ECONOMICS

Principles & Applications 5E

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Part I: Preliminaries
1. What Is Economics? 1
2. Scarcity, Choice, and Economic Systems 24

Part II: Supply and Demand
3. Supply and Demand 51
4. Working with Supply and Demand 89
5. Elasticity 121

Part III: Microeconomic Decision Makers
6. Consumer Choice 148
7. Production and Cost 189
8. How Firms Make Decisions: Profit Maximization 227

Part IV: Product Markets
9. Perfect Competition 250
10. Monopoly 287
11. Monopolistic Competition and Oligopoly 325

Part V: Labor, Capital, and Financial Markets
12. Labor Markets 355
13. Capital and Financial Markets 396

Part VI: Efficiency, Government, and the Global Economy
14. Economic Efficiency and the Competitive Ideal 434
15. Government’s Role in Economic Efficiency 458
16. Comparative Advantage and the Gains from International Trade 493

Part VII: Macroeconomics: Basic Concepts
17. What Macroeconomics Tries to Explain 521
18. Production, Income, and Employment 534
19. The Price Level and Inflation 572

Part VIII: Long-Run Macroeconomics
20. The Classical Long-Run Model 598
21. Economic Growth and Rising Living Standards 632

Part IX: The Short-Run Model and Fiscal Policy
22. Economic Fluctuations 671
23. The Short-Run Macro Model 687
24. Fiscal Policy 728

Part X: Expanding the Model: Money, Prices and the Global Economy
25. Money, Banks, and the Federal Reserve 754
26. The Money Market and Monetary Policy 790
27. Aggregate Demand and Aggregate Supply 828
28. Inflation and Monetary Policy 861
29. Exchange Rates and Macroeconomic Policy 889

Glossary G-1
Index I-1
Part IV: Product Markets

Chapter 9: Perfect Competition 250
What Is Perfect Competition? 250
The Four Requirements of Perfect Competition, 251 * Is Perfect Competition Realistic?, 253
The Perfectly Competitive Firm 253
Competitive Markets in the Short Run 262
The Market Supply Curve, 262 * Short-Run Equilibrium, 262
Competitive Markets in the Long Run 266
What Happens When Things Change? 272
A Change in Demand, 272 * Market Signals and the Economy, 277 * A Change in Technology, 279
Using the Theory: Short- and Long-Run Adjustment in the Solar Power Industry 281
Summary 284
Problem Set 285

Chapter 10: Monopoly 287
What Is a Monopoly? 287
How Monopolies Arise 288
Economies of Scale, 288 * Legal Barriers, 289 * Network Externalities, 291
Monopoly Behavior 293
Single Price versus Price Discrimination, 293 * Monopoly Price or Output Decision, 293 * Monopoly and Market Power, 296 * Profit and Loss, 297
Equilibrium in Monopoly Markets 299
Short-Run Equilibrium, 299 * Long-Run Equilibrium, 299 * Comparing Monopoly to Perfect Competition, 300 * Government and Monopoly Profit, 303
What Happens When Things Change? 304
A Change in Demand, 304 * A Cost-Saving Technological Advance, 306
Price Discrimination 307
Requirements for Price Discrimination, 308 * Effects of Price Discrimination, 309 * Perfect Price Discrimination, 312 * How Firms Choose Multiple Prices, 314 * Price Discrimination in Everyday Life, 315
Using the Theory: Monopoly Pricing and Parallel Trade in Pharmaceuticals 316
Summary 321
Problem Set 321

Chapter 11: Monopolistic Competition and Oligopoly 325
The Concept of Imperfect Competition 325
Monopolistic Competition 326
Monopolistic Competition in the Short Run, 328 * Monopolistic Competition in the Long Run, 328 * Excess Capacity Under Monopolistic Competition, 330 * Nonprice Competition, 331
Oligopoly 332
Oligopoly in the Real World, 333 * How Oligopolies Arise, 334 * Oligopoly versus Other Market Structures, 335 * The Game Theory Approach, 336 * Simple Oligopoly Games, 338 * Cooperative Behavior in Oligopoly, 342
Using the Theory: Advertising in Monopolistic Competition and Oligopoly 346
Summary 352
Problem Set 352
Part VII: Macroeconomics: Basic Concepts

Chapter 17: What Macroeconomics Tries to Explain  521
  Macroeconomic Goals  521
  Economic Growth, 521 * High Employment (or Low Unemployment), 524 * Stable Prices, 526
  The Macroeconomic Approach  528
  Aggregation in Macroeconomics, 529
  Macroeconomic Controversies  529
  As You Study Macroeconomics . . .  531
  Summary  532
  Problem Set  532

Chapter 18: Production, Income, and Employment  534
  Production and Gross Domestic Product  535
  GDP: A Definition, 535 * Tracking and Reporting GDP, 538 * The Expenditure Approach to GDP, 541 * Other Approaches to GDP, 546 * Measuring GDP: A Summary, 549 * How GDP Is Used, 549 * Problems with GDP, 551 * Using GDP Properly, 552
  Employment and Unemployment  553
  Types of Unemployment, 553 * The Costs of Unemployment, 557 * How Unemployment Is Measured, 560 * Problems in Measuring Unemployment, 562 * The Unemployment Rate in Perspective, 563

Chapter 19: The Price Level and Inflation  572
  Measuring the Price Level and Inflation  572
  Index Numbers in General, 572 * The Consumer Price Index, 573 * From Price Index to Inflation Rate, 575
  How the CPI Is Used  577
  Real Variables and Adjustment for Inflation, 577 * The GDP Price Index and Real GDP, 579
  The Costs of Inflation  580
  The Inflation Myth, 580 * The Redistributive Cost of Inflation, 581 * The Resource Cost of Inflation, 584
  Is the CPI Accurate?  586
  Sources of Bias in the CPI, 586 * The Overall Bias: A Matter of Interpretation, 589 * Consequences of CPI Bias, 590
  Using the Theory: The Controversy over Indexing Social Security Benefits  591
  Summary  594
  Problem Set  594
  Appendix: Calculating the Consumer Price Index  596
Chapter 25: Money, Banks, and the Federal Reserve

Money
The Money Supply
Functions of Money
A Brief History of the Dollar

The Banking System
Financial Intermediaries in General
Commercial Banks
A Bank’s Balance Sheet

The Federal Reserve System
The Structure of the Fed
The Functions of the Fed

The Fed and the Money Supply
How the Fed Increases the Money Supply
How the Fed Decreases the Money Supply
Some Important Provisos about the Money Multiplier
Other Fed Actions That Change the Money Supply

Banking Panics
Bank Insolvency and Bank Failure
How a Banking Panic Develops
The End of Banking Panics
The Role of Regulation

Using the Theory: The Financial Crisis of 2008

Summary
Problem Set
Appendix: Finding Equilibrium GDP Algebraically

Chapter 26: The Money Market and Monetary Policy

The Demand for Money
A Household’s Demand for Money
The Demand for Money by Businesses
The Economy-Wide Demand for Money

The Supply of Money
Equilibrium in the Money Market
How the Money Market Reaches Equilibrium
Are There Two Theories of the Interest Rate?
What Happens When Things Change?
How the Fed Can Change the Interest Rate
How Do Interest Rate Changes Affect the Economy?

