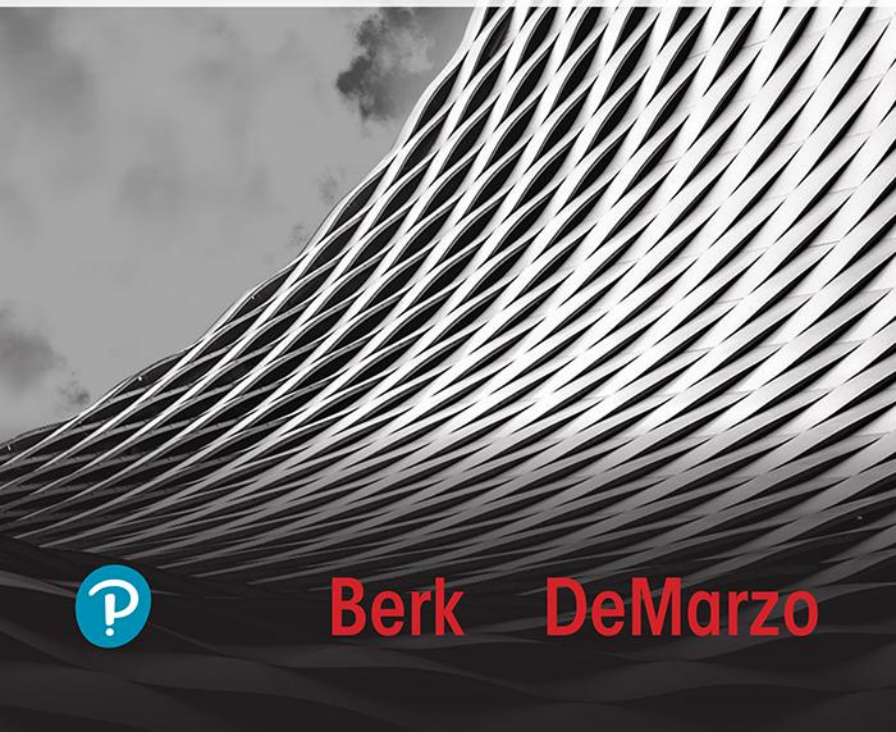
FIFTH EDITION

CORPORATE FINANCE



Berk DeMarzo

COMMON SYMBOLS AND NOTATION

A	market value of assets, premerger total value of acquirer
APR	annual percentage rate
B	risk-free investment in the replicating portfolio
C	cash flow, call option price
$Corr(R_i, R_j)$	correlation between returns of i and j
$Cov(R_i, R_j)$	covariance between returns of i and j
CPN	coupon payment
D	market value of debt
d	debt-to-value ratio
Div_t	dividends paid in year t
dis	discount from face value
E	market value of equity
EAR	effective annual rate
$EBIT$	earnings before interest and taxes
$EBITDA$	earnings before interest, taxes, depreciation, and amortization
EPS_t	earnings per share on date t
$E[R_i]$	expected return of security i
F, F_T	one-year and T-year forward exchange rate
FCF_t	free cash flow at date t
FV	future value, face value of a bond
g	growth rate
I	initial investment or initial capital committed to the project
Int_t	interest expense on date t
IRR	internal rate of return
K	strike price
k	interest coverage ratio, compounding periods per year
L	lease payment, market value of liabilities
ln	natural logarithm
MV_i	total market capitalization of security i
N	number of cash flows, terminal date, notational principal of a swap contract
N_i	number of shares outstanding of security i
$NPER$	annuity spreadsheet notation for the number of periods or dates of the last cash flow
NPV	net present value
P	price, initial principal or deposit, or equivalent present value, put option price
P_i	price of security i
P/E	price-earnings ratio
PMT	annuity spreadsheet notation for cash flow
PV	present value; annuity spreadsheet notation for the initial amount
q	dividend yield
p	risk-neutral probability
r	interest rate, discount rate of cost of capital
R_i	return of security i
R_{mkt}	return of the market portfolio
R_P	return on portfolio P
RATE	annuity spreadsheet notation for interest rate
r_E, r_D	equity and debt costs of capital
r_f	risk-free interest rate
r_i	required return or cost of capital of security i
r_U	unlevered cost of capital
r_{wacc}	weighted average cost of capital
S	stock price, spot exchange rate, value of all synergies
$SD(R_i)$	standard deviation (volatility) of return of security i
T	option expiration date, maturity date, market value of target
U	market value of unlevered equity
V_t	enterprise value on date t
$Var(R)$	variance of return R
x_i	portfolio weight of investment in i
YTC	yield to call on a callable bond
YTM	yield to maturity
α_i	alpha of security i
β_D, β_E	beta of debt or equity
β_i	beta of security i with respect to the market portfolio
β_s^P	beta of security i with respect to portfolio P
β_U	beta of unlevered firm
Δ	shares of stock in the replicating portfolio; sensitivity of option price to stock price
σ	volatility
τ	tax rate
τ_c	marginal corporate tax rate

Prepare, Apply, Confirm and Develop Employability Skills with MyLab Finance

MyLab™ Finance is an online homework, tutorial, and assessment program constructed to work with this text to engage students and improve results. It was designed to help students develop and assess the skills and applicable knowledge that they will need to succeed in their courses and their future careers.

85%

of students said MyLab Finance helped them earn higher grades on homework, exams, or the course

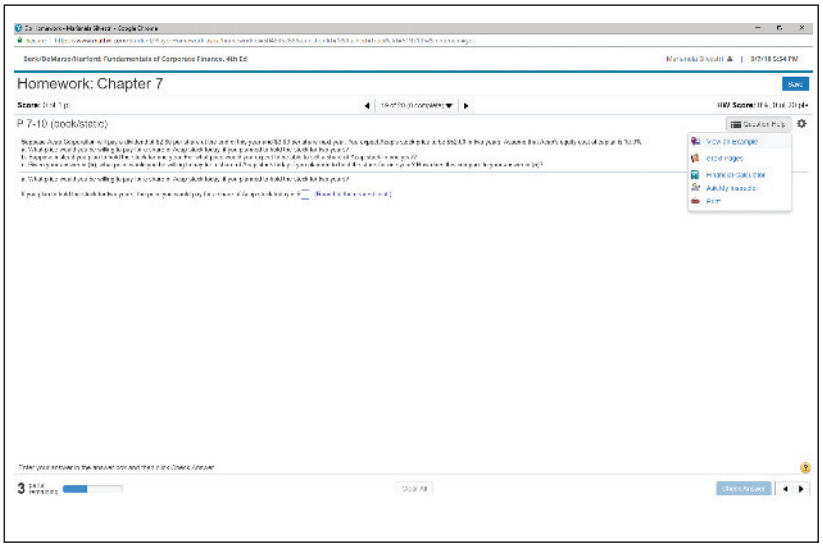
*Source: 2017 Student Survey, n 4703

See what more than 30,000 students had to say about MyLab Finance:

"MyLab Finance's primary benefit was that it helped me to learn how to solve problems and not just memorize information."

— Student,
Southern New Hampshire University

Question Help consists of homework and practice questions to give students unlimited opportunities to master concepts. **Learning aids** walk students through the problem—giving them assistance when they need it most.



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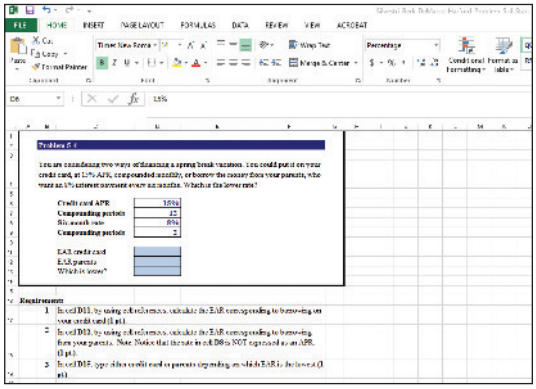
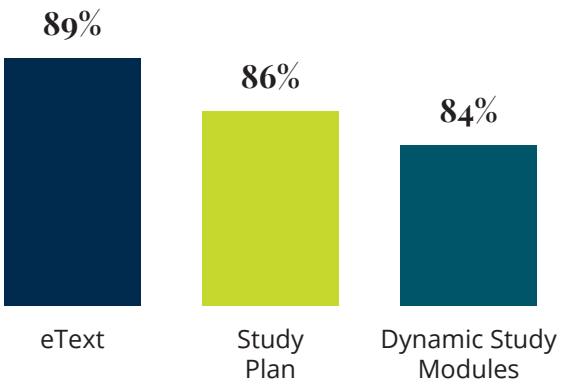
Using proven, field-tested technology, auto-graded **Excel Projects** allow instructors to seamlessly integrate Microsoft Excel® content into their course without having to manually grade spreadsheets. Students have the opportunity to practice important **finance skills** in Excel, helping them to master key concepts and gain proficiency with the program.



"I like how the 'give me an example' option works with the homework—it is nice to run through an example with guidance to learn how to solve these problems."

— Student, Virginia Polytechnic Institute and State University



% of students who found learning aid helpful

Dynamic Study Modules use the latest developments in cognitive science and help students study chapter topics by adapting to their performance in real time.

Pearson eText enhances student learning with engaging and interactive lecture and example videos that bring learning to life.

The **Gradebook** offers an easy way for you and your students to see their performance in your course.

85%

of students would tell their instructor to keep using MyLab Finance

For additional details visit: www.pearson.com/mylab/finance

CORPORATE FINANCE

FIFTH EDITION

JONATHAN BERK
STANFORD UNIVERSITY

PETER DEMARZO
STANFORD UNIVERSITY

Pearson

To Rebecca, Natasha, and Hannah, for the love and for being there —J. B.

To Kaui, Pono, Koa, and Kai, for all the love and laughter —P. D.

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Brief Contents

Detailed Contents

Bridging Theory and Practice

The Law of One Price as the Unifying Valuation Framework

The Law of One Price framework reflects the modern idea that the absence of arbitrage is the unifying concept of valuation. This critical insight is introduced in Chapter 3, revisited in each part opener, and integrated throughout the text—motivating all major concepts and connecting theory to practice.

GLOBAL FINANCIAL CRISIS European Sovereign Debt Yields: A Puzzle

Before the EMU created the euro as a single European currency, the yields of sovereign debt issued by European countries varied widely. These variations primarily reflected differences in inflation expectations and currency risk (see Figure 6.6). However, after the monetary union was put in place at the end of 1998, the yields all essentially converged to the yield on German government bonds. Investors seemed to conclude that there was little distinction between the debt of the European countries in the union—they seemed to feel that all countries in the union were essentially exposed to the same default, inflation and currency risk and thus equally "safe."

Presumably, investors believed that an outright default was unthinkable: They apparently believed that member countries would be fiscally responsible and manage their debt obligations to avoid default at all costs. But as illustrated by Figure 6.6, once the 2008 financial crisis revealed the folly of this assumption, debt yields once again diverged as investors acknowledged the likelihood that some countries (particularly Portugal and Ireland) might be unable to repay their debt and would be forced to default.

In retrospect, rather than bringing fiscal responsibility, the monetary union allowed the weaker member countries to borrow at dramatically lower rates. In response, these countries reacted by increasing their borrowing—and at least in Greece's case, borrowed to the point that default became inevitable.

Focus on the Financial Crisis and Sovereign Debt Crisis

Global Financial Crisis boxes reflect the reality of the recent financial crisis and ongoing sovereign debt crisis, noting lessons learned. Twenty-one boxes across the book illustrate and analyze key details.

Study Aids with a Practical Focus

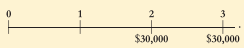
To be successful, students need to master the core concepts and learn to identify and solve problems that today's practitioners face.

COMMON MISTAKE Discounting One Too Many Times

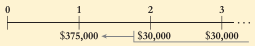
The perpetuity formula assumes that the first payment occurs at the end of the first period (at date 1). Sometimes perpetuities have cash flows that start later in the future. In this case, we can adapt the perpetuity formula to compute the present value, but we need to do so carefully to avoid a common mistake.

To illustrate, consider the MBA graduation party described in Example 4.7. Rather than starting immediately, suppose that the first party will be held two years from today (for the current entering class). How would this delay change the amount of the donation required?

Now the timeline looks like this:



We need to determine the present value of these cash flows, as it tells us the amount of money in the bank needed today to finance the future parties. We cannot apply the perpetuity formula directly, however, because these cash flows are not *exactly* a perpetuity as we defined it. Specifically, the cash flow in the first period is "missing." But consider the situation on date 1—at that point, the first party is one period away and then the cash flows are periodic. From the perspective of date 1, this *is* a perpetuity, and we can apply the formula. From the preceding calculation, we know we need $375,000 on date 1 to have enough to start the parties on date 2. We rewrite the timeline as follows:



Our goal can now be restated more simply: How much do we need to invest today to have $375,000 in one year? This is a simple present value calculation:

$$PV = \$375{,}000/1.08 = \$347{,}222 \text{ today}$$

A common mistake is to discount the $375,000 twice because the first party is in two periods. *Remember—the present value formula for the perpetuity already discounts the cash flows to one period prior to the first cash flow.* Keep in mind that this common mistake may be made with perpetuities, annuities, and all of the other special cases discussed in this section. All of these formulas discount the cash flows to one period prior to the first cash flow.

