
   b. $54,875.32
   c. $55,394.56
   d. $57,123.33

5. Donna can invest today in a fund that will guarantee her a 5% return compounded annually for five years. She can invest $1,200 today, $1,400 one year from now, $1,800 two years from now, and $2,100 three years from now. If she can make these investments as scheduled, how much will she have accumulated five years from now?
   a. $6,878.97
   b. $7,632.23
   c. $8,142.52
   d. $8,799.49

6. Jane wants to create a fund today that will provide her a 4% guaranteed compounded annual rate. She wants to withdraw $15,000 one year from now and $27,000 two years from now, after which the fund will be depleted. How much must she invest today to achieve this goal?
   a. $42,400.00
   b. $41,912.43
   c. $40,775.89
   d. $39,386.10

7. You wish to draw from a fund you're creating today with a 3% guaranteed compounded annual rate. You hope to withdraw $40,000 one year from now, $35,000 two years from now, and $25,000 three years from now, at which point the fund will be depleted. How much must you invest today to achieve this?
   a. $94,704.35
   b. $95,346.98
   c. $95,255.12
   d. $95,945.78

Review Questions

1. Refer to Question 3 above. Solve using the financial calculator, documenting your steps/keystrokes.
2. Refer to Question 7 above. Solve using the financial calculator, documenting your steps/keystrokes.
3. You agree to repay a loan over five years with the following stream of cash payments: $1,000; $1,100; $1,250; $1,280; and $1,300. If you wish to discount these payments to their present value today using 4%, why can you not use one annuity calculation, as seen in previous chapters?

Problems

1. Your aunt promises to gift you $1,500 now, $1,700 one year from now, $1,900 two years from now, and $2,500 three years from now. You will deposit all four amounts in an account that bears 3% interest compounded annually. How much will be in the account at the end of the fourth year?
2. You believe that you can set aside $1,200 each year for the next four years, starting immediately, in order to buy a small fishing boat for your retirement. Your friend Luis promises that he'll pay you back $4,900 that he owes you three years from now, so you will add that to the payment you make at the start of year 4. Then, at the start of year 5, you will increase your payment to $1,400; in year 6, to $1,500; and in year 7, to $1,600. Every payment will be deposited in a fund bearing 4% interest compounded annually. How much will you have set aside for your boat at the end of the seventh year?
3. Assume you win a lottery that will pay you $10,000 immediately, plus $20,000 one year from now, $30,000 two years from now, $40,000 three years from now, and $75,000 four years from now. You're curious about how much the lottery commission might offer you as an immediate lump sum instead. What is the minimum amount you should consider accepting today instead? Use a 5% annual discount rate. Please remember that we are ignoring taxation and other considerations and basing this only on the math itself.
4. Assume you win a lottery, and you are offered the following stream of payments by the lottery commission: $25,000 today, $32,000 one year from now, another $32,000 two years from now, and a final payment of $55,000 three years from now. You accept the offer. If you invest all of these proceeds at 6% compounded annually and extract nothing from the investment, how much will you have at the end of the fourth year?
5. You are offered a business partnership that guarantees you cash returns of $150,000 one year from now, nothing at the end of year 2, and $350,000 at the end of year 3. After year 3, the partnership will be dissolved, and there will be no more expected returns on your investment. If you analyze this plan expecting 7% compounded annually, what is this potential deal worth to you today?
6. Tony owns a small business that he is attempting to sell. A potential buyer offers him $500,000 today, plus $1,500,000 two years from now and a balance of $1,700,000 three years from now. Tony always analyzes cash flows using a rate of 4% compounded annually. To compare this to other offers, which would be paid in cash immediately, he wants to know the present value of these future cash flows. Show the calculation and solution that you would present to Tony to use in his decision.
7. Continuing Problem 6 above, assume that as Tony receives each payment from the buyer, he can immediately invest it in a fund that returns a guaranteed 3.5% compounded annually. If he accepts the terms of this offer, how much will he have accumulated in this investment four years from now?
8. You hire Susan for a three-year term. She has no retirement plan, so you agree to invest money immediately to allow her a stream of three payments beginning one year after her employment term ends. Draw a timeline! The money you invest for the full six years of this arrangement (three years of employment and three years of withdrawals) always earns 4% compounded annually. When Susan receives her third and last payment, the fund will be depleted and equal zero. The three payments she will receive are as follows:
   End of year 4: $25,000
   End of year 5: $30,000
   End of year 6: $37,000

   Therefore, your goal is to have enough money in this account at the end of Susan's three-year employment term to assure her of receiving these payments.

   How much money must you invest today to accomplish this strategy?

9. Abby owns a business that projects two years of strong cash flow, followed by a two-year hiatus while she pursues a graduate degree. She then plans to resume her business and is confident about the following two years of cash flow. At the end of each year, she will invest her profits in a fund that returns 3% compounded annually. Each investment will be made at the end of the year. Her expected investments are as follows:

   Year 1: $50,000
   Year 2: $78,000
   Year 3: 0
   Year 4: 0
   Year 5: $84,000
   Year 6: $89,000

   If Abby meets her expectations, how much money will she have in this fund at the end of year 7?

Video Activity

Calculate the Present Value for Multiple Cash Flows

Click to view content (https://openstax.org/r/calculate-the-present-value)

1. Provide a practical example from your own personal financial management of why an understanding of the present value of future cash flows would be important.
2. You expect to receive $10,800 one year from now, $17,400 two years from now, nothing at the end of the third year, and $24,000 four years from now. If you discount all of your cash flows at 7%, then with annual compounding, what are these future cash amounts worth to you in total today?

Future Value of Uneven Cash Flows

Click to view content (https://openstax.org/r/uneven-cash-flows)

3. Using Excel, determine the future value of this series of expected unequal receipts five years from now if each payment is received at the end of each year, beginning one year from now, and the interest rate is 6% compounded annually.

   End of year 1: $3,800
   End of year 2: $4,400
   End of year 3: $5,100
   End of year 4: $5,800

4. When using Excel's built-in Future Value function, why does Dr. Konners enter dollar amounts as negative numbers?