Monetary Policy
How Monetary Policy Works
Targeting the Interest Rate
Monetary Policy with Many Interest Rates

Unconventional Monetary Policy
Changing Interest Rate Spreads
The Zero Lower Bound
Financial Crises


Summary
Problem Set
Appendix: Finding Equilibrium GDP Algebraically

Chapter 27: Aggregate Demand and Aggregate Supply

The Aggregate Demand Curve
The Price Level and the Money Market
Deriving the Aggregate Demand Curve
Understanding the AD Curve
Movements along the AD Curve
Shifts of the AD Curve

Part X Expanding the Model: Money, Prices and the Global Economy

Chapter 24: Fiscal Policy

The Short Run: Countercyclical Fiscal Policy
The Mechanics of Countercyclical Fiscal Policy
Problems with Countercyclical Fiscal Policy

The Long Run: Deficits and the National Debt
Numbers in Perspective
Outlays, Revenue, and the Deficit
Deficits over Time
The Deficit and the National Debt

The National Debt: Myths and Realities
Mythical Concerns about the National Debt
Genuine Concerns about the National Debt

Using the Theory: Fiscal Policy During the Recession of 2008–2009

Summary
Problem Set
Appendix: Finding Equilibrium GDP Algebraically
Contents

The Aggregate Supply Curve  835
  Costs and Prices, 835 * How GDP Affects Unit Costs, 837 * Short Run versus Long Run, 838 * Deriving the Aggregate Supply Curve, 839 * Movements along the AS Curve, 840 * Shifts of the AS Curve, 841
AD and AS Together: Short-Run Equilibrium  843
What Happens When Things Change?  845
  Demand Shocks in the Short Run, 845 * Demand Shocks: Adjusting to the Long Run, 849 * The Long-Run Aggregate Supply Curve, 852 * Supply Shocks, 854
Using the Theory: The Story of Two Recessions  856
Summary  859
Problem Set  859

Chapter 28: Inflation and Monetary Policy  861
The Objectives of Monetary Policy  861
  Low, Stable Inflation, 861 * Full Employment, 862
The Fed’s Performance  864
Federal Reserve Policy: Theory and Practice  865
  Responding to Demand Shocks, 865 * Responding to Supply Shocks, 870
Expectations and Ongoing Inflation  872
  How Ongoing Inflation Arises, 872 * Built-In Inflation, 873 * Ongoing Inflation and the Phillips Curve, 875 * The Long-Run Phillips Curve, 877 * Why the Fed Allows Ongoing Inflation, 879
Challenges for Monetary Policy  880
  Information Problems, 880 * Rules versus Discretion, 882 * Avoiding Deflation, 883
Using the Theory: Should the Fed Prevent (or Pop) Asset Bubbles?  884
Summary  887
Problem Set  888

Chapter 29: Exchange Rates and Macroeconomic Policy  889
Foreign Exchange Markets and Exchange Rates  889
  Dollars per Pound or Pounds per Dollar?, 890 * The Demand for British Pounds, 891 * The Supply of British Pounds, 894 * The Equilibrium Exchange Rate, 896
What Happens When Things Change?  897
  How Exchange Rates Change over Time, 898
Government Intervention in Foreign Exchange Markets  903
  Managed Float, 903 * Fixed Exchange Rates, 904 * Foreign Currency Crises, the IMF, and Moral Hazard, 906
Exchange Rates and the Macroeconomy  908
  Exchange Rates and Demand Shocks, 908 * Exchange Rates and Monetary Policy, 909
Exchange Rates and the Trade Deficit  910
  The Origins of the U.S. Trade Deficit, 910 * How a Financial Inflow Causes a Trade Deficit, 912 * Explaining the Net Financial Inflow, 914 * Concerns about the Trade Deficit, 915
Using the Theory: The U.S. Trade Deficit with China  917
Summary  920
Problem Set  920

Glossary  G-1
Index  I-1
Economics: Principles and Applications is about economic principles and how economists use them to understand the world. It was conceived, written, and for the fifth edition, substantially revised to help your students focus on those basic principles and applications. We originally decided to write this book, because we thought that existing texts tended to fall into one of three categories. In the first category are the encyclopedias—the heavy tomes with a section or a paragraph on every topic or subtopic you might possibly want to present to your students. These books are often useful as reference tools. But because they cover so many topics—many of them superficially—the central themes and ideas can be lost in the shuffle. The second type of text we call the “scrapbook.” In an effort to elevate student interest, these books insert multicolored boxes, news clippings, interviews, cartoons, and whatever else they can find to jolt the reader on each page. While these special features are often entertaining, there is a trade-off: These books sacrifice a logical, focused presentation of the material. Once again, the central themes and ideas are often lost. Finally, a third type of text, perhaps in response to the first two, tries to do less in every area—a lot less. But instead of just omitting extraneous or inessential details, these texts often throw out key ideas, models, and concepts. Students who use these books may think that economics is overly simplified and unrealistic. After the course, they may be less prepared to go on in the field, or to think about the economy on their own.

Careful Focus

Because we have avoided encyclopedic complexity, we have had to think hard about what topics are most important. As you will see:

We Avoid Nonessential Material. When we believed a topic was not essential to a basic understanding of economics, we left it out. However, we have strived to include core material to support an instructor who wants to present special topics in class. So, for example, we do not have separate chapters on environmental economics, agricultural economics, urban economics, health care economics, or comparative systems. But instructors should find in the text a good foundation for building any of these areas—and many others—into their course. And we have included examples from each of these areas as applications of core theory where appropriate throughout the text.

We Avoid Distracting Features. This text does not have interviews, news clippings, or boxed inserts with only distant connections to the core material. The features your students will find in our book are there to help them understand and apply economic theory itself, and to help them avoid common mistakes in applying the theory (the Dangerous Curves feature).

We Explain Difficult Concepts Patiently. By freeing ourselves from the obligation to introduce every possible topic in economics, we can explain the topics we do cover more thoroughly and patiently. We lead students, step-by-step, through each aspect of the theory, through each graph, and through each numerical example. In developing this book, we asked other experienced teachers to tell us which aspects of economic theory
were hardest for their students to learn, and we have paid special attention to the trouble spots.

**We Use Concrete Examples.** Students learn best when they see how economics can explain the world around them. Whenever possible, we develop the theory using real-world examples. You will find numerous references to real-world corporations and government policies throughout the text. When we employ hypothetical examples because they illustrate the theory more clearly, we try to make them realistic. In addition, almost every chapter ends with a thorough, extended application (the “Using the Theory” section) focusing on an interesting real-world issue.

**Features That Reinforce**

To help students see economics as a coherent whole, and to reinforce its usefulness, we have included some important features in this book.

**THE THREE-STEP PROCESS**

Most economists, when approaching a problem, begin by thinking about buyers and sellers, and the markets in which they come together to trade. They move on to characterize a market equilibrium, and then give their model a workout in a comparative statics exercise. To understand what economics is about, students need to understand this process and see it in action in different contexts. To help them do so, we have identified and stressed a “three-step process” that economists use in analyzing problems. The three key steps are:

1. **Characterize the Market.** Decide which market or markets best suit the problem being analyzed, and identify the decision makers (buyers and sellers) who interact there.
2. **Find the Equilibrium.** Describe the conditions necessary for equilibrium in the market, and a method for determining that equilibrium.
3. **Determine What Happens When Things Change.** Explore how events or government policies change the market equilibrium.

The steps themselves are introduced toward the end of Chapter 3. Thereafter, the content of most chapters is organized around this three-step process. We believe this helps students learn how to think like economists, and in a very natural way. And they come to see economics as a unified whole, rather than as a series of disconnected ideas.

**DANGEROUS CURVES**

Anyone who teaches economics for a while learns that, semester after semester, students tend to make the same familiar errors. In class, in office hours, and on exams, students seem pulled, as if by gravity, toward certain logical pitfalls in thinking about, and using, economic theory. We've discovered in our own classrooms that merely explaining the theory properly isn't enough; the most common errors need to be confronted, and the student needs to be shown specifically why a particular logical path is incorrect. This was the genesis of our “Dangerous Curves” feature—boxes that anticipate the most common traps and warn students just when they are most likely to fall victim to them. We've been delighted to hear from instructors how effective this feature has been in overcoming the most common points of confusion for their students.

**USING THE THEORY**

This text is full of applications that are woven throughout the narrative. In addition, almost every chapter ends with an extended application (“Using the Theory”) that pulls together several of the tools learned in that chapter. These are not news clippings or world events that relate only tangentially to the material. Rather, they are step-by-step presentations that help students see how the tools of economics can explain things about the world—things that would be difficult to explain without those tools.

**CONTENT INNOVATIONS**

In addition to the special features just described, you will find some important differences from other texts in topical approach and arrangement. These, too, are designed to make the theory stand out more clearly, and to make learning easier. These are not pedagogical experiments, nor are they innovation for the sake of innovation. The differences you will find in this text are the product of years of classroom experience.
Innovations in Microeconomics

Scarcity, Choice, and Economic Systems (Chapter 2) This early chapter, while covering standard material such as opportunity cost, also introduces some central concepts much earlier than other texts. Most importantly, it introduces the concept of comparative advantage, and the basic principle of specialization and exchange. We have placed them at the front of our book, because we believe they provide important building blocks for much that comes later. For example, comparative advantage and specialization within the firm help explain economies of scale (Chapter 6). International trade (Chapter 16) can be seen as a special application of these principles, extending them to trade between nations.