Common Mistakes boxes alert students to frequently made mistakes stemming from misunderstanding core concepts and calculations—in the classroom and in the field.

EXAMPLE 4.14 Evaluating an Annuity with Monthly Cash Flows

Problem

You are about to purchase a new car and have two options to pay for it. You can pay $20,000 in cash immediately, or you can get a loan that requires you to pay $500 each month for the next 48 months (four years). If the monthly interest rate you earn on your cash is 0.5%, which option should you take?

Solution

Let's start by writing down the timeline of the loan payments:

The timeline shows that the loan is a 48-period annuity. Using the annuity formula the present value is

$$PV(\text{48-period annuity of \$500}) = \$500 \times \frac{1}{0.005}\left(1 - \frac{1}{1.005^{48}}\right)$$
$$= \$21{,}290$$

Alternatively, we may use the annuity spreadsheet to solve the problem:

	NPER	RATE	PV	PMT	FV	Excel Formula
Given	48	0.50%		500	0	
Solve for PV			(21,290)			=PV(0.005,48,500,0)

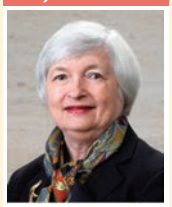
Thus, taking the loan is equivalent to paying $21,290 today, which is costlier than paying cash. You should pay cash for the car.

Worked Examples accompany every important concept using a step-by-step procedure that guides students through the solution process. Clear labels make them easy to find for help with homework and studying.

Applications that Reflect Real Practice

Corporate Finance features actual companies and leaders in the field.

INTERVIEW WITH
DR. JANET YELLEN



Dr. Janet L. Yellen served as the Chair of the Board of Governors of the Federal Reserve System from 2014 to 2018, and as Vice Chair from 2010 to 2014. Previously she was President and Chief Executive Officer of the Federal Reserve Bank of San Francisco; Chair of the White House Council of Economic Advisers under President Bill Clinton; and business professor at the University of California, Berkeley, Haas School of Business. She is currently Distinguished Fellow in Residence—Economic Studies, at The Brookings Institution's Hutchins Center on Fiscal and Monetary Policy.

QUESTION: *What are the main policy instruments used by central banks to control the economy, and how did they change as a result of the financial crisis?*

ANSWER: Before the financial crisis, short-term interest rates were the main tool of monetary policy. The Federal Reserve (The Fed) controlled these rates by adjusting the quantity of bank reserves (cash in the banking system) it made available. By purchasing or selling Treasury securities the Federal Reserve raised or lowered the available quantity of reserves and thereby controlled short-term interest rates.

In the aftermath of the crisis, short-term interest rates remain a prime tool of monetary policy, but they are now set in a different way and the quantity of reserves is an ... much larger—peaking at around $2.5 tril...

appropriate pace as the economy recovers and no longer needs the level of stimulus required post-crisis. The danger of raising rates too slowly is the risk of the economy overheating and inflation significantly overshooting the Fed's 2% target level; raising rates too quickly, on the other hand, could stall economic growth. As of March 2018, the Fed had raised rates six times, bringing the fed funds rate to almost 1.75%. It also began a gradual process of shrinking its massive balance sheet by diminishing its reinvestments of principal.

QUESTION: *In the last 10 years we have witnessed a period of very low interest rates. Is this a new norm, or do you think rates will eventually rise to their historic averages?*

ANSWER: The evidence suggests, and I concur, that low interest rates may be the "new norm" in developed countries. Short-term interest rates appeared to be falling in the United States and other developed countries even before the financial crisis. Estimates now place the "neutral rate"—the rate consistent with stable growth and low inflation—at a bit under 1% in real terms. Two key factors that influence the level of neutral rates are productivity growth and demographics. Productivity growth in most developed countries has been slow relative to the postwar period; at the same ti... growth

Interviews with notable practitioners—three new for this edition—highlight leaders in the field and address the effects of the financial crisis.

General Interest boxes highlight timely material from financial publications that shed light on business problems and real-company practices.

Teaching Students to Think Finance

With a consistency in presentation and an innovative set of learning aids, *Corporate Finance* simultaneously meets the needs of both future financial managers and non-financial managers. This textbook truly shows every student how to "think finance."

Simplified Presentation of Mathematics

One of the hardest parts of learning finance is mastering the jargon, math, and non-standardized notation. *Corporate Finance* systematically uses:

Notation Boxes: Each chapter opens by defining the variables and acronyms used in the chapter as a "legend" for students' reference.

Timelines: Introduced in Chapter 4, timelines are emphasized as the important first step in solving *every* problem that involves cash flows.

Numbered and Labeled Equations: The first time a full equation is given in notation form it is numbered. Key equations are titled and revisited in the chapter summary.

Using Excel Boxes: Provide hands-on instruction of Excel techniques and include screenshots to serve as a guide for students.

Spreadsheet Tables: Select tables are available as Excel files, enabling students to change inputs and manipulate the underlying calculations.

USING EXCEL

Excel's IRR Function

Excel also has a built-in function, IRR, that will calculate the IRR of a stream of cash flows. Excel's IRR function has the format, IRR (values, guess), where "values" is the range containing the cash flows, and "guess" is an optional starting guess where Excel begins its search for an IRR. See the example below:

	A	B	C	D	E
1	Period	0	1	2	3
2	Cash Flow C_t	(1,000.0)	300.0	400.0	500.0
3	IRR	8.9% =IRR(B2:E2)			

Source: Microsoft Corporation

There are three things to note about the IRR function. First, the values given to the IRR function should include all of the cash flows of the project, including the one at date 0. In this sense, the IRR and NPV functions in Excel are inconsistent. Second, like the NPV function, the IRR ignores the period associated with any blank cells. Finally, as we will discuss in Chapter 7, in some settings the IRR function may fail to find a solution, or may give a different answer, depending on the initial guess.

TABLE 8.1 SPREADSHEET HomeNet's Incremental Earnings Forecast

	Year	0	1	2	3	4	5
Incremental Earnings Forecast ($000s)							
1	Sales	—	26,000	26,000	26,000	26,000	—
2	Cost of Goods Sold	—	(11,000)	(11,000)	(11,000)	(11,000)	—
3	**Gross Profit**	—	15,000	15,000	15,000	15,000	—
4	Selling, General, and Administrative	—	(2,800)	(2,800)	(2,800)	(2,800)	—
5	Research and Development	(15,000)	—	—	—	—	—
6	Depreciation	—	(1,500)	(1,500)	(1,500)	(1,500)	(1,500)
7	**EBIT**	(15,000)	10,700	10,700	10,700	10,700	(1,500)
8	Income Tax at 20%	3,000	(2,140)	(2,140)	(2,140)	(2,140)	300
9	**Unlevered Net Income**	**(12,000)**	**8,560**	**8,560**	**8,560**	**8,560**	**(1,200)**

Practice Finance to Learn Finance

Working problems is the proven way to cement and demonstrate an understanding of finance.

Concept Check questions at the end of each section enable students to test their understanding and target areas in which they need further review.

End-of-chapter problems written personally by Jonathan Berk and Peter DeMarzo offer instructors the opportunity to assign first-rate materials to students for homework and practice with the confidence that the problems are consistent with chapter content. Both the problems and solutions, which also were written by the authors, have been class-tested and accuracy-checked to ensure quality.

Data Cases present in-depth scenarios in a business setting with questions designed to guide students' analysis. Many questions involve the use of Internet resources and Excel techniques.

Data Case

This is your second interview with a prestigious brokerage firm for a job as an equity analyst. You survived the morning interviews with the department manager and the Vice President of Equity. Everything has gone so well that they want to test your ability as an analyst. You are seated in a room with a computer and a list with the names of two companies—Ford (F) and Microsoft (MSFT). You have 90 minutes to complete the following tasks:

1. Download the annual income statements, balance sheets, and cash flow statements for the last four fiscal years from MarketWatch (www.morningstar.com). Enter each company's stock symbol and then go to "financials." Export the statements to Excel by clicking the export button.
2. Find historical stock prices for each firm from Yahoo! Finance (finance.yahoo.com). Enter your stock symbol, click "Historical Prices" in the left column, and enter the proper date range to cover the last day of the month corresponding to the date of each financial statement. Use the closing stock prices (not the adjusted close). To calculate the firm's market capitalization at each date, multiply the number of shares outstanding (see "Basic" on the income statement under "Weighted Average Shares Outstanding") by the firm's historic stock price.
3. For each of the four years of statements, compute the following ratios for each firm:

Valuation Ratios
Price-Earnings Ratio (for EPS use Diluted EPS Total)
Market-to-Book Ratio
Enterprise Value-to-EBITDA
(For debt, include long-term and short-term debt; for cash, include marketable securities.)

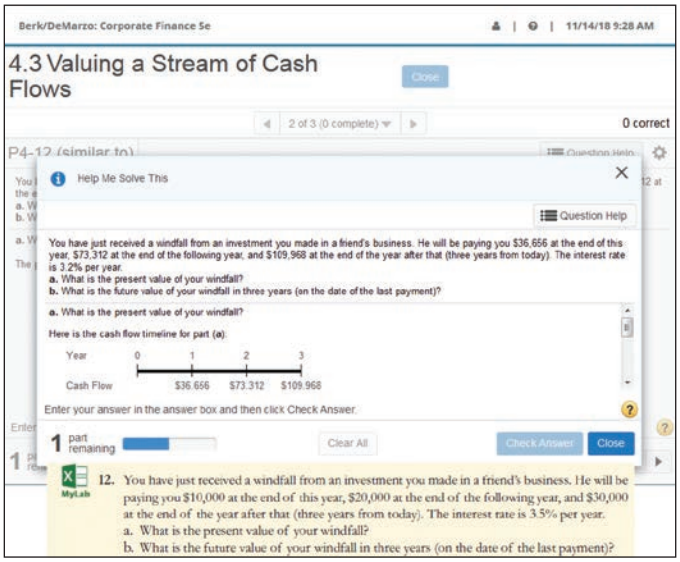
Profitability Ratios
Operating Margin
Net Profit Margin

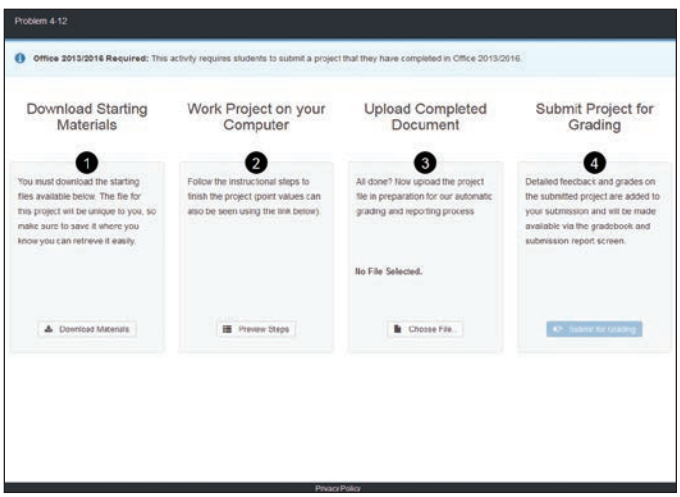
MyLab Finance

Because practice with homework problems is crucial to learning finance, *Corporate Finance* is available with **MyLab Finance**, a fully integrated homework and tutorial system. **MyLab Finance** revolutionizes homework and practice with material written and developed by Jonathan Berk and Peter DeMarzo.

Online Assessment Using End-of-Chapter Problems

The seamless integration among the textbook, assessment materials, and online resources sets a new standard in corporate finance education.





- **End-of-chapter problems**—every single one—appear online. The values in the problems are algorithmically generated, giving students many opportunities for practice and mastery. Problems can be assigned by professors and completed online by students.
- **Helpful tutorial tools,** along with the same pedagogical aids from the text, support students as they study. Links to the eText direct students right to the material they most need to review.
- **Interactive Figures—**Select in-text graphs and figures—covering topics such as bonds, stock valuation, NPV, and IRR—have been digitally enhanced to allow students to interact with variables to affect outcomes and bring concepts to life.

Additional Resources in MyLab Finance

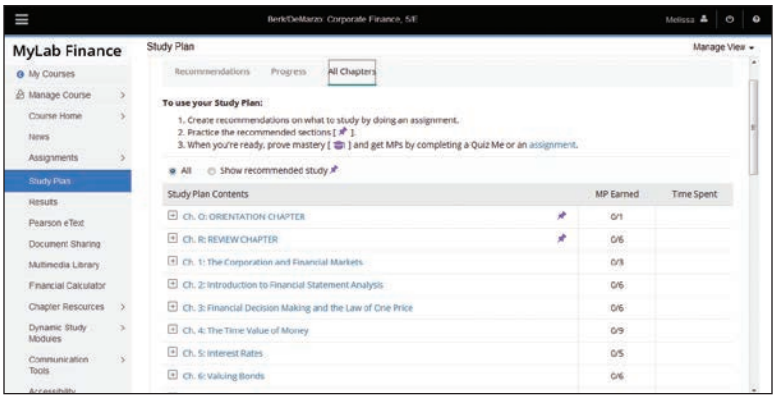
- **Auto-Graded Excel Projects—**Using proven, field-tested technology, **MyLab Finance**'s auto-graded Excel Projects allow instructors to seamlessly integrate Excel content into their course. without having to manually grade spreadsheets. Students have the opportunity to practice important finance skills in Excel, helping them to master key concepts and gain proficiency with the program. End-of-chapter problems identified with an icon **MyLab Finance** indicate Excel Projects problems assignable in **MyLab Finance**.
- **Finance in the News** provides weekly postings of a relevant and current article from a newspaper or journal article with discussion questions that are assignable in **MyLab Finance**.
- **Author Solution Videos** walk through the in-text examples using math, the financial calculator, and spreadsheets.

To learn more about **MyLab Finance**, contact your local Pearson representative, https://www.pearson.com/us/contact-us/find-your-rep.html, or visit www.pearson.com/mylab/finance.

Improving Results

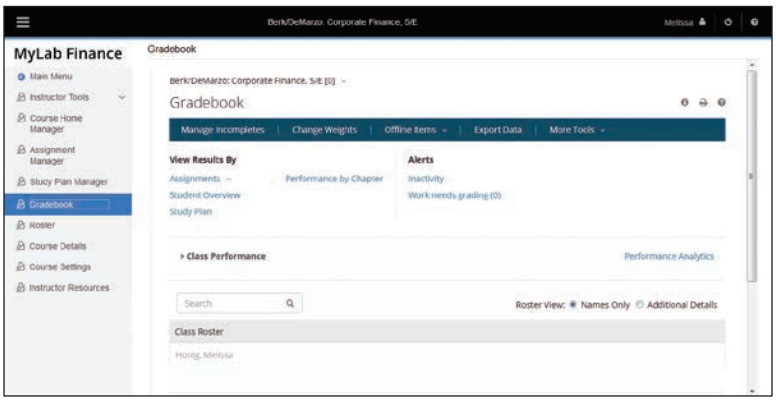
Hands-On, Targeted Practice

Students can take pre-built Practice Tests for each chapter, and their test results will generate an individualized Study Plan. With the Study Plan, students learn to focus their energies on the topics they need to be successful in class, on exams, and, ultimately, in their careers.



Powerful Instructor Tools

MyLab Finance provides flexible tools that enable instructors to easily customize the online course materials to suit their needs.



- **Easy-to-Use Homework Manager.** Instructors can easily create and assign tests, quizzes, or graded homework assignments. In addition to pre-built **MyLab Finance** questions, the Test Bank is also available so that instructors have ample material with which to create assignments.
- **Flexible Gradebook.** **MyLab Finance** saves time by automatically grading students' work and tracking results in an online Gradebook.
- **Downloadable Classroom Resources.** Instructors also have access to online versions of each instructor supplement, including the Instructor's Manual, Solutions Manual, PowerPoint Lecture Notes, and Test Bank.

To learn more about **MyLab Finance**, contact your local Pearson representative, https://www.pearson.com/us/contact-us/find-your-rep.html, or visit www.pearson.com/mylab/finance.

About the Authors

Jonathan Berk is the A.P. Giannini Professor of Finance at the Graduate School of Business, Stanford University and is a Research Associate at the National Bureau of Economic Research. Before coming to Stanford, he was the Sylvan Coleman Professor of Finance at Haas School of Business at the University of California, Berkeley. Prior to earning his Ph.D., he worked as an Associate at Goldman Sachs (where his education in finance really began).

Professor Berk's research interests in finance include corporate valuation, capital structure, mutual funds, asset pricing, experimental economics, and labor economics. His work has won a number of research awards including the Stephen A. Ross Prize in Financial Economics, TIAA-CREF Paul A. Samuelson Award, the Smith Breeden Prize, Best Paper of the Year in *The Review of Financial Studies,* and the FAME Research Prize. His paper, "A Critique of Size-Related Anomalies," was selected as one of the two best papers ever published in *The Review of Financial Studies.* In recognition of his influence on the practice of finance he has received the Bernstein-Fabozzi/Jacobs Levy Award, the Graham and Dodd Award of Excellence, and the Roger F. Murray Prize. He served two terms as an Associate Editor of the *Journal of Finance,* and a term as a director of the American Finance Association, the Western Finance Association, and academic director of the Financial Management Association. He is a Fellow of the Financial Management Association and a member of the advisory board of the *Review of Finance* and the *Journal of Portfolio Management.*

Peter DeMarzo and Jonathan Berk

Born in Johannesburg, South Africa, Professor Berk has two daughters, and is an avid skier and biker.

Peter DeMarzo is the Staehelin Family Professor of Finance at the Graduate School of Business, Stanford University. He is the current President of the American Finance Association and a Research Associate at the National Bureau of Economic Research. He teaches MBA and Ph.D. courses in Corporate Finance and Financial Modeling. In addition to his experience at the Stanford Graduate School of Business, Professor DeMarzo has taught at the Haas School of Business and the Kellogg Graduate School of Management, and he was a National Fellow at the Hoover Institution.

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Professor DeMarzo was born in Whitestone, New York, and is married with three boys. He and his family enjoy hiking, biking, and skiing.

Preface

IT IS HARD TO BELIEVE HOW MUCH TIME HAS PASSED since we first sat down together and conceived of this book. We have now published 5 editions and reached well over a million students. We were originally motivated to write this textbook by a central insight: The core concepts in finance are simple and intuitive. What makes the subject challenging is that it is often difficult for a novice to distinguish between these core ideas and other intuitively appealing approaches that, if used in financial decision making, will lead to incorrect decisions. Nothing has changed in the intervening years. De-emphasizing the core concepts that underlie finance strips students of the essential intellectual tools they need to differentiate between good and bad decision making. The book's continued success is a testament to the value of this approach.

We present corporate finance as an application of a set of simple, powerful ideas. At the heart is the principal of the absence of arbitrage opportunities, or Law of One Price—*in life, you don't get something for nothing*. This simple concept is a powerful and important tool in financial decision making. By relying on it, and the other core principles in this book, financial decision makers can avoid the bad decisions brought to light by the financial crisis and still ongoing every day. We use the Law of One Price as a compass; it keeps financial decision makers on the right track and is the backbone of the entire book.

New to This Edition

We have updated all text discussions and figures, tables, data cases, and facts to accurately reflect developments in the field in the last few years. Specific highlights include the following:

- Updates made throughout the text to reflect the Tax Cuts and Jobs Act of 2017. Extensive updates made to Chapter 8 (Fundamentals of Capital Budgeting), Chapter 15 (Debt and Taxes), and Chapter 31 (International Corporate Finance).
- Added discussion of Finance and Technology (Fintech) in Chapter 1 (The Corporation and Financial Markets).
- Added three new interviews with practitioners: Janet L. Yellen in Chapter 5 (Interest Rates), Susan Athey in Chapter 9 (Valuing Stocks), and Anne Martin in Chapter 11 (Optimal Portfolio Choice and the Capital Asset Pricing Model).
- Added discussion of cryptocurrency valuation in Chapter 9 (Valuing Stocks).
- Added discussion of "Smart Beta" in Chapter 13 (Investor Behavior and Capital Market Efficiency)
- Incorporated new and/or revised features throughout, including Common Mistakes, Global Financial Crisis, Nobel Prize, and General Interest boxes, as well as Examples.
- Added two new Data Cases (on bitcoin in Ch. 3, corporate yield curves in Ch. 6) and extensively revised many others; added new and revised problems, once again personally writing and solving each one. In addition, every single problem is available in **MyLab Finance**, the groundbreaking homework and tutorial system that accompanies the book.
- Updated tables and figures to reflect current data.

The Law of One Price as a Unifying Principle of Valuation

This book presents corporate finance as an application of a small set of simple core ideas. Modern finance theory and practice is grounded in the idea of the absence of arbitrage—or the Law of One Price—as the unifying concept in valuation. We introduce the Law of One Price concept as the basis for NPV and the time value of money in Chapter 3, Financial Decision Making and the Law of One Price. In the opening of each part and as pertinent throughout the remaining chapters, we relate major concepts to the Law of One Price, creating a framework to ground the student reader and connect theory to practice.

Table of Contents Overview

Corporate Finance offers coverage of the major topical areas for introductory-level MBA students as well as the depth required in a reference textbook for upper-division courses. Most professors customize their classes by selecting a subset of chapters reflecting the subject matter they consider most important. We designed this book from the outset with this need for flexibility in mind. Parts 2 through 6 are the core chapters in the book. We envision that most MBA programs will cover this material—yet even within these core chapters instructors can pick and choose.

Single quarter course: Cover Chapters 3–15; if time allows, or students are previously familiar with the time value of money, add on Chapters 16 –19.

Semester-long course: Incorporate options (Chapters 20–22) and Part 10, *Special Topics,* chapters as desired.

Single mini-semester: Assign Chapters 3–10, 14, and 15 if time allows.

Chapter	Highlights and Changes
1 The Corporation and Financial Markets	Introduces the corporation and its governance; updated the Dodd-Frank Act information; new section on Finance and Technology (Fintech)
2 Introduction to Financial Statement Analysis	Introduces key financial statements; coverage of financial ratios is centralized to prepare students to analyze financial statements holistically
3 Financial Decision Making and the Law of One Price	Introduces the Law of One Price and net present value as the basis of the book's unifying framework; new Data Case on arbitraging bitcoin
4 The Time Value of Money	Introduces the mechanics of discounting with applications to personal finance; Using Excel boxes familiarizes students with spreadsheet functionality
5 Interest Rates	Discusses key determinants of interest rates and their relation to the cost of capital; new Interview with Janet L. Yellen, former Chair of the Board of Governors of the Federal Reserve System
6 Valuing Bonds	Analyzes bond prices and yields, as well as the risk of fixed-income securities as illustrated by the sovereign debt crisis; expanded Global Financial Crisis box on negative bond yields; new Data Case on corporate yield curves
7 Investment Decision Rules	Introduces the NPV rule as the "golden rule" against which we evaluate other investment decision rules; introduces the use of Data Tables for sensitivity analysis
8 Fundamentals of Capital Budgeting	Provides a clear focus on the distinction between earnings and free cash flow, and shows how to build a financial model to assess the NPV of an investment decision (including tips on using Excel); new Common Mistake box on corporate tax rates and investment; extensive updates to align with the Tax Cuts and Jobs Act

Chapter	Highlights and Changes
9 Valuing Stocks	Provides a unifying treatment of projects within the firm and the valuation of the firm as a whole; new box on cryptocurrencies and financial bubbles; new interview with Susan Athey, Economics of Technology Professor at the Stanford Graduate School of Business
10 Capital Markets and the Pricing of Risk	Establishes the intuition for understanding risk and return, explains the distinction between diversifiable and systematic risk, and introduces beta and the CAPM; extensive data updates throughout to reflect current market conditions
11 Optimal Portfolio Choice and the Capital Asset Pricing Model	Presents the CAPM and develops the details of mean-variance portfolio optimization; new interview with Anne Martin, Wesleyan University Chief Investment Officer; updated examples and Data Case
12 Estimating the Cost of Capital	Demonstrates the practical details of estimating the cost of capital for equity, debt, or a project, and introduces asset betas, and the unlevered and weighted-average cost of capital; Using Excel box on estimating beta
13 Investor Behavior and Capital Market Efficiency	Examines the role of behavioral finance and ties investor behavior to the topic of market efficiency and alternative models of risk and return; expanded discussion of fund manager performance; new Nobel Prize box on Behavioral Finance; new discussion of "Smart Beta"
14 Capital Structure in a Perfect Market	Presents Modigliani and Miller's results and introduces the market value balance sheet, discussion of important leverage fallacies with application to bank capital regulation
15 Debt and Taxes	Analyzes the tax benefits of leverage, including the debt tax shield and the after-tax WACC; new Common Mistake box on how to save for retirement; extensive updates to align with the Tax Cuts and Jobs Act
16 Financial Distress, Managerial Incentives, and Information	Examines the role of asymmetric information and introduces the debt overhang and leverage ratchet effect; new Nobel Prize box on markets with asymmetric information and adverse selection
17 Payout Policy	Considers alternative payout policies including dividends and share repurchases; analyzes the role of market imperfections in determining the firm's payout policy; updated discussion of corporate cash retention
18 Capital Budgeting and Valuation with Leverage	Develops in depth the three main methods for capital budgeting with leverage and market imperfections: the weighted average cost of capital (WACC) method, the adjusted present value (APV) method, and the flow-to-equity (FTE) method; appendix explains the relation between DCF and residual income valuation methods
19 Valuation and Financial Modeling: A Case Study	Builds a financial model for a leveraged acquisition; Using Excel box "Summarizing Model Outputs"
20 Financial Options	Introduces the concept of financial options, how they are used and exercised; demonstrates how corporate securities may be interpreted using options
21 Option Valuation	Develops the binomial, Black-Scholes, and risk-neutral pricing methods for option pricing
22 Real Options	Analyzes real options using decision tree and Black-Scholes methods, and considers the optimal staging of investment; discussion of decision tree methodology with examples
23 Raising Equity Capital	Overview of the stages of equity financing, from angel financing and venture capital to IPO to seasoned equity offerings; expanded coverage of venture capital financing including common deal terms and protections as well as an illustration of typical funding patterns and success rates; new General Interest box on an alternative to the traditional IPO
24 Debt Financing	Overview of debt financing, including a discussion of asset-backed securities and their role in the financial crisis
25 Leasing	Introduces leasing as an alternative form of levered financing; update on new FASB rules for lease accounting; new Example on leasing to avoid debt overhang

Chapter	Highlights and Changes
26 Working Capital Management	Introduces the Cash Conversion Cycle and methods for managing working capital
27 Short-Term Financial Planning	Develops methods for forecasting and managing short-term cash needs
28 Mergers and Acquisitions	Considers motives and methods for mergers and acquisitions, including leveraged buyouts; expanded discussion of valuation and premiums paid
29 Corporate Governance	Evaluates direct monitoring, compensation policies, and regulation as methods to manage agency conflicts within the firm; addresses impact of Dodd-Frank Act; discussion of shareholder activism and its recent impact on corporate governance; new Common Mistake box on celebrity boards
30 Risk Management	Analyzes the methods and motives for the use of insurance, commodity futures, currency forwards and options, and interest rate swaps to hedge risk
31 International Corporate Finance	Analyzes the valuation of projects with foreign currency cash flows with integrated or segregated capital markets; extensive updates to align with the Tax Cuts and Jobs Act

A Complete Instructor and Student Support Package

MyLab Finance

A critical component of the text, **MyLab Finance** will give all students the practice and tutorial help they need to succeed. For more details, see pages xix.