How Firms Make Decisions: Profit Maximization (Chapter 8) Many texts introduce the theory of the firm using the perfectly competitive model first. While this has logical appeal to economists, we believe it is an unfortunate choice for students encountering this material for the first time. Leading with perfect competition forces students to simultaneously master the logic of profit maximization and the details of a rather counterintuitive kind of market at the same time. Students quite naturally think of firms as facing downward-sloping demand curves—not horizontal ones. We have found that they have an easier time learning the theory of the firm with the more familiar, downward-sloping demand curve. Further, by treating the theory of the firm in a separate chapter, before perfect competition, we can separate concepts that apply in all market structures (the shapes of marginal cost and average cost curves, the MC and MR approach to profit maximization, the shut-down rule, etc.), from concepts that are unique to perfect competition (horizontal demand curve, marginal revenue the same as price, etc.). This avoids confusion later on.

Monopolistic Competition and Oligopoly (Chapter 11) Two features of our treatment are worth noting. First, we emphasize advertising, a key feature of both of these types of markets. Students are very interested in advertising and how firms make decisions about it. Second, we have omitted older theories of oligopoly that raised more questions than they answered, such as the kinked demand curve model. Our treatment of oligopoly is strictly game theoretic, but we have taken great care to keep it simple and clear. Here, as always, we provide the important tools to support instructors who want to take game theory further, without forcing every instructor to do so by including too much.

Capital and Financial Markets (Chapter 13) This chapter focuses on the common theme of these subjects: the present value of future income. Moreover, it provides simple, principles-level analyses of the stock and bond markets—something that students are hungry for but that many principles textbooks neglect.

Description versus Assessment (Chapters 8–11 and 14–15) In treating product market structures, most texts switch back and forth between the description and analysis of different markets on the one hand and their efficiency properties on the other. Our book deals with description and analysis first, and only then discusses efficiency, in two comprehensively chapters. The first of these (Chapter 14) covers the concept and measurement of economic efficiency, using Pareto improvements as well as consumer and producer surplus. The second (Chapter 15) deals with market failures and government’s role in economic efficiency. This arrangement of the material permits instructors to focus on description and prediction when first teaching about market structures—a full plate, in our experience. Second, two chapters devoted to efficiency allows a more comprehensive treatment of the topic than we have seen elsewhere. Finally, our approach—in which students learn about efficiency after they have mastered the four market structures—allows them to study efficiency with the perspective needed to really understand it.

Comparative Advantage and the Gains from International Trade (Chapter 16) We’ve found that international trade is best understood through clear numerical examples, and we’ve developed them carefully in this chapter. We also try to bridge the gap between the economics and politics of international trade with a systematic discussion of winners and losers.

Innovations in Macroeconomics

Long-Run Macroeconomics (Chapters 20 and 21) Our text presents long-run growth before short-run fluctuations. Chapter 20 develops the long-run, classical model at a level appropriate for introductory students, mostly using supply and demand. Chapter 21 then uses the classical model to explain the causes—and costs—of economic growth in both rich and poor countries. We believe it is better to treat the long run before the short run, for two reasons. First, the long-run model makes full use of the tools of supply and demand, and thus allows a natural transition from the preliminary chapters (1 through 4) into macroeconomics. Second, we believe that students can best understand economic fluctuations
by understanding how and why the long-run model breaks down over shorter time periods. This, of course, requires an introduction to the long-run model first.

**Economic Fluctuations (Chapter 22)** This unique chapter provides a bridge from the long-run to the short-run macro model, rather than just moving from one to the other with mere assertions about when they are used. This chapter explains why the long-run model doesn’t work in the short run and paves the way for the short-run focus on spending as a driving force behind economic fluctuations.

**Aggregate Demand and Aggregate Supply (Chapter 27)** One of our pet peeves about some introductory texts is the too-early introduction of aggregate demand and aggregate supply curves, before teaching where these curves come from. Students then confuse the AD and AS curves with their microeconomic counterparts, requiring corrective action later. In this text, the AD and AS curves do not appear until Chapter 27, where they are fully explained. Our treatment of aggregate supply is based on a very simple mark-up model that our students have found easy to understand.

**Exchange Rates and Macroeconomic Policy (Chapter 29)** Many students find international macroeconomics the most interesting topic in the course, especially the material on exchange rates and what causes them to change. Accordingly, you will find unusually full coverage of exchange rate determination in this chapter. This treatment is kept simple and straightforward, relying exclusively on supply and demand. And it forms the foundation for the discussion of the trade deficit that ends the chapter.

**Organizational Flexibility**

We have arranged the contents of each chapter, and the table of contents as a whole, according to our recommended order of presentation. But we have also built in flexibility.

**In Microeconomics**

- Chapter 6 develops consumer theory with both marginal utility and (in an appendix) indifference curves, allowing you to present either method in class. (Instructors will find it even easier to make their choice in this edition—see following.)
- If you wish to highlight international trade or present comparative advantage earlier in the course, you could assign Chapter 16 immediately following Chapter 3.
- If you wish to introduce consumer and producer surplus earlier in the course, all of Chapter 14 can be assigned after Chapter 9. And if you feel strongly that economic efficiency should be interwoven bit-by-bit with the chapters on market structure, Chapter 14 can be easily broken into parts. The relevant sections can then be assigned separately with Chapters 3, 4, 9, and 10.

**In Macroeconomics**

- Instructors wishing to move rapidly to macro models—and willing to spend less time on macroeconomic measurement issues—can cut large chunks of material out of Chapter 18 (Production and Employment) and Chapter 19 (The Price Level and Inflation) with no loss of continuity. The only essential requirements for later chapters are the identity of output and income in Chapter 18, and translating nominal to real variables in Chapter 19.
- Instructors who would like to move rapidly to the short-run model can skip (or postpone) Chapter 21 (Economic Growth) without any loss of continuity. And for those who want to sprint to the short run, Chapters 20, 21, and 22 could all be moved toward the end of the course. (In the latter case, students will come across occasional references to Chapters 20 and 22 in the chapters that follow, but they will still have all the analytical tools necessary to keep moving forward).

Finally, we have included only those chapters that we thought were both essential and teachable in a year-long course. But not everyone will agree about what is essential. While we—as authors—cringe at the thought of a chapter being omitted in the interest of time, we have allowed for that possibility. Nothing in Chapter 12 (labor markets), Chapter 13 (capital and financial markets), Chapter 15 (government’s role in economic efficiency), Chapter 16 (international trade), Chapter 21 (economic growth), Chapter 22 (economic fluctuations), Chapter 27 (inflation and monetary policy), or Chapter 29 (international macroeconomics) is essential.
to any of the other chapters in the book. Skipping any of these should not cause continuity problems.

New to the Fifth Edition

This is our most significant revision yet. This will not surprise anyone who was teaching an economics principles course during or after September 2008, when the financial crisis hit its peak. One of us (Lieberman) was teaching macro principles at the time and had the daily task of integrating the flood of unprecedented events into the course. When the semester was over, the two of us thought long and hard about what worked, what didn’t, and how the principles course—both micro and macro—should respond to the changes we had seen.

We wanted to be able to discuss recent events and draw out their long-lasting lessons or challenges. We knew this would require adding some new concepts and tools. But we were mindful that this is a first course in economics and did not want to migrate into areas that we could not fully explain at the principles level. In our discussions, we kept coming back to the same place: that by adding two new core concepts, we could open up a myriad of other doors to understanding recent economic events. Both of these concepts are introduced in Chapter 4 (Working with Supply and Demand). And—for the first time—we’ve decided to include this chapter in our macro split as well as the micro.

TWO NEW CONCEPTS

The first new concept we’ve introduced in this new edition is leverage. While leverage is at the heart of the recent economic turmoil, it has not been part of the traditional principles pedagogy. We’ve introduced it in a simple, intuitive way in the body of Chapter 4. We then delve a bit deeper in the short appendix to that chapter, which explains the concept of owners’ equity (in a home), and presents a simple leverage ratio that students can work with. Teaching this concept not only creates an early, fresh connection between the classroom and current policy debates but also lays the foundation for later applications in the text. Students will see how leverage contributed to the recent housing boom and bust (in Chapter 4); moral hazard in financial institutions (Chapter 15); the recession of 2008–2009 (Chapter 23); the problems of bank and non-bank insolvency (Chapter 25); and the Fed’s response (Chapters 26).