Instructor's Resource Center

This password-protected site, accessible at www.pearsonhighered.com/irc, hosts all of the instructor resources that follow. Instructors should click on the "Request Access" link for easy-to-follow access instructions or may contact their sales representative for further information.

Solutions Manual

- Prepared by Jonathan Berk and Peter DeMarzo.
- Provides detailed, accuracy-verified, class-tested solutions to every chapter Problem.

Instructor's Manual

- Written by Janet Payne of Texas State University.
- Corresponding to each chapter, provides: chapter overview and outline correlated to the PowerPoint Lecture Notes; learning objectives; guide to fresh worked examples in the PowerPoint Lecture Notes; and listing of chapter problems with accompanying Excel spreadsheets.

Test Bank

- Revised by Michael Woodworth.
- Provides a wide selection of multiple-choice, short answer, and essay questions qualified by difficulty level and skill type and correlated to chapter topics. Numerical-based Problems include step-by-step solutions.
- Available as Computerized Test Bank in TestGen.

PowerPoint Lecture Presentation

- Authored by William Chittenden of Texas State University.

- Offers outlines of each chapter with graphs, tables, key terms, and concepts from each chapter.
- Worked examples provide detailed, step-by-step solutions in the same format as the boxes from the text and correlated to parallel specific textbook examples.

Videos

- Author Solution Videos that walk through the in-text examples using math, the financial calculator, and spreadsheets.
- Available in **MyLab Finance**.

Acknowledgments

With five editions behind us, we are heartened by the book's success and its impact on the profession by shaping future practitioners. As any textbook writer will tell you, achieving this level of success requires a substantial amount of help. First and foremost we thank Donna Battista, whose leadership, talent, and market savvy are imprinted on all aspects of the project and are central to its more than 10 years of success; Denise Clinton, a friend and a leader in fact not just in name, whose experience and knowledge were indispensable in the earliest stages; Rebecca Ferris-Caruso, for her unparalleled expertise in managing the complex writing, reviewing, and editing processes and patience in keeping us on track—it is impossible to imagine writing the first edition without her; Jami Minard, for spearheading marketing efforts; Kate Fernandes, for her energy and fresh perspective as our former editor; Miguel Leonarte, for his central role on **MyLab Finance**; and Gina Linko for getting the book from draft pages into print. We were blessed to be approached by the best publisher in the business and we are both truly thankful for the indispensable help provided by these and other professionals, including Catherine Cinque, Meredith Gertz, Melissa Honig, and Carol Melville.

Updating a textbook like ours requires a lot of painstaking work, and there are many who have provided insights and input along the way. We would especially like to call out Jared Stanfield for his important contributions and suggestions throughout. We're also appreciative of Marlene Bellamy's work conducting the lively interviews that provide a critically important perspective, and to the interviewees who graciously provided their time and insights.

Of course, this fifth edition text is built upon the shoulders of the first four, and we have many to thank for helping us make those early versions a reality. We remain forever grateful for Jennifer Koski's critical insights, belief in this project, and tireless effort, all of which were critical to the first edition. Many of the later, non-core chapters required specific detailed knowledge. Nigel Barradale, Reid Click, Jarrad Harford, and Marianne Plunkert ensured that this knowledge was effectively communicated. Joseph Vu and Vance P. Lesseig contributed their talents to the Concept Check questions and Data Cases, respectively.

Creating a truly error-free text is a challenge we could not have lived up to without our team of expert error checkers; we owe particular thanks to Sukarnen Suwanto, Siddharth Bellur, Robert James, Anand Goel, Ian Drummond Gow, Janet Payne, and Jared Stanfield. Thomas Gilbert and Miguel Palacios tirelessly worked examples and problems in the first edition, while providing numerous insights along the way.

A corporate finance textbook is the product of the talents and hard work of many talented colleagues. We are especially gratified with the work of those who updated the impressive array of supplements to accompany the book: Janet Payne for the Instructor's Manual; William Chittenden for the PowerPoint; Michael Woodworth for the Test Bank; and Carlos Bazan for his accuracy review of the Solutions Manual.

As a colleague of both of us, Mark Rubinstein inspired us with his passion to get the history of finance right by correctly attributing the important ideas to the people who first enunciated them. We have used his book, *A History of the Theory of Investments: My Annotated Bibliography,* extensively in this text and we, as well as the profession as a whole, owe him a debt of gratitude for taking the time to write it all down.

We could not have written this text if we were not once ourselves students of finance. As any student knows, the key to success is having a great teacher. In our case we are lucky to have been taught and advised by the people who helped create modern finance: Ken Arrow, Darrell Duffie, Mordecai Kurz, Stephen Ross, and Richard Roll. It was from them that we learned the importance of the core principles of finance, including the Law of One Price, on which this book is based. The learning process does not end at graduation and like most people we have had especially influential colleagues and mentors from which we learned a great deal during our careers and we would like to recognize them explicitly here: Mike Fishman, Richard Green, Vasant Naik, Art Raviv, Mark Rubinstein, Joe Williams, and Jeff Zwiebel. We continue to learn from all of our colleagues and we are grateful to all of them. Finally, we would like to thank those with whom we have taught finance classes over the years: Anat Admati, Ming Huang, Dirk Jenter, Robert Korajczyk, Paul Pfleiderer, Sergio Rebelo, Richard Stanton, and Raman Uppal. Their ideas and teaching strategies have without a doubt influenced our own sense of pedagogy and found their way into this text.

Finally, and most importantly, we owe our biggest debt of gratitude to Rebecca Schwartz and Kaui Chun DeMarzo. Little did we (or they) know how much this project would impact our lives, and without their love and support—and especially their patience and understanding—this text could not have been completed. We owe a special thanks to Kaui DeMarzo, for her inspiration and support at the start of this project, and for her willingness to be our in-house editor, contributor, advisor, and overall sounding-board throughout each stage of its development.

Jonathan Berk
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We are truly thankful to have had so many manuscript reviewers, class testers, and focus group participants. We list all of these contributors below, but Gordon Bodnar, James Conover, Anand Goel, James Linck, Evgeny Lyandres, Marianne Plunkert, Mark Simonson, and Andy Terry went so far beyond the call of duty that we would like to single them out.

We are very grateful for all comments—both informal and in written evaluations—from Fourth Edition users. We carefully weighed each reviewer suggestion as we sought to streamline the narrative to improve clarity and add relevant new material. The book has benefited enormously for this input.

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PART

1

Introduction

WHY STUDY CORPORATE FINANCE? No matter what your role in a corporation, an understanding of why and how financial decisions are made is essential. Even the best and most innovative business ideas require an investment of resources. The tools of finance allow you to assess whether that investment is worthwhile, how it might be improved, and how it might be funded. And while the main focus of this book is how to make optimal corporate financial decisions, along the way you will learn skills that will guide you in your personal financial decisions as well.

In this part of the book, we lay the foundation for our study of corporate finance. We begin, in Chapter 1, by introducing the corporation and related business forms. We then examine the role of financial managers and outside investors in decision making for the firm. To make optimal decisions, a decision maker needs information. As a result, in Chapter 2, we review an important source of information for corporate decision-making—the firm's financial statements.

We then introduce the most important idea in this book, the concept of *the absence of arbitrage* or *Law of One Price* in Chapter 3. The Law of One Price allows us to use market prices to determine the value of an investment opportunity to the firm. We will demonstrate that the Law of One Price is the one unifying principle that underlies all of financial economics and links all of the ideas throughout this book. We will return to this theme throughout our study of Corporate Finance.

CHAPTER

1

The Corporation and Financial Markets

THE MODERN U.S. CORPORATION WAS BORN IN A COURTROOM in Washington, D.C., on February 2, 1819. On that day the U.S. Supreme Court established the legal precedent that the property of a corporation, like that of a person, is private and entitled to protection under the U.S. Constitution. Today, it is hard to entertain the possibility that a corporation's private property would not be protected under the Constitution. However, before the 1819 Supreme Court decision, the owners of a corporation were exposed to the possibility that the state could take their business. This concern was real enough to stop most businesses from incorporating and, indeed, in 1816 that concern was realized: The state seized Dartmouth College.

Dartmouth College was incorporated in 1769 as a private educational institution governed by a self-perpetuating board of trustees. Unhappy with the political leanings of the board, the state legislature effectively took control of Dartmouth by passing legislation in 1816 that established a governor-appointed board of overseers to run the school. The legislation had the effect of turning a private university under private control into a state university under state control. If such an act were constitutional, it implied that any state (or the federal government) could, at will, nationalize any corporation.

Dartmouth sued for its independence and the case made it to the Supreme Court under Chief Justice John Marshall in 1818. In a nearly unanimous 5–1 decision, the court struck down the New Hampshire law, ruling that a corporation was a "contract" and that, under Article 1 of the Constitution, "the state legislatures were forbidden to pass any law impairing the obligation of contracts."[1] The precedent was set: Owners of businesses could incorporate and still enjoy the protection of private property, as well as protection from seizure, both guaranteed by the U.S. Constitution. The modern business corporation was born.

[1] The full text of John Marshall's decision can be found at https://www.law.cornell.edu/supremecourt/text/17/518.

Today, the corporate structure is ubiquitous all over the world, and continues to evolve in the face of new forces. For example, in 2008, the financial crisis transformed the financial landscape, bringing down giants like Bear Stearns, Lehman Brothers, and AIG and reshaping investment banks like Goldman Sachs into government-guaranteed commercial banks. Government bailouts of institutions such as General Motors and AIG have provoked challenging questions regarding the role of the federal government in the control and management of private corporations. In the wake of that crisis, significant reforms of the regulation and oversight of financial markets were passed into law. And though the crisis has now passed, new political agendas and global tensions continue to reshape the practice of business, so that understanding the principles of corporate finance remains as important as ever.

The focus of this book is on how people in corporations make financial decisions. This chapter introduces the corporation and explains alternative business organizational forms. A key factor in the success of corporations is the ability to easily trade ownership shares, and so we will also explain the role of stock markets in facilitating trading among investors in a corporation and the implications that has for the ownership and control of corporations.

1.1 The Four Types of Firms

We begin our study of corporate finance by introducing the four major types of firms: *sole proprietorships*, *partnerships*, *limited liability companies*, and *corporations*. We explain each organizational form in turn, but our primary focus is on the most important form—the corporation. In addition to describing what a corporation is, we also provide an overview of why corporations are so successful.

Sole Proprietorships

A **sole proprietorship** is a business owned and run by one person. Sole proprietorships are usually very small with few, if any, employees. Although they do not account for much sales revenue in the economy, they are the most common type of firm in the world, as shown in Figure 1.1. Statistics indicate that nearly 72% of businesses in the United States are sole proprietorships, although they generate only 4% of the revenue.[2] Contrast this with corporations, which make up under 18% of firms but are responsible for 82% of U.S. revenue.

Sole proprietorships share the following key characteristics:

1. Sole proprietorships are straightforward to set up. Consequently, many new businesses use this organizational form.
2. The principal limitation of a sole proprietorship is that there is no separation between the firm and the owner—the firm can have only one owner. If there are other investors, they cannot hold an ownership stake in the firm.
3. The owner has unlimited personal liability for any of the firm's debts. That is, if the firm defaults on any debt payment, the lender can (and will) require the owner to repay the loan from personal assets. An owner who cannot afford to repay the loan must declare personal bankruptcy.

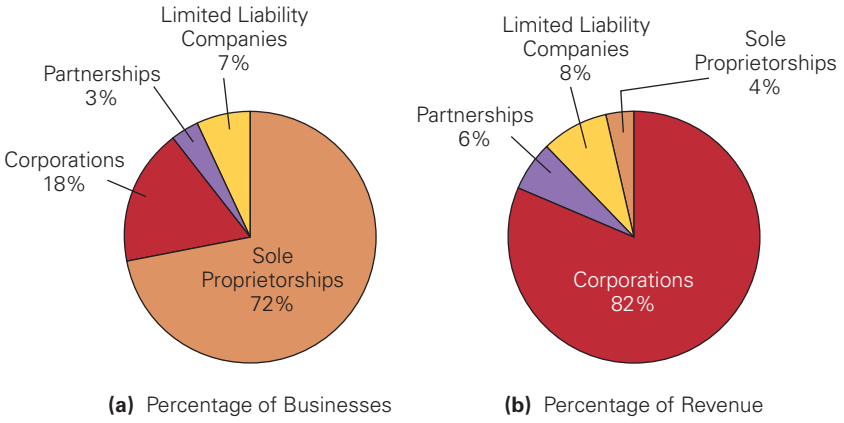
[2] www.irs.gov (www.irs.gov/uac/SOI-Tax-Stats-Integrated-Business-Data)

FIGURE 1.1

Types of U.S. Firms

There are four different types of firms in the United States. As (a) and (b) show, although the majority of U.S. firms are sole proprietorships, they generate only a small fraction of total revenue, in contrast to corporations.

Source: www.irs.gov



(a) Percentage of Businesses **(b)** Percentage of Revenue

4. The life of a sole proprietorship is limited to the life of the owner. It is also difficult to transfer ownership of a sole proprietorship.

For most businesses, the disadvantages of a sole proprietorship outweigh the advantages. As soon as the firm reaches the point at which it can borrow without the owner agreeing to be personally liable, the owners typically convert the business into a form that limits the owner's liability.

Partnerships

A **partnership** is identical to a sole proprietorship except it has more than one owner. The following are key features of a partnership:

1. *All* partners are liable for the firm's debt. That is, a lender can require *any* partner to repay all the firm's outstanding debts.
2. The partnership ends on the death or withdrawal of any single partner, although partners can avoid liquidation if the partnership agreement provides for alternatives such as a buyout of a deceased or withdrawn partner.

Some old and established businesses remain partnerships or sole proprietorships. Often these firms are the types of businesses in which the owners' personal reputations are the basis for the businesses. For example, law firms, groups of doctors, and accounting firms are often organized as partnerships. For such enterprises, the partners' personal liability increases the confidence of the firm's clients that the partners will strive to maintain their reputation.

A **limited partnership** is a partnership with two kinds of owners, general partners and limited partners. General partners have the same rights and privileges as partners in a (general) partnership—they are personally liable for the firm's debt obligations. Limited partners, however, have **limited liability**—that is, their liability is limited to their investment. Their private property cannot be seized to pay off the firm's outstanding debts. Furthermore, the death or withdrawal of a limited partner does not dissolve the partnership, and a limited partner's interest is transferable. However, a limited partner has no management authority and cannot legally be involved in the managerial decision making for the business.

Private equity funds and venture capital funds are two examples of industries dominated by limited partnerships. In these firms, a few general partners contribute some of their own capital and raise additional capital from outside investors who are limited partners. The general partners control how all the capital is invested. Most often they will actively participate in running the businesses they choose to invest in. The outside investors play no active role in the partnership other than monitoring how their investments are performing.

Limited Liability Companies

A **limited liability company (LLC)** is a limited partnership without a general partner. That is, all the owners have limited liability, but unlike limited partners, they can also run the business.

The LLC is a relatively new phenomenon in the United States. The first state to pass a statute allowing the creation of an LLC was Wyoming in 1977; the last was Hawaii in 1997. Internationally, companies with limited liability are much older and established. LLCs rose to prominence first in Germany over 100 years ago as a *Gesellschaft mit beschränkter Haftung* (GmbH) and then in other European and Latin American countries. An LLC is known in France as a *Société à responsabilité limitée* (SARL), and by similar names in Italy (SRL) and Spain (SL).

Corporations

The distinguishing feature of a **corporation** is that it is a legally defined, artificial being (a judicial person or legal entity), separate from its owners. As such, it has many of the legal powers that people have. It can enter into contracts, acquire assets, incur obligations, and, as we have already established, it enjoys protection under the U.S. Constitution against the seizure of its property. Because a corporation is a legal entity separate and distinct from its owners, it is solely responsible for its own obligations. Consequently, the owners of a corporation (or its employees, customers, etc.) are not liable for any obligations the corporation enters into. Similarly, the corporation is not liable for any personal obligations of its owners.

Formation of a Corporation. Corporations must be legally formed, which means that the state in which it is incorporated must formally give its consent to the incorporation by chartering it. Setting up a corporation is therefore considerably more costly than setting up a sole proprietorship. Delaware has a particularly attractive legal environment for corporations, so many corporations choose to incorporate there. For jurisdictional purposes, a corporation is a citizen of the state in which it is incorporated. Most firms hire lawyers to create a corporate charter that includes formal articles of incorporation and a set of bylaws. The corporate charter specifies the initial rules that govern how the corporation is run.

Ownership of a Corporation. There is no limit on the number of owners a corporation can have. Because most corporations have many owners, each owner owns only a small fraction of the corporation. The entire ownership stake of a corporation is divided into shares known as **stock**. The collection of all the outstanding shares of a corporation is known as the **equity** of the corporation. An owner of a share of stock in the corporation is known as a **shareholder**, **stock holder**, or **equity holder** and is entitled to **dividend payments**, that is, payments made at the discretion of the corporation to its equity holders. Shareholders usually receive a share of the dividend payments that is proportional to the amount of stock they own. For example, a shareholder who owns 25% of the firm's shares will be entitled to 25% of the total dividend payment.

A unique feature of a corporation is that there is no limitation on who can own its stock. That is, an owner of a corporation need not have any special expertise or qualification. This feature allows free trade in the shares of the corporation and provides one of the most important advantages of organizing a firm as a corporation rather than as sole proprietorship, partnership, or LLC. Corporations can raise substantial amounts of capital because they can sell ownership shares to anonymous outside investors.

The availability of outside funding has enabled corporations to dominate the economy, as shown by Panel (b) of Figure 1.1. Let's take one of the world's largest firms, Walmart Inc., as an example. Walmart had over 2 million employees, and reported annual revenue of $500 billion in 2018. Indeed, the top five companies by sales volume in 2018 (Walmart, Sinopec, PetroChina, Royal Dutch Shell, and Volkswagen Group) had combined sales exceeding $1.8 trillion, an amount significantly larger than the total sales of the more than 24 million U.S. sole proprietorships.

Tax Implications for Corporate Entities

An important difference between the types of organizational forms is the way they are taxed. Because a corporation is a separate legal entity, a corporation's profits are subject to taxation separate from its owners' tax obligations. In effect, shareholders of a corporation pay taxes twice. First, the corporation pays tax on its profits, and then when the remaining profits are distributed to the shareholders, the shareholders pay their own personal income tax on this income. This system is sometimes referred to as double taxation.

EXAMPLE 1.1 Taxation of Corporate Earnings

Problem

You are a shareholder in a corporation. The corporation earns $8 per share before taxes. After it has paid taxes, it will distribute the rest of its earnings to you as a dividend. The dividend is income to you, so you will then pay taxes on these earnings. The corporate tax rate is 25% and your tax rate on dividend income is 20%. How much of the earnings remains after all taxes are paid?

Solution

First, the corporation pays taxes. It earned $8 per share, but must pay $0.25 \times \$8 = \$2$ to the government in corporate taxes. That leaves $6 to distribute. However, you must pay $0.20 \times \$6 = \$1.20$ in income taxes on this amount, leaving $\$6 - \$1.20 = \$4.80$ per share after all taxes are paid. As a shareholder you only end up with $4.80 of the original $8 in earnings; the remaining $\$2 + \$1.20 = \$3.20$ is paid as taxes. Thus, your total effective tax rate is $3.20/8 = 40\%$.

S Corporations. The corporate organizational structure is the only organizational structure subject to double taxation. However, the U.S. Internal Revenue Code allows an exemption from double taxation for **"S" corporations**, which are corporations that elect subchapter S tax treatment. Under these tax regulations, the firm's profits (and losses) are not subject to corporate taxes, but instead are allocated directly to shareholders based on their ownership share. The shareholders must include these profits as income on their individual tax returns (even if no money is distributed to them). However, after the shareholders have paid income taxes on these profits, no further tax is due.

Corporate Taxation Around the World

Most countries offer investors in corporations some relief from double taxation. Thirty countries make up the Organisation for Economic Co-operation and Development (OECD), and of these countries, only Ireland offers no relief whatsoever. A few countries, including Australia, Canada, Chile, Mexico and New Zealand, give shareholders a tax credit for the amount of corporate taxes paid, while others, such as Estonia and Latvia, fully or partially exempt dividend income from individual taxes. The United States offers partial relief by having a lower tax rate on dividend income than on other sources of income. As of 2018, for most investors qualified dividends are taxed at up to 20%, a rate significantly below their personal income tax rate. Despite this relief, the effective corporate tax rate in the U.S. had been one of the highest in the world— nearly 30% above the median for the OECD in 2017. The **Tax Cut and Jobs Act of 2017 (TCJA)** significantly reduced this differential by lowering the federal corporate tax rate from 35% to 21% in 2018.*

*OECD Tax Database Table II.4

EXAMPLE 1.2 Taxation of S Corporation Earnings

Problem

Rework Example 1.1 assuming the corporation in that example has elected subchapter S treatment and your tax rate on non-dividend income is 35%.

Solution

In this case, the corporation pays no taxes. It earned $8 per share. Whether or not the corporation chooses to distribute or retain this cash, you must pay $0.35 \times \$8 = \$2.80$ in income taxes, which is $0.40 lower than the $3.20 paid in Example 1.1.[3]

The government places strict limitations on the qualifications for subchapter S tax treatment. In particular, the shareholders of such corporations must be individuals who are U.S. citizens or residents, and there can be no more than 100 of them. Because most corporations have no restrictions on who owns their shares or the number of shareholders, they cannot qualify for subchapter S treatment. Thus most large corporations are **"C" corporations**, which are corporations subject to corporate taxes. S corporations account for less than one quarter of all corporate revenue.

CONCEPT CHECK

1. What is a limited liability company (LLC)? How does it differ from a limited partnership?
2. What are the advantages and disadvantages of organizing a business as a corporation?

1.2 Ownership Versus Control of Corporations

It is often not feasible for the owners of a corporation to have direct control of the firm because there are sometimes many owners, each of whom can freely trade his or her stock. That is, in a corporation, direct control and ownership are often separate. Rather than the owners, the *board of directors* and *chief executive officer* possess direct control of the corporation. In this section, we explain how the responsibilities for the corporation are divided between these two entities and how together they shape and execute the goals of the firm.

The Corporate Management Team

The shareholders of a corporation exercise their control by electing a **board of directors**, a group of people who have the ultimate decision-making authority in the corporation. In most

[3] In reality the tax savings might be even higher. Under the new tax code some owners of S Corporations will be able to shield 20% of their income from taxes.

INTERVIEW WITH DAVID VINIAR

David Viniar is Chief Financial Officer and head of the Operations, Technology and Finance Division at Goldman Sachs—the last major investment bank to convert from a partnership to a corporation. As the firm's CFO, he played a leading role in the firm's conversion to a corporation in 1999 and charting the firm's course through the financial crisis of 2008–2009.

QUESTION: *What are the advantages of partnerships and corporations?*

ANSWER: We debated this question at length when we were deciding whether to go public or stay a private partnership in the mid-1990s. There were good arguments on both sides. Those in favor of going public argued we needed greater financial and strategic flexibility to achieve our aggressive growth and market leadership goals. As a public corporation, we would have a more stable equity base to support growth and disperse risk; increased access to large public debt markets; publicly traded securities with which to undertake acquisitions and reward and motivate our employees; and a simpler and more transparent structure with which to increase scale and global reach.

Those against going public argued our private partnership structure worked well and would enable us to achieve our financial and strategic goals. As a private partnership, we could generate enough capital internally and in the private placement markets to fund growth; take a longer-term view of returns on our investments with less focus on earnings volatility, which is not valued in public companies; and retain voting control and alignment of the partners and the firm.

A big perceived advantage of our private partnership was its sense of distinctiveness and mystique, which reinforced our culture of teamwork and excellence and helped differentiate us from our competitors. Many questioned whether the special qualities of our culture would survive if the firm went public.

QUESTION: *What was the driving force behind the conversion?*

ANSWER: We ultimately decided to go public for three main reasons: to secure permanent capital to grow; to be able to use publicly traded securities to finance strategic acquisitions; and to enhance the culture of ownership and gain compensation flexibility.

QUESTION: *Did the conversion achieve its goals?*

ANSWER: Yes. As a public company, we have a simpler, bigger and more permanent capital base, including enhanced long-term borrowing capacity in the public debt markets. We have drawn on substantial capital resources to serve clients, take advantage of new business opportunities, and better control our own destiny through changing economic and business conditions. We have been able to use stock to finance key acquisitions and support large strategic and financial investments. Given how the stakes in our industry changed, how capital demands grew, going public when we did fortunately positioned us to compete effectively through the cycle.

Our distinctive culture of teamwork and excellence has thrived in public form, and our equity compensation programs turned out better than we could have hoped. Making everyone at Goldman Sachs an owner, rather than just 221 partners, energized all our employees. The growing size and scope of our business—not the change to public form—has presented the greatest challenges to the positive aspects of our culture.