The second new core concept is how supply and demand can be used for stock variables, and not just flow variables. While this idea was present in prior editions, it came late in the text and was not fully established as a key concept. We’ve long wanted to introduce the stock-flow distinction earlier, and more carefully, so we could analyze the market for the housing stock with supply and demand. But we never thought this was essential... until now.

As you’ll see in Chapter 4, treating housing as a stock variable opens another door to understanding the recent housing boom and bust. We also believe that teaching the stock-flow distinction early—with the rather intuitive case of housing—makes it easier to think about stock variables later, when they learn about financial asset markets (in micro), and the money market (in macro).

OTHER KEY CHANGES

Our overall approach, and the sequence of the material, will be mostly familiar to those who’ve used past editions. But we wanted to highlight some key pedagogical changes, in addition to the new sections (discussed earlier) in Chapter 4.

In microeconomics, our biggest change (at the request of many instructors) is the new, simplified treatment of labor markets. The previous two chapters (one on labor markets and one on income inequality) are now combined into the single Chapter 12 (Labor Markets). The development of the labor demand curve is streamlined, so you can get to interesting applications (such as wage inequality) with less delay. (Those who liked the prior approach to labor demand will find it in the appendix to that chapter.)

Two other pedagogical changes we should note are the shift of the section on opportunity cost from Chapter 2 to Chapter 1 and an earlier introduction of international trade (within the discussion of comparative advantage in Chapter 2).

In macroeconomics, our biggest change is the chapter on fiscal policy (now Chapter 24). Given recent events, we felt it was time to thoroughly rewrite this chapter and move it earlier in the text. It now comes right after the chapter on the short-run model. In prior editions, this chapter was heavy on public-finance type material, with shorter sections on policy. In this new edition, it is almost all policy. And it deals head-on with the debate over the fiscal stimulus package—both the short-run and long-run controversies.
We should note a few other changes in macroeconomics. Our treatment of economic growth (Chapter 21) puts more stress on technological change and distinguishes “catch-up growth” in poor countries from “discovery-based growth” in rich countries. In the chapter on money, banks, and the Federal Reserve (Chapter 25), we’ve streamlined our development of the money multiplier, dispensed with the many “T-Accounts,” and replaced them with a (much smaller) number of balance sheets. The use of balance sheets creates an easy transition to the new discussions of bank capital (shareholders’ equity) and bank insolvency. We’ve also continued our gradual shift of emphasis (begun a few editions ago) away from the money supply and toward interest rate targeting. And in the chapter on monetary policy (Chapter 26), we have new sections on unconventional monetary policy and the conditions (such as the “zero lower bound”) that call for it.

**NEW APPLICATIONS**

There are dozens of new applications in this edition—some woven into the narrative, others as new or substantially revised “Using the Theory” sections, where the analysis is more extensive. The *entirely* new “Using the Theory” sections are:

- “The Oil Price Spike of 2007–2008” (Chapter 3)
- “The Housing Boom and Bust of 1997–2008” (Chapter 4)
- “Monopoly Pricing and Parallel Trade in Pharmaceuticals” (Chapter 10)
- “Moral Hazard in the Financial Crisis of 2008” (Chapter 15)
- “The Recession of 2008–2009” (Chapter 23)
- “Fiscal Policy during the Recession of 2008–2009” (Chapter 24)
- “The Financial Crisis of 2008” (Chapter 25)
- “The Fed and the Financial Crisis” (Chapter 26)
- “Should the Fed Prevent (or Pop) Asset Bubbles” (Chapter 28)

Within the chapters, there are new or substantially expanded sections on the role of elasticity in explaining commodity price fluctuations (Chapter 5), how the insights of behavioral economics have affected government policy (Chapter 6), interest rate spreads in financial markets (Chapter 13), what asset bubbles imply about efficient markets theory (Chapter 13), how information asymmetry affects the health insurance market (Chapter 15), the problem of automatic de-stabilizers (Chapter 23), bank failures and banking panics (Chapter 25), monetary policy at the zero lower bound (Chapter 26), and more.

**Teaching and Learning Aids**

To help you present the most interesting principles courses possible, we have created an extensive set of supplementary items. Many of them can be downloaded from the Hall/Lieberman Web site www.cengage.com/economics/hall. The list includes the following items.

**FOR THE INSTRUCTOR**

- The **Instructor’s Manual** is revised by Natalija Novta, New York University, and Jeff Johnson, Sullivan University. The manual provides chapter outlines, teaching ideas, experiential exercises for many chapters, suggested answers to the end-of-chapter review questions, and solutions to all end-of-chapter problems.

**Instructor Resources** on the **Product Support Web Site**. This site at www.cengage.com/economics/hall features the essential resources for instructors, password-protected, in downloadable format: the Instructor’s Manual in Word, the test banks in Word, and PowerPoint lecture and exhibit slides.

- **Microeconomics and Macroeconomics Test Bank** are revised by Toni Weiss, Tulane University, and Andrew Paizis, New York University. These contain more than 5,000 multiple-choice questions. The test questions have been arranged according to chapter headings and subheadings, making it easy to find the material needed to construct examinations.

- **ExamView Computerized Testing Software**. ExamView is an easy-to-use test creation package compatible with both Microsoft Windows and Macintosh client software, and contains all of the questions in all of the printed test banks. You can select questions by previewing them on the screen, selecting them by number, or selecting them randomly. Questions, instructions, and answers can be edited, and new questions can easily be added. You
can also administer quizzes online over the Internet, through a local area network (LAN), or through a wide area network (WAN).

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A Request

Although we have worked hard on the five editions of this book, we know there is always room for further improvement. For that, our fellow users are indispensable. We invite your comments and suggestions wholeheartedly. We especially welcome your suggestions for additional “Using the Theory” sections and Dangerous Curves. You may send your comments to either of us care of South-Western.

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Robert E. Hall is a prominent applied economist. He is the Robert and Carole McNeil Professor of Economics at Stanford University and Senior Fellow at Stanford’s Hoover Institution where he conducts research on inflation, unemployment, taxation, monetary policy, and the economics of high technology. He received his Ph.D. from MIT and has taught there as well as at the University of California, Berkeley. Hall is director of the research program on Economic Fluctuations of the National Bureau of Economic Research, and chairman of the Bureau’s Committee on Business Cycle Dating, which maintains the semi-official chronology of the U.S. business cycle. He has published numerous monographs and articles in scholarly journals, and coauthored an intermediate macro text. Hall has advised the Treasury Department and the Federal Reserve Board on national economic policy and has testified on numerous occasions before congressional committees. Hall is President-elect of the American Economic Association and will serve as President in 2010. He presented the Ely Lecture to the Association in 2001 and served as Vice President in 2005.

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Marc Lieberman is Clinical Professor of Economics at New York University. He received his Ph.D. from Princeton University. Lieberman has presented his extremely popular Principles of Economics course at Harvard, Vassar, the University of California at Santa Cruz, and the University of Hawaii, as well as at NYU. He has twice won NYU’s Golden Dozen teaching award, and also the Economics Society Award for Excellence in Teaching. He is coeditor and contributor to The Road to Capitalism: Economic Transformation in Eastern Europe and the Former Soviet Union. Lieberman has consulted for the Bank of America and the Educational Testing Service. In his spare time, he is a professional screenwriter, and teaches screenwriting at NYU’s School of Continuing and Professional Studies.
Father Guido Sarducci, a character on the early Saturday Night Live shows, once observed that the average person remembers only about five minutes worth of material from college. He therefore proposed the “Five Minute University,” in which you’d learn only the five minutes of material you’d actually remember. The economics course would last only 10 seconds, just enough time for students to learn to memorize three words: “supply and demand.”

Of course, there is much more to economics than these three words. But supply and demand does play a central role in economics. What, exactly, does this familiar phrase really mean?

First, supply and demand is an economic model, designed to explain how prices are determined in certain types of markets.

It’s such an important model because prices themselves play such an important role in the economy. In a market system, once the price of something has been determined, only those willing to pay that price will get it. Thus, prices determine which households will get which goods and services and which firms will get which resources. If you want to know why the cell phone industry is expanding while the video rental industry is shrinking, or why homelessness is a more pervasive problem in the United States than hunger, you need to understand how prices are determined. In this chapter, you will learn how the model of supply and demand works and how to use it.

Markets

Put any compound in front of a chemist, ask him what it is and what it can be used for, and he will immediately think of the basic elements—carbon, hydrogen, oxygen, and so on. Ask an economist almost any question about the economy, and he will immediately think about markets.

In ordinary language, a market is a specific location where buying and selling take place: a supermarket, a flea market, and so on. In economics, a market is not a place, but rather a collection of traders. More specifically,

>a market is a group of buyers and sellers with the potential to trade with each other.

Economists think of the economy as a collection of markets. There is a market for oranges, another for automobiles, another for real estate, and still others for corporate stocks, labor services, land, euros, and anything else that is bought and sold.
CHARACTERIZING A MARKET

The first step in analyzing a market is to figure out which market we are analyzing. This might seem easy. But we can choose to define a market in different ways, depending on our purpose.

Broad versus Narrow Definition

Suppose we want to study the personal computer industry in the United States. Should we define the market very broadly (“the market for computers”), or very narrowly (“the market for ultra-light laptops”), or something in between (“the market for laptops”)? The right choice depends on the problem we’re trying to analyze.

For example, if we’re interested in why computers in general have come down in price over the past decade, we’d treat all types of computers as if they were the same good. Economists call this process aggregation—combining a group of distinct things into a single whole.

But suppose we’re asking a different question: Why do laptops always cost more than desktops with similar computing power? Then we’d aggregate all laptops together as one good, and all desktops as another, and look at each of these more narrowly defined markets.

We can also choose to define the geography of a market more broadly or more narrowly, depending on our purpose. We’d analyze the national market for gasoline if we’re explaining general nationwide trends in gas prices. But we’d define it more locally to explain, say, why gas prices are rising more rapidly in Los Angeles than in other areas of the country.

In economics, markets can be defined broadly or narrowly, depending on our purpose.

How markets are defined is one of the most important differences between microeconomics and macroeconomics. In macroeconomics, goods and services are aggregated to the highest levels. Macro models even lump all consumer goods—breakfast cereals, cell phones, blue jeans, and so forth—into the single category “consumption goods” and view them as if they are traded in a single, national “market for consumption goods.” Defining markets this broadly allows macroeconomists to take an overall view of the economy without getting bogged down in the details.

In microeconomics, by contrast, markets are defined more narrowly. Instead of asking how much we’ll spend on consumer goods, a microeconomist might ask how much we’ll spend on health care or video games. Even in microeconomics, there is always some aggregation, but not as much as in macroeconomics.

Product and Resource Markets

Figure 1, often called the simple circular flow model of the economy, illustrates two different types of markets and how they relate to each other. The upper half illustrates product markets, where goods and services are bought and sold. The blue arrows show the flow of products from the business firms who supply them to the households who buy them. The green arrows show the associated flow of dollars from the households who spend the dollars, to the business firms who receive these dollars as revenue. (In the real world, businesses also sell products to the government and to other businesses, but this simple version leaves out these details.)
The outer loop of the diagram shows the flows of goods and resources, and the markets in which they are traded. Households sell resources to firms in resource markets. Business firms use the resources to produce goods and services, which they sell to households in product markets. The inner loop shows money flows. The resource payments made by firms become income to households. Households use the income to purchase goods and services from firms.

The lower half depicts a different set of markets: resource markets, where labor, land, and capital are bought and sold. Here, the roles of households and firms are reversed. The blue arrows show resources flowing from the households (who own and supply them) to the business firms (who demand them). The associated flow of dollars is indicated by the green arrows: Business firms pay for the resources they use, and households receive these payments as income.

In this chapter, we’ll be using supply and demand to analyze product markets—particularly those where business firms supply goods and services to households. In later chapters, we’ll be applying supply and demand to resource markets, and to some other types of markets that are not included in the circular flow depicted here. These include markets for existing homes, and markets for financial markets such as stocks and bonds.

**Competition in Markets**

A final issue in defining a market is how prices are determined. In some markets, individual buyers or sellers have an important influence over the price. For example, in the national market for cornflakes, Kellogg’s—an individual seller—simply sets its price every few months. It can raise the price and sell fewer boxes of cereal or lower the price and sell more. In a small-town, a major buyer of antiques may be...
able to negotiate special discount prices with the local antique shops. These are examples of imperfectly competitive markets.

In imperfectly competitive markets, individual buyers or sellers can influence the price of the product.

But now think about the U.S. market for wheat. Can an individual seller have any impact on the market price? Not really. On any given day there is a going price for wheat—say, $5.80 per bushel. If a farmer tries to charge more than that—say, $5.85 per bushel—he won’t sell any wheat at all! His customers will instead go to one of his many competitors and buy the identical product from them for less. Each wheat farmer must take the price of wheat as a “given.”

The same is true of a single wheat buyer: If he tries to negotiate a lower price from a seller, he’d be laughed off the farm. “Why should I sell my wheat to you for $5.75 per bushel, when there are others who will pay me $5.80?” Accordingly, each buyer must take the market price as a given.

The market for wheat is an example of a perfectly competitive market.

In perfectly competitive markets (or just competitive markets), each buyer and seller takes the market price as a given.

What makes some markets imperfectly competitive and others perfectly competitive? You’ll learn the complete answer, along with more formal definitions, when you are further into your study of microeconomics. But here’s a hint: In perfectly competitive markets, there are many small buyers and sellers, each is a small part of the market, and the product is standardized, like wheat. Imperfectly competitive markets, by contrast, have just a few large buyers or sellers, or else the product of each seller is unique in some way.

Understanding competition in markets is important in this chapter for one simple reason:

The supply and demand model is designed to show how prices are determined in perfectly competitive markets.

Competition in the Real World

Markets that are truly perfectly competitive—where no buyer or seller has any influence over the price—are rare. Does that mean we can only use supply and demand in those rare cases, such as the market for wheat? Not at all. Supply and demand is useful for many real-world markets, even when the competition is somewhat imperfect.

Consider the market for laptop computers. Laptops made by Lenovo, Hewlett Packard, Toshiba, Apple, and other producers differ in important ways: memory, speed, operating system, and more. And even within a smaller group—say, Windows laptops with the same memory and speed—there are still differences. The keyboards feel different, the reputations for reliability and service are different, and more. For this reason, each producer can charge a different price, even for very similar laptops. Because there is no single market price that all producers take as given, the market is not strictly perfectly competitive.
But laptops made by different firms, while not identical, are not *that* different. So the freedom to set price is limited. For example, if other similar laptops are selling for between $900 and $1,000, Lenovo cannot charge $1,400; it would lose almost all of its customers to competitors. While there is no single market price, each producer views the range of prices it can charge as given.

Thus, the laptop market—while not perfectly competitive—is still somewhat competitive. And in cases like these, supply and demand can help us see how the price range is determined, and what makes that range rise and fall.

More generally, 

*while few markets are strictly perfectly competitive, most markets have enough competition for supply and demand to explain broad movements in prices.*

This is why supply and demand has proven to be the most versatile and widely used model in the economist’s toolkit. Neither DVDs nor avocados strictly satisfy the requirements of perfect competition. But ask an economist why the price of DVDs has fallen dramatically in recent years, or how wildfires in southern California might affect the price of avocados next month, and he or she will invariably reach for the model of supply and demand.

In the rest of this chapter, we will build the supply and demand model. As the name implies, the model has two major parts. We will first consider each part separately, and then put them together.

**Demand**

It’s tempting to think of the “demand” for a product psychologically—a pure “want” or “desire.” But that kind of thinking can lead us astray. For example, you want all kinds of things: a bigger apartment, a better car, nicer clothes, more and better vacations. The list is endless. But you don’t always buy them. Why not?

Because in addition to your wants—which you’d very much like to satisfy—you also face constraints. First, you have to pay. Second, your spending power is limited, so every decision to buy one thing is also a decision not to buy something else (or a decision to save less, and have less buying power in the future). As a result, every purchase confronts you with an opportunity cost. Your “wants,” together with the real-world constraints that you face, determine what you will choose to buy in any market. Hence, the following definition:

*The quantity demanded of a good or service is the number of units that all buyers in a market would choose to buy over a given time period, given the constraints that they face.*

Since this definition plays a key role in any supply and demand analysis, it’s worth taking a closer look at it.