QUESTION: *What prompted Goldman's decision to become a bank holding company in Fall 2008?*

ANSWER: The market environment had become extraordinarily unstable following the collapse of Bear Stearns in March 2008. There was an increased focus on the SEC-supervised broker/dealer business model, and in September, market sentiment had become increasingly negative with growing concerns over Lehman Brothers' solvency. Following the bankruptcy of Lehman Brothers and the sale of Merrill Lynch in the middle of September, and notwithstanding the reporting of quite strong earnings by both Goldman Sachs and Morgan Stanley, it became clear to us that the market viewed oversight by the Federal Reserve and the ability to source insured bank deposits as offering a greater degree of safety and soundness. By changing our status, we gained all the benefits available to our commercial banking peers, including access to permanent liquidity and funding, without affecting our ability to operate or own any of our current businesses or investments.

corporations, each share of stock gives a shareholder one vote in the election of the board of directors, so investors with the most shares have the most influence. When one or two shareholders own a very large proportion of the outstanding stock, these shareholders may either be on the board of directors themselves, or they may have the right to appoint a number of directors.

The board of directors makes rules on how the corporation should be run (including how the top managers in the corporation are compensated), sets policy, and monitors the performance of the company. The board of directors delegates most decisions that involve day-to-day running of the corporation to its management. The **chief executive officer (CEO)** is charged with running the corporation by instituting the rules and policies set by the board of directors. The size of the rest of the management team varies from corporation to corporation. The separation of powers within corporations between the board of directors and the CEO is not always distinct. In fact, it is not uncommon for the CEO also to be the chairman of the board of directors. The most senior financial manager is the **chief financial officer (CFO)**, who often reports directly to the CEO. Figure 1.2 presents part of a typical organizational chart for a corporation, highlighting the key positions a financial manager may take.

The Financial Manager

Within the corporation, financial managers are responsible for three main tasks: making investment decisions, making financing decisions, and managing the firm's cash flows.

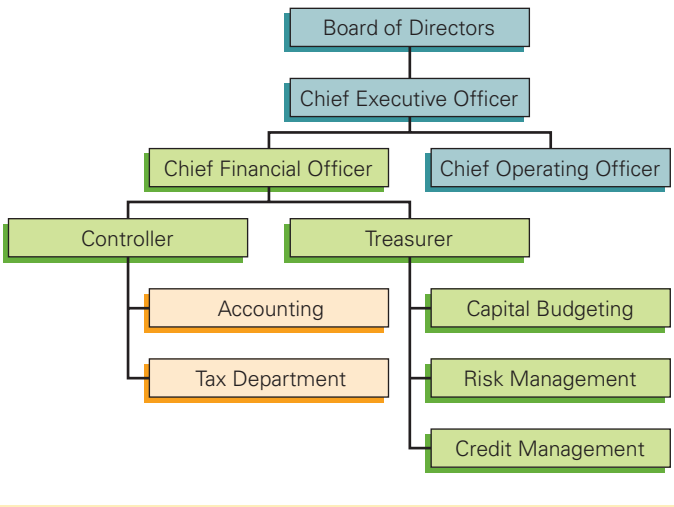
Investment Decisions. The financial manager's most important job is to make the firm's investment decisions. The financial manager must weigh the costs and benefits of all investments and projects and decide which of them qualify as good uses of the money stockholders have invested in the firm. These investment decisions fundamentally shape what the firm does and whether it will add value for its owners. In this book, we will develop the tools necessary to make these investment decisions.

Financing Decisions. Once the financial manager has decided which investments to make, he or she also decides how to pay for them. Large investments may require the corporation to raise additional money. The financial manager must decide whether to raise more money from new and existing owners by selling more shares of stock (equity) or to borrow the money

FIGURE 1.2

Organizational Chart of a Typical Corporation

The board of directors, representing the stockholders, controls the corporation and hires the Chief Executive Officer who is then responsible for running the corporation. The Chief Financial Officer oversees the financial operations of the firm, with the Controller managing both tax and accounting functions, and the Treasurer responsible for capital budgeting, risk management, and credit management activities.



GLOBAL FINANCIAL CRISIS The Dodd-Frank Act

In response to the 2008 financial crisis, the U.S. federal government reevaluated its role in the control and management of financial institutions and private corporations. Signed into law on July 21, 2010, the **Dodd-Frank Wall Street Reform and Consumer Protection Act** brought a sweeping change to financial regulation in response to widespread calls for financial regulatory system reform after the near collapse of the world's financial system in the fall of 2008 and the ensuing global credit crisis. History indeed repeats itself: It was in the wake of the 1929 stock market crash and subsequent Great Depression that Congress passed the Glass-Steagall Act establishing the Federal Deposit Insurance Corporation (FDIC) and instituted significant bank reforms to regulate transactions between commercial banks and securities firms.

The Dodd-Frank Act aims to (i) promote U.S. financial stability by "improving accountability and transparency in the financial system," (ii) put an end to the notion of "too big to fail," (iii) "protect the American taxpayer by ending bailouts," and (iv) "protect consumers from abusive financial services practices."* Time will tell whether the Act will actually achieve these important goals.

Implementing the wide-ranging financial reforms in the Dodd-Frank Act required the work and coordination of many federal agencies, either through rulemaking or other regulatory actions. By mid-2018, just over two-thirds of the rules had been finalized. But as the financial crisis has faded from memory and political priorities have changed, there is increasing pressure to roll back many of the Dodd-Frank reforms. For example, small- and medium-sized banks have been exempted from many of the Act's regulations, and the Consumer Financial Protection Board, which was created by the Act, has sharply curtailed its activity under new leadership. Finally, significant changes to the "Volcker rule," which bars banks from engaging in speculative trading, are being considered by the Federal Reserve.

While these changes are intended to reduce the cost of financial services, the extent to which they increase the risk of another financial crisis remains to be seen.

* The full text of the act is available from the U. S. Government publishing Office: https://www.gpo.gov/fdsys/pkg/PLAW-111publ203

(debt). In this book, we will discuss the characteristics of each source of funds and how to decide which one to use in the context of the corporation's overall mix of debt and equity.

Cash Management. The financial manager must ensure that the firm has enough cash on hand to meet its day-to-day obligations. This job, also commonly known as managing working capital, may seem straightforward, but in a young or growing company, it can mean the difference between success and failure. Even companies with great products require significant amounts of money to develop and bring those products to market. Consider the $150 million Apple spent during its secretive development of the iPhone, or the costs to Boeing of producing the 787—the firm spent billions of dollars before the first 787 left the ground. A company typically burns through a significant amount of cash developing a new product before its sales generate income. The financial manager's job is to make sure that access to cash does not hinder the firm's success.

The Goal of the Firm

In theory, the goal of a firm should be determined by the firm's owners. A sole proprietorship has a single owner who runs the firm, so the goals of a sole proprietorship are the same as the owner's goals. But in organizational forms with multiple owners, the appropriate goal of the firm—and thus of its managers—is not as clear.

Many corporations have thousands of owners (shareholders). Each owner is likely to have different interests and priorities. Whose interests and priorities determine the goals of the firm? Later in the book, we examine this question in more detail. However, you might be surprised to learn that the interests of shareholders are aligned for many, if not most, important decisions. That is because, regardless of their own personal financial position and stage in life, all the shareholders will agree that they are better off if management makes decisions that increase the value of their shares. For example, by January 2018, Apple shares were worth over 170 times as

much as they were in October 2001, when the first iPod was introduced. Clearly, regardless of their preferences and other differences, all investors who held shares of Apple stock over this period have benefited from the investment decisions Apple's managers have made.

The Firm and Society

Are decisions that increase the value of the firm's equity beneficial for society as a whole? Most often they are. While Apple's shareholders have become much richer since 2001, its customers also are better off with products like the iPod and iPhone that they might otherwise never have had. But even if the corporation only makes its shareholders better off, as long as nobody else is made worse off by its decisions, increasing the value of equity is good for society.

The problem occurs when increasing the value of equity comes at the expense of others. Consider a corporation that, in the course of business, pollutes the environment and does not pay the costs to clean up the pollution. Alternatively, a corporation may not itself pollute, but use of its products may harm the environment. In such cases, decisions that increase shareholder wealth can be costly for society as whole.

The 2008 financial crisis highlighted another example of decisions that can increase shareholder wealth but are costly for society. In the early part of the last decade, banks took on excessive risk. For a while, this strategy benefited the banks' shareholders. But when the bets went bad, the resulting financial crisis harmed the broader economy.

When the actions of the corporation impose harm on others in the economy, appropriate public policy and regulation is required to assure that corporate interests and societal interests remain aligned. Sound public policy should allow firms to continue to pursue the maximization of shareholder value in a way that benefits society overall.

Ethics and Incentives within Corporations

But even when all the owners of a corporation agree on the goals of the corporation, these goals must be implemented. In a simple organizational form like a sole proprietorship, the owner, who runs the firm, can ensure that the firm's goals match his or her own. But a corporation is run by a management team, separate from its owners, giving rise to conflicts of interest. How can the owners of a corporation ensure that the management team will implement their goals?

Agency Problems. Many people claim that because of the separation of ownership and control in a corporation, managers have little incentive to work in the interests of the shareholders when this means working against their own self-interest. Economists call this an **agency problem**—when managers, despite being hired as the agents of shareholders, put their own self-interest ahead of the interests of shareholders. Managers face the ethical dilemma of whether to adhere to their responsibility to put the interests of shareholders first, or to do what is in their own personal best interest.

This agency problem is commonly addressed in practice by minimizing the number of decisions managers must make for which their own self-interest substantially differs from the interests of the shareholders. For example, managers' compensation contracts are designed to ensure that most decisions in the shareholders' interest are also in the managers' interests; shareholders often tie the compensation of top managers to the corporation's profits or perhaps to its stock price. There is, however, a limitation to this strategy. By tying compensation too closely to performance, the shareholders might be asking managers to take on more risk than they are comfortable taking. As a result, managers may not make decisions that the shareholders want them to, or it might be hard to find talented managers willing to accept the job. On the other hand, if compensation contracts reduce managers' risk by rewarding good performance but limiting the penalty associated with poor performance, managers may have an incentive to take excessive risk.

GLOBAL FINANCIAL CRISIS

The Dodd-Frank Act on Corporate Compensation and Governance

Compensation is one of the most important conflicts of interest between corporate executives and shareholders. To limit senior corporate executives' influence over their own compensation and prevent excessive compensation, the Act directs the SEC to adopt new rules that:

- Mandate the independence of a firm's compensation committee and its advisers.
- Provide shareholders the opportunity to approve—in a non-binding, advisory vote—the compensation of executive officers at least once every three years (referred to as a "Say-on-Pay" vote).
- Require firm disclosure and shareholder approval of large bonus payments (so-called "golden parachutes") to ousted senior executives as the result of a takeover.
- Require disclosure of the relationship of executive pay to the company's performance, as well as the ratio between the CEO's total compensation and that of the median employee.
- Require disclosure of whether executives are permitted to hedge their stock or option holdings.
- Create "clawback" provisions that allow firms to recoup compensation paid based on erroneous financial results.

As of 2018, however, the last three of these requirements had not yet been fully implemented by the SEC (with the Trump administration indicating it has no plans to do so).

Further potential for conflicts of interest and ethical considerations arise when some stakeholders in the corporation benefit and others lose from a decision. Shareholders and managers are two stakeholders in the corporation, but others include the regular employees and the communities in which the company operates, for example. Managers may decide to take the interests of other stakeholders into account in their decisions, such as keeping a loss-generating factory open because it is the main provider of jobs in a small town, paying above-market wages to factory workers in a developing country, or operating a plant at a higher environmental standard than local law mandates.

In some cases, these actions that benefit other stakeholders also benefit the firm's shareholders by creating a more dedicated workforce, generating positive publicity with customers, or other indirect effects. In other instances, when these decisions benefit other stakeholders at shareholders' expense, they represent a form of corporate charity. Indeed, many corporations explicitly donate (on behalf of their shareholders) to local and global charitable and political causes. For example, in 2015, Gilead Sciences gave $447 million in cash to charity (making it the largest corporate donor of cash in that year). These actions are costly and reduce shareholder wealth. Thus, while some shareholders might support such policies because they feel that they reflect their own moral and ethical priorities, it is unlikely that all shareholders will feel this way, leading to potential conflicts of interest amongst shareholders.

This conflict of interest can be resolved in cases for which shareholders can take equivalent actions on their own, such as giving cash to charity. In that case the firm can return the cash to shareholders who can then determine how much to give on their own. But this simple solution

Citizens United v. Federal Election Commission

On January 21, 2010, the U.S. Supreme Court ruled on what some scholars have argued is the most important First Amendment case in many years. In *Citizens United v. Federal Election Commission* the Court held, in a controversial 5–4 decision, that the First Amendment allows corporations and unions to make political expenditures in support of a particular candidate. This ruling overturned existing restrictions on political campaigning by corporations. But because it is highly unlikely that all shareholders of a corporation would unanimously support a particular candidate, allowing such activities effectively guarantees a conflict of interest.

is not available when there are actions only the corporation can take, such as operating at a higher environmental standard. In that case, to maximize shareholder welfare, it is appropriate for the firm's managers to weigh conflicting shareholder preferences in their decision making.