*Quantity Demanded Implies a Choice.* Quantity demanded doesn’t tell us the amount of a good that households feel they “need” or “desire” in order to be happy. Instead, it tells us how much households would choose to buy *when they take into account the opportunity cost* of their decisions. The opportunity cost arises from the
constraints households face, such as having to pay a given price for the good, limits on spendable funds, and so on.

**Quantity Demanded Is Hypothetical.** Will households actually be able to purchase the amount they want to purchase? As you’ll soon see, usually yes. But there are special situations—analyzed in microeconomics—in which households are frustrated in buying all that they would like to buy. Quantity demanded makes no assumptions about the availability of the good. Instead, it’s the answer to a hypothetical question: How much would households buy, given the constraints that they face, if the units they wanted to buy were available?

**Quantity Demanded Depends on Price.** The price of the good is just one variable among many that influences quantity demanded. But because the price is a key variable that our model will ultimately determine, we try to keep that variable front-and-center in our thinking. This is why for the next few pages we’ll assume that all other influences on demand are held constant, so we can explore the relationship between price and quantity demanded.

**THE LAW OF DEMAND**

How does a change in price affect quantity demanded? You probably know the answer to this already: When something is more expensive, people tend to buy less of it. This common observation applies to air travel, magazines, guitars, and virtually everything else that people buy. For all of these goods and services, price and quantity are negatively related: that is, when price rises, quantity demanded falls; when price falls, quantity demanded rises. This negative relationship is observed so regularly in markets that economists call it the law of demand.

The law of demand states that when the price of a good rises and everything else remains the same, the quantity of the good demanded will fall.

Read that definition again, and notice the very important words, “everything else remains the same.” The law of demand tells us what would happen if all the other influences on buyers’ choices remained unchanged, and only one influence—the price of the good—changed.

This is an example of a common practice in economics. In the real world, many variables change simultaneously. But to understand changes in the economy, we must first understand the effect of each variable separately. So we conduct a series of mental experiments in which we ask: “What would happen if this one influence—and only this one—were to change?” The law of demand is the result of one such mental experiment, in which we imagine that the price of the good changes, but all other influences on quantity demanded remain constant.

Mental experiments like this are used so often in economics that we sometimes use a shorthand Latin expression to remind us that we are holding all but one influence constant: *ceteris paribus* (formally pronounced KAY-ter-is PAR-ih-bus, although it’s acceptable to pronounce the first word as SEH-ter-is). This is Latin for “all else the same,” or “all else remaining unchanged.” Even when it is not explicitly stated, the *ceteris paribus* assumption is virtually always implied. The exceptions are cases where we consider two or more influences on a variable that change simultaneously, as we will do toward the end of this chapter.
THE DEMAND SCHEDULE AND THE DEMAND CURVE

To make our discussion more concrete, let’s look at a specific market: the market for real maple syrup in the United States. In this market, we’ll view the buyers as U.S. households, whereas the sellers (to be considered later) are maple syrup producers in the United States or Canada.

Table 1 shows a hypothetical demand schedule for maple syrup in this market. This is a list of different quantities demanded at different prices, with all other variables that affect the demand decision assumed constant. For example, the demand schedule tells us that when the price of maple syrup is $2.00 per bottle, the quantity demanded will be 60,000 bottles per month. Notice that the demand schedule obeys the law of demand: As the price of maple syrup increases, ceteris paribus, the quantity demanded falls.

Now look at Figure 2. It shows a diagram that will appear again and again in your study of economics. In the figure, each price-and-quantity combination in Table 1 is represented by a point. For example, point A represents the price $4.00 and quantity 40,000, while point B represents the pair $2.00 and 60,000. When we
connect all of these points with a line, we obtain the famous demand curve, labeled with a $D$ in the figure.

The demand curve shows the relationship between the price of a good and the quantity demanded in the market, holding constant all other variables that influence demand. Each point on the curve shows the total quantity that buyers would choose to buy at a specific price.

Notice that the demand curve in Figure 2—like virtually all demand curves—slopes downward. This is just a graphical representation of the law of demand.

**Shifts versus Movements Along the Demand Curve**

Markets are affected by a variety of events. Some events will cause us to move along the demand curve; others will cause the entire demand curve to shift. It is crucial to distinguish between these two very different types of effects.

Let’s go back to Figure 2. There, you can see that when the price of maple syrup rises from $2.00 to $4.00 per bottle, the number of bottles demanded falls from 60,000 to 40,000. This is a movement along the demand curve, from point B to point A. In general,

a change in the price of a good causes a movement along the demand curve.

In Figure 2, a fall in price would cause us to move rightward along the demand curve (from point A to point B), and a rise in price would cause us to move leftward along the demand curve (from B to A).

Remember, though, that when we draw a demand curve, we assume all other variables that might influence demand are held constant at some particular value. For example, the demand curve in Figure 2 might have been drawn to give us quantity demanded at each price when average household income in the United States remains constant at, say, $40,000 per year.

But suppose average income increases to $50,000. With more income, we’d expect households to buy more of most things, including maple syrup. This is illustrated in Table 2. At the original income level, households would choose to buy 60,000 bottles of maple syrup at $2.00 per bottle. But after income rises, they would choose to buy more at that price—80,000 bottles, according to Table 2. A similar

### TABLE 2

<table>
<thead>
<tr>
<th>Increase in Demand for Maple Syrup in the United States</th>
<th>Price (per bottle)</th>
<th>Original Quantity Demanded (average income = $40,000)</th>
<th>New Quantity Demanded (average income = $50,000)</th>
</tr>
</thead>
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<tr>
<td></td>
<td>$1.00</td>
<td>75,000</td>
<td>95,000</td>
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<td>$2.00</td>
<td>60,000</td>
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<td>70,000</td>
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<tr>
<td></td>
<td>$5.00</td>
<td>35,000</td>
<td>55,000</td>
</tr>
</tbody>
</table>
change would occur at any other price for maple syrup: After income rises, households would choose to buy more than before. In other words, the rise in income changes the entire relationship between price and quantity demanded. We now have a new demand curve.

Figure 3 plots the new demand curve from the quantities in the third column of Table 2. The new demand curve lies to the right of the old curve. For example, at a price of $2.00, quantity demanded increases from 60,000 bottles on the old curve (point $B$) to 80,000 bottles on the new demand curve (point $C$). As you can see, the rise in household income has shifted the demand curve to the right.

More generally,

*a change in any variable that affects demand—except for the good’s price—causes the demand curve to shift.*

When buyers would choose to buy a greater quantity at any price, the demand curve shifts rightward. If they would decide to buy a smaller quantity at any price, the demand curve shifts leftward.

“Change in Quantity Demanded” versus “Change in Demand”

Language is important when discussing demand. The term quantity demanded means a particular amount that buyers would choose to buy at a specific price, represented by a single point on a demand curve. Demand, by contrast, means the entire relationship between price and quantity demanded, represented by the entire demand curve.

For this reason, when a change in the price of a good moves us along a demand curve, we call it a change in quantity demanded. For example, in Figure 2, the movement from point $A$ to point $B$ is an increase in quantity demanded. This is a change from one number (40,000 bottles) to another (60,000 bottles).

**FIGURE 3** A Shift of the Demand Curve

An increase in income shifts the demand curve for maple syrup from $D_1$ to $D_2$. At each price, more bottles are demanded after the shift.
When something other than the price changes, causing the entire demand curve to shift, we call it a change in demand. In Figure 3, for example, the shift in the curve would be called an increase in demand.

**FACTORS THAT SHIFT THE DEMAND CURVE**

Let’s take a closer look at what might cause a change in demand (a shift of the demand curve). Keep in mind that for now, we’re exploring one factor at a time, always keeping all other determinants of demand constant.

**Income.** In Figure 3, an increase in income shifted the demand for maple syrup to the right. In fact, a rise in income increases demand for most goods. We call these normal goods. Housing, automobiles, health club memberships, and real maple syrup are all examples of normal goods.

But not all goods are normal. For some goods—called inferior goods—a rise in income would decrease demand—shifting the demand curve leftward. Regular-grade ground chuck is a good example. It’s a cheap source of protein, but not as high in quality as sirloin. With higher income, households could more easily afford better types of meat—ground sirloin or steak, for example. As a result, higher incomes for buyers might cause the demand for ground chuck to decrease. For similar reasons, we might expect that Greyhound bus tickets (in contrast to airline tickets) and single-ply paper towels (in contrast to two-ply) are inferior goods.

* A rise in income will increase the demand for a normal good, and decrease the demand for an inferior good.

**Wealth.** Your wealth at any point in time is the total value of everything you own (cash, bank accounts, stocks, bonds, real estate or any other valuable property) minus the total dollar amount you owe (home mortgage, credit card debt, auto loan, student loan, and so on). Although income and wealth are different, (see the nearby Dangerous Curves box), they have similar effects on demand. Increases in wealth among buyers—because of an increase in the value of their stocks or bonds, for example—gives them more funds with which to purchase goods and services. As you might expect,

* an increase in wealth will increase demand (shift the curve rightward) for a normal good, and decrease demand (shift the curve leftward) for an inferior good.

**Prices of Related Goods.** A substitute is a good that can be used in place of some other good and that fulfills more or less the same purpose. For example, many people use real maple syrup to sweeten their pancakes, but they could use a number of other things instead: honey, sugar, jam, or artificial maple syrup. Each of these can be considered a substitute for real maple syrup.

When the price of a substitute rises, people will choose to buy more maple syrup. For example, when the price of jam rises, some jam users will switch to maple syrup, and the demand for maple syrup will increase. In general,

* a rise in the price of a substitute increases the demand for a good, shifting the demand curve to the right.
Of course, if the price of a substitute falls, we have the opposite result: Demand for the original good decreases, shifting its demand curve to the left.

A complement is the opposite of a substitute: It's used together with the good we are interested in. Pancake mix is a complement to maple syrup, since these two goods are used frequently in combination. If the price of pancake mix rises, some consumers will switch to other breakfasts—bacon and eggs, for example—that don't include maple syrup. The demand for maple syrup will decrease.

**A rise in the price of a complement decreases the demand for a good, shifting the demand curve to the left.**

To test yourself: How would a lower price for DVDs affect the demand for DVD players? How would it affect the demand for movies in theaters?

**Population.** As the population increases in an area, the number of buyers will ordinarily increase as well, and the demand for a good will increase. The growth of the U.S. population over the last 50 years has been an important reason (but not the only reason) for rightward shifts in the demand curves for food, housing, automobiles, and many other goods and services.

**Expected Price.** If buyers expect the price of maple syrup to rise next month, they may choose to purchase more now to stock up before the price hike. If people expect the price to drop, they may postpone buying, hoping to take advantage of the lower price later.

**In many markets, an expectation that price will rise in the future shifts the current demand curve rightward, while an expectation that price will fall shifts the current demand curve leftward.**

Expected price changes for goods are especially important for goods that can be purchased and stored until needed later. Expected price changes are also important in the markets for financial assets such as stocks and bonds and in the market for housing, as you'll see in the next chapter.

**Tastes.** Not everyone likes maple syrup. And among those who do, some really like it, and some like it just a little. Buyers’ basic attitudes toward a good are based on their tastes or preferences. Economists are sometimes interested in where these tastes come from or what makes them change. But for the most part, economics deals with the consequences of a change in tastes, whatever the reason for its occurrence.

When tastes change toward a good (people favor it more), demand increases, and the demand curve shifts to the right. When tastes change away from a good, demand decreases, and the demand curve shifts to the left. An example of this is the change in tastes away from cigarettes over the past several decades. The cause may have been an aging population, a greater concern about health among people of all ages, or successful antismoking advertising. But regardless of the cause, the effect has been to decrease the demand for cigarettes, shifting the demand curve to the left.

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**Complement.** A good that is used together with some other good.
**Other Shift Variables.** Many other things, besides those we’ve discussed, can shift the demand curve. For example, if the government began to offer subsidies to households who buy maple syrup, demand would shift rightward. Also, if business firms (rather than just households) are among the buyers, then changes in the demand for their own products will influence their demand for maple syrup. We’ll discuss additional shift-variables in later chapters, as they become relevant.

**DEMAND: A SUMMARY**

Figure 4 summarizes the key variables we’ve discussed that affect the demand side of the market and how their effects are represented with a demand curve. Notice the important distinction between events that move us *along* the curve (changes in price) and events that *shift* the curve.

---

**FIGURE 4 The Demand Curve—A Summary**

- **price ↓** ⇒ move rightward along curve
- **price ↑** ⇒ move leftward along curve
- \(
\begin{align*}
\text{income or wealth} & \uparrow \\
\text{price of substitute} & \uparrow \\
\text{price of complement} & \downarrow \\
\text{population} & \uparrow \\
\text{expected price} & \uparrow \\
\text{Tastes shift toward good}
\end{align*}
\) ⇒ demand curve shifts rightward
- \(
\begin{align*}
\text{income or wealth} & \downarrow \\
\text{price of substitute} & \downarrow \\
\text{price of complement} & \uparrow \\
\text{population} & \downarrow \\
\text{expected price} & \downarrow \\
\text{Tastes shift away from good}
\end{align*}
\) ⇒ demand curve shifts leftward
Supply

When most people hear the word supply, their first thought is that it’s the amount of something “available,” as if this amount were fixed in stone. For example, someone might say, “We can only drill so much oil from the ground,” or “There are only so many apartments for rent in this town.” And yet, the world’s known oil reserves—as well as yearly production of oil—have increased dramatically over the last half century, as oil companies have found it worth their while to look harder for oil. Similarly, in most towns and cities, short buildings have been replaced with tall ones, and the number of apartments has increased. Supply, like demand, can change, and the amount of a good supplied in a market depends on the choices made by those who produce it.

What governs these choices? We assume that those who supply goods and services have a goal: to earn the highest profit possible. But they also face constraints. First, in a competitive market, the price they can charge for their product is a given—the market price. Second, firms have to pay the costs of producing and selling their product. These costs will depend on the production process they use, the prices they must pay for their inputs, and more. Business firms’ desire for profit, together with the real-world constraints that they face, determines how much they will choose to sell in any market. Hence, the following definition:

**Quantity supplied is the number of units of a good that all sellers in the market would choose to sell over some time period, given the constraints that they face.**

Let’s briefly go over the notion of quantity supplied to clarify what it means and doesn’t mean.

**Quantity Supplied Implies a Choice.** Quantity supplied doesn’t tell us the amount of, say, maple syrup that sellers would like to sell if they could charge a thousand dollars for each bottle, and if they could produce it at zero cost. Instead, it’s the quantity that firms choose to sell—the quantity that gives them the highest profit given the constraints they face.

**Quantity Supplied Is Hypothetical.** Will firms actually be able to sell the amount they want to sell at the going price? You’ll soon see that they usually can. But the definition of quantity supplied makes no assumptions about firms’ ability to sell the good. Quantity supplied answers the hypothetical question: How much would suppliers sell, given their constraints, if they were able to sell all that they wanted to.

**Quantity Supplied Depends on Price.** The price of the good is just one variable among many that influences quantity supplied.
But—as with demand—we want to keep that variable foremost in our thinking. This is why for the next couple of pages we’ll assume that all other influences on supply are held constant, so we can explore the relationship between price and quantity supplied.

**THE LAW OF SUPPLY**

How does a change in price affect quantity supplied? When a seller can get a higher price for a good, producing and selling it become more profitable. Producers will devote more resources toward its production—perhaps even pulling resources from other goods they produce—so they can sell more of the good in question. For example, a rise in the price of laptop (but not desktop) computers will encourage computer makers to shift resources out of the production of other things (such as desktop computers) and toward the production of laptops.

In general, price and quantity supplied are positively related: When the price of a good rises, the quantity supplied will rise as well. This relationship between price and quantity supplied is called the law of supply, the counterpart to the law of demand we discussed earlier.

The law of supply states that when the price of a good rises, and everything else remains the same, the quantity of the good supplied will rise.

Once again, notice the very important words “everything else remains the same”—ceteris paribus. Although many other variables influence the quantity of a good supplied, the law of supply tells us what would happen if all of them remained unchanged and only one—the price of the good—changed.