The CEO's Performance. Another way shareholders can encourage managers to work in the interests of shareholders is to discipline them if they don't. If shareholders are unhappy with a CEO's performance, they could, in principle, pressure the board to oust the CEO. Disney's Michael Eisner, Hewlett Packard's Carly Fiorina, and Barclay's Antony Jenkins were all reportedly forced to resign by their boards. Despite these high-profile examples, directors and top executives are rarely replaced through a grassroots shareholder uprising. Instead, dissatisfied investors often choose to sell their shares. Of course, somebody must be willing to buy the shares from the dissatisfied shareholders. If enough shareholders are dissatisfied, the only way to entice investors to buy (or hold on to) the shares is to offer them a low price. Similarly, investors who see a well-managed corporation will want to purchase shares, which drives the stock price up. Thus, the stock price of the corporation is a barometer for corporate leaders that continuously gives them feedback on their shareholders' opinion of their performance.

When the stock performs poorly, the board of directors might react by replacing the CEO. In some corporations, however, the senior executives are entrenched because boards of directors do not have the will to replace them. Often the reluctance to fire results because the board members are close friends of the CEO and lack objectivity. In corporations in which the CEO is entrenched and doing a poor job, the expectation of continued poor performance will decrease the stock price. Low stock prices create a profit opportunity. In a **hostile takeover**, an individual or organization—sometimes known as a corporate raider—can purchase a large fraction of the stock and acquire enough votes to replace the board of directors and the CEO. With a new superior management team, the stock is a much more attractive investment, which would likely result in a price rise and a profit for the corporate raider and the other shareholders. Although the words "hostile" and "raider" have negative connotations, corporate raiders themselves provide an important service to shareholders. The mere threat of being removed as a result of a hostile takeover is often enough to discipline bad managers and motivate boards of directors to make difficult decisions. Consequently, when a corporation's shares are publicly traded, a "market for corporate control" is created that encourages managers and boards of directors to act in the interests of their shareholders.

Corporate Bankruptcy. Ordinarily, a corporation is run on behalf of its shareholders. But when a corporation borrows money, the holders of the firm's debt also become investors in the corporation. While the debt holders do not normally exercise control over the firm, if the corporation fails to repay its debts, the debt holders are entitled to seize the assets of the corporation in compensation for the default. To prevent such a seizure, the firm may attempt to renegotiate with the debt holders, or file for bankruptcy protection in a federal court. (We describe the details of the bankruptcy process and its implications for corporate decisions in much more detail in Part 5 of the textbook.) Ultimately, however, if the firm is unable to repay or renegotiate with the debt holders, the control of the corporation's assets will be transferred to them.

Thus, when a firm fails to repay its debts, the end result is a change in ownership of the firm, with control passing from equity holders to debt holders. Importantly, bankruptcy need not result in a **liquidation** of the firm, which involves shutting down the business and selling off its assets. Even if control of the firm passes to the debt holders, it is in the debt holders' interest to run the firm in the most profitable way possible. Doing so often means keeping the business operating. For example, in 1990, Federated Department Stores declared bankruptcy. One of its best-known assets at the time was Bloomingdale's, a

Airlines in Bankruptcy

On December 9, 2002, United Airlines filed for bankruptcy protection following an unsuccessful attempt to convince the federal government to bail out the company's investors by providing loan guarantees. Although United remained in bankruptcy for the next three years, it continued to operate and fly passengers, and even expanded capacity in some markets. One of those expansions was "Ted," an ill-fated attempt by United to start a budget airline to compete directly with Southwest Airlines. In short, although United's original shareholders were wiped out, as far as customers were concerned it was business as usual. People continued to book tickets and United continued to fly and serve them.

It is tempting to think that when a firm files for bankruptcy, things are "over." But often, rather than liquidate the firm, bondholders and other creditors are better off allowing the firm to continue operating as a going concern. United was just one of many airlines to move in and out of bankruptcy since 2002; others include US Airways, Air Canada, Hawaiian Airlines, Northwest Airlines, and Delta Airlines. In November 2011, American Airlines became the latest airline to declare bankruptcy. Like United in 2002, American continued to operate while it cut costs and reorganized, returning to profitability in mid-2012. American ultimately settled with creditors in December 2013 as part of a merger agreement with US Airways.

nationally recognized department store. Because Bloomingdale's was a profitable business, neither equity holders nor debt holders had any desire to shut it down, and it continued to operate in bankruptcy. In 1992, when Federated Department Stores was reorganized and emerged from bankruptcy, Federated's original equity holders had lost their stake in Bloomingdale's, but this flagship chain continued to perform well for its new owners, and its value as a business was not adversely affected by the bankruptcy.

Thus, a useful way to understand corporations is to think of there being two sets of investors with claims to its cash flows—debt holders and equity holders. As long as the corporation can satisfy the claims of the debt holders, ownership remains in the hands of the equity holders. If the corporation fails to satisfy debt holders' claims, debt holders may take control of the firm. Thus, a corporate bankruptcy is best thought of as a *change in ownership* of the corporation, and not necessarily as a failure of the underlying business.

CONCEPT CHECK

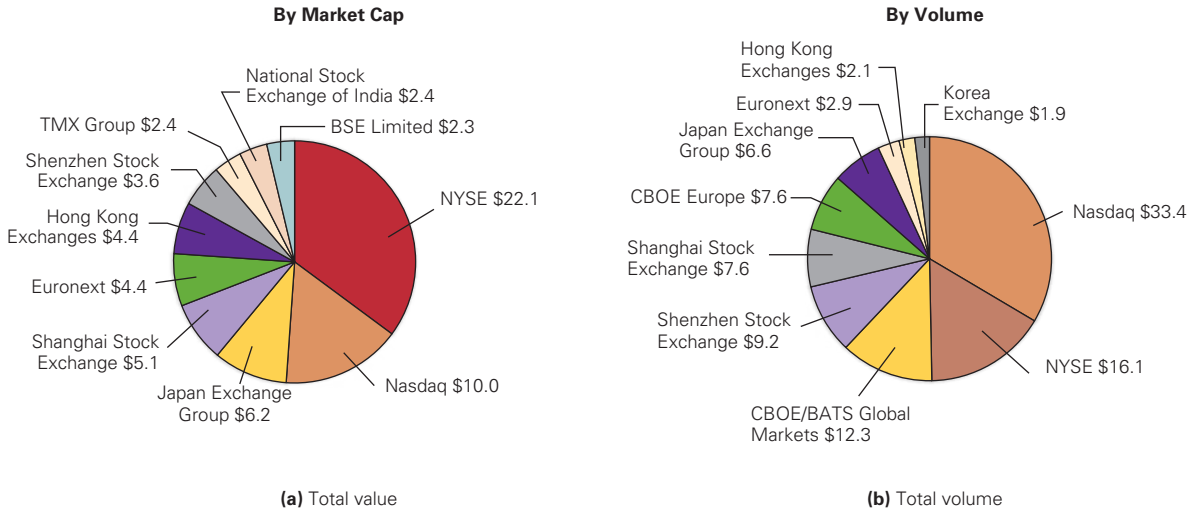
1. What are the three main tasks of a financial manager?
2. What is a principal-agent problem that may exist in a corporation?
3. How may a corporate bankruptcy filing affect the ownership of a corporation?

1.3 The Stock Market

As we have discussed, shareholders would like the firm's managers to maximize the value of their investment in the firm. The value of their investment is determined by the price of a share of the corporation's stock. Because **private companies** have a limited set of shareholders and their shares are not regularly traded, the value of their shares can be difficult to determine. But many corporations are **public companies**, whose shares trade on organized markets called a **stock market** (or **stock exchange**). Figure 1.3 shows the major exchanges worldwide, by total value of listed stocks and trading volume.

These markets provide *liquidity* and determine a market price for the company's shares. An investment is said to be **liquid** if it is possible to sell it quickly and easily for a price very close to the price at which you could contemporaneously buy it. This liquidity is attractive to outside investors, as it provides flexibility regarding the timing and duration of their investment in the firm. In addition, the research and trading of participants in these markets give rise to share prices that provide constant feedback to managers regarding investors' views of their decisions.

FIGURE 1.3 **Worldwide Stock Exchanges Ranked by Two Common Measures**



The 10 biggest stock markets in the world (a) by total value of all domestic corporations listed on the exchange at year-end 2017 and (b) by total volume of shares traded on the exchange in 2017.

Source: www.world-exchanges.org

Primary and Secondary Stock Markets

When a corporation itself issues new shares of stock and sells them to investors, it does so on the **primary market**. After this initial transaction between the corporation and investors, the shares continue to trade in a **secondary market** between investors without the involvement of the corporation. For example, if you wish to buy 100 shares of Starbucks Coffee, you would place an order on a stock exchange, where Starbucks trades under the ticker symbol SBUX. You would buy your shares from someone who already held shares of Starbucks, not from Starbucks itself. Because firms only occasionally issue new shares, secondary market trading accounts for the vast majority of trading in the stock market.

Traditional Trading Venues

Historically, a firm would choose one stock exchange on which to list its stock, and almost all trade in the stock would occur on that exchange. In the U.S., the two most important exchanges are the New York Stock Exchange (NYSE) and the National Association of Security Dealers Automated Quotation (Nasdaq).

Prior to 2005, almost all trade on the NYSE took place on the exchange's trading floor in lower Manhattan. **Market makers** (known then on the NYSE as **specialists**) matched buyers and sellers. They posted two prices for every stock in which they made a market: the price at which they were willing to *buy* the stock (the **bid price**) and the price at which they were willing to *sell* the stock (the **ask price**). When a customer arrived and wanted to make a trade at these prices, the market maker would honor the posted prices (up to a limited number of shares) and make the trade even when they did not have another customer willing to take the other side of the trade. In this way, market makers provided **liquidity** by ensuring that market participants always had somebody to trade with.

INTERVIEW WITH FRANK HATHEWAY

As Chief Economist and Senior Vice President for Nasdaq, Dr. Frank Hatheway leads a team of 20 professionals who serve as an internal consultancy for the Nasdaq markets. Their work includes designing new features, evaluating operations markets, and advising on strategic initiatives.

QUESTION: *Compared to 15 years ago, the number of potential trading venues for investors has changed dramatically. Who have these changes benefited?*

ANSWER: The number of trading venues has increased dramatically. In 2000 you placed an order on Nasdaq or the NYSE, and the majority of trading activity in that stock occurred on the same market as your order. That's not the case anymore. Your trade may be executed on the National Stock Exchange, BATS, or one of 10 other exchanges. To deal with the soaring number of venues, trading became highly automated and highly competitive, benefiting both individual and institutional investors. A fast retail trade in the 1980s took about three minutes and cost over $100 (in 1980s money). Now it's a mouse click, browser refresh, and maybe $20 (in 2016 money). Trading costs for individual investors are down over 90 percent since 2000. Institutional-size block orders are also cheaper and easier to trade today.

Automation has virtually removed traditional equity traders like the market makers, specialists, and floor brokers at the exchanges. As the head of the trading desk for a major firm quipped around 2006, "I used to have 100 traders and 10 IT guys. I now have 100 IT guys and 10 traders." The once bustling New York Stock Exchange floor is now essentially a TV studio.

QUESTION: *How have these changes affected market liquidity?*

ANSWER: Liquidity is very transitory. The computer algorithms controlling trading constantly enter orders into the market and remove orders if the order fails to trade or if market conditions change. The algorithms quickly re-enter removed orders into the market, leading to rapidly changing prices and quantities. Also, numerous studies show that there is more liquidity in the market today. To control an order 15 years ago, you phoned your broker with your instructions. Today, the algorithm you selected controls the order and can change the order almost instantly. Because computers have more control over orders than human traders did, there is less risk associated with placing an order. Consequently there are more orders and greater liquidity.

QUESTION: *How has Nasdaq been affected by these changes and what does the future hold?*

ANSWER: Nasdaq has become an innovative, technologically savvy company—much like the companies we list. Fifteen years ago we operated a single stock market in the United States. Thanks to increased technological efficiency, today we operate three stock markets, three listed-options markets, and a futures market. Operating these seven markets requires less than half the personnel required for a single market 15 years ago. To compete in this environment, Nasdaq had to develop a better trading system to handle our increased order volume. Order volume that took an entire day to process 15 years ago, today takes a few seconds. We've also transformed our culture from supporting an industry based on human traders to one based on algorithmic traders and the IT professionals who design those algorithms.

QUESTION: *Is High Frequency Trading a cause for concern in the market? Should it be limited?*

ANSWER: Specific concerns about High Frequency Trading are generally about market disruptions and manipulation, and cases center around the operation of trading algorithms. I believe market oversight is evolving to appropriately address disruptive or manipulative activity.

These days essentially every order in the United States is handled by a computer trading algorithm. Simply put, we are all High Frequency Traders. Consequently, limiting High Frequency Trading should not be a policy objective. What should be a policy objective is making sure that equity markets benefit investors and issuers by ensuring that the algorithms do not disrupt the markets and that they operate in a manner that is fair to investors. The market exists to support capital formation and economic growth. Market operators such as Nasdaq work with regulators and others to look after the interests of investors and issuers.

In contrast to the NYSE, the Nasdaq market never had a trading floor. Instead, all trades were completed over the phone or on a computer network. An important difference between the NYSE and Nasdaq was that on the NYSE, each stock had only one market maker. On the Nasdaq, stocks had multiple market makers who competed with one another. Each market maker posted bid and ask prices on the Nasdaq network that were viewed by all participants.

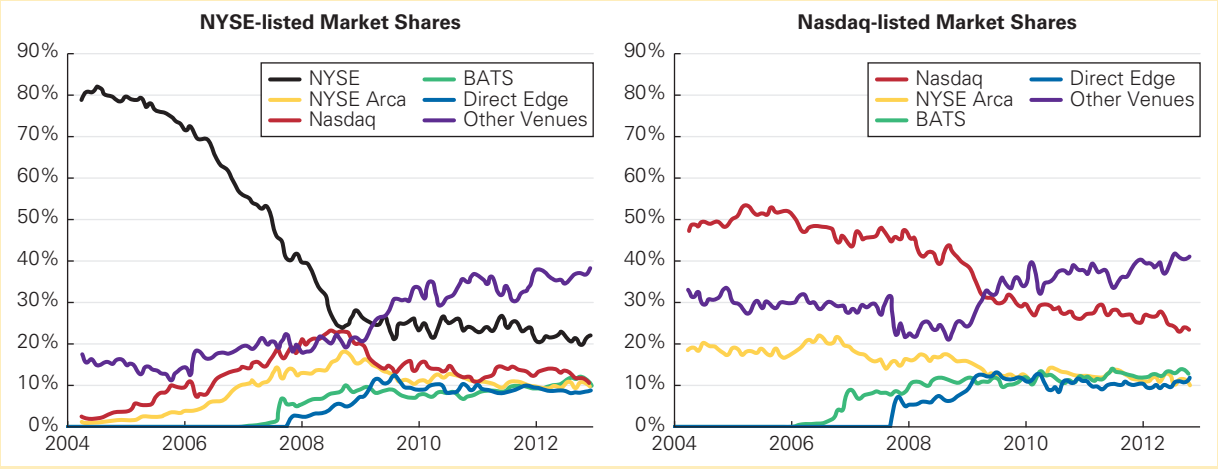
Market makers make money because ask prices are higher than bid prices. This difference is called the **bid-ask spread**. Customers always buy at the ask (the higher price) and sell at the bid (the lower price). The bid-ask spread is a **transaction cost** investors pay in order to trade. Because specialists on the NYSE took the other side of the trade from their customers, this cost accrued to them as a profit. This was the compensation they earned for providing a liquid market by standing ready to honor any quoted price. Investors also paid other forms of transactions costs like commissions.

New Competition and Market Changes

Stock markets have gone through enormous changes in the last decade. In 2005, the NYSE and Nasdaq exchanges accounted for over 75% of all trade in U.S. stocks. Since that time, however, competition from new, fully electronic exchanges and alternative trading systems has caused their market share to dramatically decline, as shown in Figure 1.4. Today, these new entrants handle more than 50% of all trades.

With this change in market structure, the role of an official market maker has largely disappeared. Because all transactions occur electronically with computers matching buy and sell orders, anyone can make a market in a stock by posting a **limit order**—an order to buy or sell a set amount at a fixed price. For example, a limit buy order might be an order to buy 100 shares of IBM at a price of $138/share. The bid-ask spread of a stock is determined

FIGURE 1.4



Distribution of trading volume for NYSE-listed shares (left panel) and Nasdaq-listed shares (right panel). NYSE-Arca is the electronic trading platform of the NYSE. BATS and Direct Edge merged in 2014; these new electronic exchanges now handle about 20% of all trades. Other venues, including internal dealer platforms and so called "dark pools," accounted for almost 40% of all trades in 2015.

Source: J. Angel, L. Harris, and C. Spatt, "Equity Trading in the 21st Century: An Update," *Quarterly Journal of Finance* 5 (2015): 1–39.

by the outstanding limit orders. The limit sell order with the lowest price is the ask price. The limit buy order with the highest price is the bid price. Traders make the market in the stock by posting limit buy and sell orders. The collection of all limit orders is known as the **limit order book**. Exchanges make their limit order books public so that investors (or their brokers) can see the best bid and ask prices when deciding where to trade.

Traders who post limit orders provide the market with liquidity. On the other hand, traders who place **market orders**—orders that trade immediately at the best outstanding limit order—are said to be "takers" of liquidity. Providers of liquidity earn the bid-ask spread, but in so doing they risk the possibility of their orders becoming stale: When news about a stock arrives that causes the price of that stock to move, smart traders will quickly take advantage of the existing limit orders by executing trades at the old prices. To protect themselves against this possibility, liquidity providers need to constantly monitor the market, cancelling old orders and posting new orders when appropriate. So-called **high frequency traders (HFTs)** are a class of traders who, with the aid of computers, will place, update, cancel, and execute trades many times per second in response to new information as well as other orders, profiting both by providing liquidity and by taking advantage of stale limit orders.

Dark Pools

When trading on an exchange, investors are guaranteed the opportunity to trade immediately at the current bid or ask price, and transactions are visible to all traders when they occur. In contrast, alternative trading systems called **dark pools** do not make their limit order books visible. Instead, these dark pools offer investors the ability to trade at a better price (for example, the average of the bid and ask, thus saving the bid-ask spread), with the tradeoff being that the order might not be filled if an excess of either buy or sell orders is received. Trading on a dark pool is therefore attractive to traders who do not want to reveal their demand and who are willing to sacrifice the guarantee of immediacy for a potentially better price.

When dark pools are included, researchers estimate that in the U.S. alone there could be as many 50 venues in which to trade stocks. These venues compete with one another for order volume. Because traders value liquid markets, an important area of competition is liquidity—exchanges try to ensure that their limit order books are deep, that is, that they contain many orders. As a result, exchanges have been experimenting with different rules designed to encourage traders who provide liquidity and discourage traders who take advantage of stale limit orders. For example, some trading venues pay traders to post limit orders and charge traders who place market orders. Others pay for orders from retail investors and impose additional charges on high frequency trading. The proliferation of exchange venues has generated a wide variety of different compensation schemes. Indeed, CBOE/BATS operates different markets with different rules, essentially tailoring markets to the perceived needs of customers. It is highly unlikely that we have seen the end of these changes. Stock markets remain in a state of flux, and only time will tell what the eventual shakeout will look like.

CONCEPT CHECK

1. What are the important changes that have occurred in stock markets over the last decade?
2. What is the limit order book?
3. Why are people who post limit orders termed "providers" of liquidity?

1.4 Fintech: Finance and Technology

The relation between financial innovation and technical innovation has become known as **Fintech**. Although the term is new, there is nothing new about the use of advanced technology in the provision of financial services. Finance has always been on the cutting edge of technological change.

Telecommunications

Because the same financial securities are often traded on markets that are physically far apart, finance professionals have always been amongst the first adopters of improved communication technologies. Consider, for example, the introduction of the telegraph in the 1840s. Soon after New York and Philadelphia were linked by the telegraph, *The New York Herald* reported that "certain parties in New York and Philadelphia were employing the telegraph for speculating in stocks." Not surprisingly, prices of the same security trading in both markets became significantly closer once the telegraph was introduced. The same thing happened when New York and New Orleans were linked. When the first reliable trans-atlantic cable linking London to New York was established, the effect was even more dramatic, presumably because the improvement over existing communication technology was larger.[4]

With the introduction of the telegraph came the first stock ticker system. It allowed the continuous transmission of stock prices using telegraph lines and was in effect the first digital electronic communications system. It remained in use until the 1970s when it was replaced by digital CRT technology systems and then ultimately computers and the internet. Today, some traders use microwave technology to transmit information and orders at the highest possible speeds (which we describe in more detail on page 84).

Security and Verification

Finance has spurred significant innovation in security and verification technology. Indeed, perhaps the greatest technological innovation of all time, the invention of cuneiform writing in Mesopotamia, derived from a need to verify transactions across distance. In the 1860s, the earliest version of the modern fax machine, the pantelegraph, was developed to allow banks to transmit signatures over telegraph lines, thereby greatly shortening the time needed to verify transactions at a distance.

Today finance remains at the cutting edge of verification technology. Based on advances in cryptography in the 1990s, **blockchain** technology allows a transaction to be recorded in a publicly verifiable way without the need for a trusted third party to certify the authenticity of the transaction. By enabling a public ledger of transactions, blockchain technology allows for the digital transfer of assets without the backing of a government or a central clearinghouse. In 2008, this conceptual idea became a reality with the introduction of bitcoin, the world's first **cryptocurrency** – a currency whose creation and ownership is determined via a public blockchain. All bitcoin transactions are recorded in a public ledger using blockchain technology allowing individuals to create and trade bitcoins and to verify those transactions digitally.

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[4] For a detailed analysis of how the introduction of the telegraph affected financial markets see K. Garbade and W. Silber, "Technology, Communication and the Performance of Financial Markets: 1840–1975" (*Journal of Finance*, 33(3), June 1978)

Given the many millions of financial transactions that occur every hour that require verification, blockchain technology has the potential to reform how many financial transactions take place. But like any technological change, the success of the new system will depend on whether it can provide a significant advantage over current practices.

Automation of Banking Services

Technological innovation has also been important in the consumer sphere. Introduced in 1967, the automatic teller machine (ATM) was one of the earliest instances of automated customer service in any industry. Today, automated customer service is routine in banking. For example, it is possible to open an account, move money between accounts at different institutions, make payments to third parties, apply for and be approved for a loan without talking to a human being.

More recently, PayPal's Venmo, Tencent's WeChat, and other smartphone apps have made it easy for individuals to pay for goods and transfer money to others almost instantly. In the developing world, companies have brought a full range of automated banking services to individuals via their cellular phones, granting access to the modern financial system to millions of people who would otherwise not have access.

Investment advising is another traditional banking service that may potentially be disrupted by the recent growth in **robo-advisors**, computer programs that are intended to replace the work of financial advisors by providing detailed and customized investment recommendations. Whether consumers will embrace these new services with the same enthusiasm with which they embraced ATMs is an open question.

Big Data and Machine Learning

Long before the term "big data" was coined, financial organizations recognized the importance of collecting data and using it in decision making. Newspapers have always devoted space to reporting (and thereby storing) security prices. With the advent of computers, companies like Bloomberg arose whose sole purpose was the collection and dissemination of data. In the 1990s, stock exchanges began to make trade-by-trade data available, making these datasets one of first examples of what today is referred to as "big data." Today investors have access to an unprecedented array of financial data at very low cost. These data not only give individual investors an unprecedented window into the companies they invest in, it also allows both firms and policy makers to make more informed decisions.

Another important use of data and technology in finance is in predicting price changes in the market. Early attempts to discern repeatable patterns in the data met with little success. But as technology advanced and computer power increased, companies like Renaissance Technologies and D.E. Shaw developed sophisticated pattern recognition software that successfully predicted very short-term price movements. An important reason for their success is that investors who trade based on information have an incentive to hide their advantage (and their information) by breaking up their trades over time. This behavior can potentially be exploited to predict future price moves. However, as these computer algorithms compete with each other to better predict price moves, and as traders adjust their strategies to make them less predictable, future price moves become harder to forecast and so a technological arms race has ensued.

The availability of data has enabled companies throughout the economy to better target their products to consumers, and financial services companies are no exception. In financial services, two areas that have been particularly successful are lending and insurance. Startups such as SoFi, Lending Club, and Upstart, as well as established lenders like

CapitalOne, use machine learning to go beyond basic credit scores to make improved lending decisions. Similarly, insurance providers use big data to structure the insurance contracts they offer. Although these providers have opened new markets and may provide services at lower cost, there are also potential concerns. Customers that are found to be higher risk based on the machine learning algorithms may now pay more for the service or not be offered the service at all.

Competition

Technological advances, and the internet in particular, have opened the way for non-finance organizations to provide financial services. For example, companies like Apple, Paypal, and Google provide payment services that traditionally have been provided by banks. Amazon provides business loans by exploiting the data it collects on the vendors on its site. Numerous startups are entering the market to provide new and improved financial services to customers, businesses, and banks themselves. This intense competition will likely spur further innovation.

If historical experience is any guide, finance will continue to lead the way in the adoption of new technologies. Any technological innovation that confers a competitive advantage has the potential to provide large profits to early adopters. Beyond that, the provision of financial services can create substantial value to end users and the broader economy. It is therefore no surprise that there continues to be large investment in fintech. The innovations that result are likely to continue to reshape the financial industry in the years to come.

CONCEPT CHECK

1. In what ways has the finance industry been on the cutting edge of technology in the past?
2. What is blockchain technology, and how might it be useful in finance?

MyLab Finance

Here is what you should know after reading this chapter. **MyLab Finance** will help you identify what you know and where to go when you need to practice.

1.1 The Four Types of Firms

- There are four types of firms in the United States: sole proprietorships, partnerships, limited liability companies, and corporations.
- Firms with unlimited personal liability include sole proprietorships and partnerships.
- Firms with limited liability include limited partnerships, limited liability companies, and corporations.
- A corporation is a legally defined artificial being (a judicial person or legal entity) that has many of the same legal powers as people. It can enter into contracts, acquire assets, incur obligations, and, as we have already established, it enjoys the protection under the U.S. Constitution against the seizure of its property.
- The shareholders in a C corporation effectively must pay tax twice. The corporation pays tax once and then investors must pay personal tax on any funds that are distributed.
- S corporations are exempt from the corporate income tax.

1.2 Ownership Versus Control of Corporations

- The ownership of a corporation is divided into shares of stock collectively known as equity. Investors in these shares are called shareholders, stockholders, or equity holders.