**THE SUPPLY SCHEDULE AND THE SUPPLY CURVE**

Let’s continue with our example of the market for maple syrup in the United States. Who are the suppliers in this market? Maple syrup producers are located mostly in the forests of Vermont, upstate New York, and Canada. The market quantity supplied is the amount of syrup all of these producers together would offer for sale at each price for maple syrup in the United States.

Table 3 shows the supply schedule for maple syrup—a list of different quantities supplied at different prices, with all other variables held constant. As you can see, the supply schedule obeys the law of supply: As the price of maple syrup rises, the quantity supplied rises along with it. But how can this be? After all, maple trees must be about 40 years old before they can be tapped for syrup, so any rise in quantity supplied now or in the near future cannot come from an increase in planting. What, then, causes quantity supplied to rise as price rises?

Many things. With higher prices, firms will find it profitable to tap existing trees more intensively. Evaporating and bottling can be done more carefully, so that less maple syrup is spilled and more is available for shipping. Or the product can be diverted from other areas and shipped to the United States instead. For example, if the price of maple syrup rises in the United States but not in Canada, producers would shift deliveries away from Canada so they could sell more in the United States.
Chapter 3: Supply and Demand

Now look at Figure 5, which shows a very important curve—the counterpart to the demand curve we drew earlier. In Figure 5, each point represents a price-quantity pair taken from Table 3. For example, point $F$ in the figure corresponds to a price of $2.00 per bottle and a quantity of 40,000 bottles per month, while point $G$ represents the price-quantity pair $4.00 and 60,000 bottles. Connecting all of these points with a solid line gives us the supply curve for maple syrup, labeled with an $S$ in the figure.

*The supply curve shows the relationship between the price of a good and the quantity supplied in the market, holding constant the values of all other variables that affect supply. Each point on the curve shows the quantity that sellers would choose to sell at a specific price.*

Notice that the supply curve in Figure 5—like all supply curves for goods and services—is upward sloping. This is the graphical representation of the law of supply.

<table>
<thead>
<tr>
<th>Price (per bottle)</th>
<th>Quantity Supplied (bottles per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00</td>
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<td>$2.00</td>
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<td>$4.00</td>
<td>60,000</td>
</tr>
<tr>
<td>$5.00</td>
<td>65,000</td>
</tr>
</tbody>
</table>

**Supply curve** A graph of a supply schedule, showing the quantity of a good or service supplied at various prices, with all other variables held constant.

**Figure 5** The Supply Curve

When the price is $2.00 per bottle, 40,000 bottles are supplied (point $F$).

At $4.00 per bottle, quantity supplied is 60,000 bottles (point $G$).
Shifts versus Movements Along the Supply Curve

As with the demand curve, it's important to distinguish those events that will cause us to move along a given supply curve for the good, and those that will cause the entire supply curve to shift.

If you look once again at Figure 5, you'll see that if the price of maple syrup rises from $2.00 to $4.00 per bottle, the number of bottles supplied rises from 40,000 to 60,000. This is a movement along the supply curve, from point $F$ to point $G$. In general,

*a change in the price of a good causes a movement along the supply curve.*

In the figure, a rise in price would cause us to move rightward along the supply curve (from point $F$ to point $G$) and a fall in price would move us leftward along the curve (from point $G$ to point $F$).

But remember that when we draw a supply curve, we assume that all other variables that might influence supply are held constant at some particular values. For example, the supply curve in Figure 5 might tell us the quantity supplied at each price when the cost of an important input—transportation from the farm to the point of sale—remains constant.

But suppose the cost of transportation drops. Then, at any given price for maple syrup, firms would find it more profitable to produce and sell it. This is illustrated in Table 4. With the original transportation cost, and a selling price of $4.00 per bottle, firms would choose to sell 60,000 bottles. But after transportation cost falls, they would choose to produce and sell more—80,000 bottles in our example—assuming they could still charge $4.00 per bottle. A similar change would occur for any other price of maple syrup we might imagine: After transportation costs fall, firms would choose to sell more than before. In other words, the entire relationship between price and quantity supplied has changed, so we have a new supply curve.

Figure 6 plots the new supply curve from the quantities in the third column of Table 4. The new supply curve lies to the right of the old one. For example, at a price of $4.00, quantity supplied increases from 60,000 bottles on the old curve (point $G$) to 80,000 bottles on the new supply curve (point $J$). The drop in the transportation costs has shifted the supply curve to the right.

### TABLE 4

<table>
<thead>
<tr>
<th>Increase in Supply of Maple Syrup in the United States</th>
<th>Price (per bottle)</th>
<th>Original Quantity Supplied</th>
<th>Quantity Supplied After Decrease in Transportation Cost</th>
</tr>
</thead>
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<tr>
<td></td>
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<tr>
<td></td>
<td>$5.00</td>
<td>65,000</td>
<td>90,000</td>
</tr>
</tbody>
</table>
In general,

*a change in any variable that affects supply—except for the good’s price—causes the supply curve to shift.*

If sellers want to sell a greater quantity at any price, the supply curve shifts *rightward*. If sellers would prefer to sell a smaller quantity at any price, the supply curve shifts *leftward*.

**Change in Quantity Supplied versus Change in Supply**

As we stressed in our discussion of the demand side of the market, be careful about language when thinking about supply. The term *quantity supplied* means a *particular amount* that sellers would choose to sell at a *particular* price, represented by a single point on the supply curve. The term *supply*, however, means the *entire relationship* between price and quantity supplied, as represented by the entire supply curve.

For this reason, when the price of the good changes, and we move *along* the supply curve, we have a *change in quantity supplied*. For example, in Figure 5, the movement from point $F$ to point $G$ is an *increase* in quantity supplied.

When something *other* than the price changes, causing the entire supply curve to shift, we call it a *change in supply*. The shift in Figure 6, for example, would be called an *increase in supply*.

**Factors That Shift the Supply Curve**

Let’s look at some of the *causes* of a change in supply (a shift of the supply curve). As always, we’re considering *one* variable at a time, keeping all other determinants of supply constant.
**Input Prices.** In Figure 6, we saw that a drop in transportation costs shifted the supply curve for maple syrup to the right. But producers of maple syrup use a variety of other inputs besides transportation: land, maple trees, sap pans, evaporators, labor, glass bottles, and more. A lower price for any of these means a lower cost of producing and selling maple syrup, making it more profitable. As a result, we would expect producers to shift resources into maple syrup production, causing an increase in supply.

In general,

* a fall in the price of an input causes an increase in supply, shifting the supply curve to the right.

Similarly, a rise in the price of an input causes a decrease in supply, shifting the supply curve to the left. If, for example, the wages of maple syrup workers rose, the supply curve in Figure 6 would shift to the left.

**Price of Alternatives.** Many firms can switch their production rather easily among several different goods or services, each of which requires more or less the same inputs. For example, a dermatology practice can rather easily switch its specialty from acne treatments for the young to wrinkle treatments for the elderly. An automobile producer can—without too much adjustment—switch to producing light trucks. And a maple syrup producer could dry its maple syrup and produce maple sugar instead. Or it could even cut down its maple trees and sell maple wood as lumber. These other goods that firms could produce are called alternate goods and their prices influence the supply curve.

For example, if the price of maple sugar rose, then at any given price for maple syrup, producers would shift some production from syrup to sugar. This would be a decrease in the supply of maple syrup.

Another alternative for the firm is to sell the same good in a different market, which we’ll call an alternate market. For example, since we are considering the market for maple syrup in the United States, the maple syrup market in Canada is a different market for producers. For any given price in the United States, a rise in the price of maple syrup in Canada will cause producers to shift some sales from the United States to Canada. In the U.S. market, this will cause the supply curve to shift leftward.

* When the price for an alternative rises—either an alternate good or the same good in an alternate market—the supply curve shifts leftward.

Similarly, a decrease in the price of an alternate good (or a lower price in an alternate market) will shift the supply curve rightward.

**Technology.** A technological advance in production occurs whenever a firm can produce a given level of output in a new and cheaper way than before. Examples would include a new, more efficient tap that draws more maple syrup from each tree, or a new bottling method that reduces spillage. Advances like these would reduce the cost of producing maple syrup, making it more profitable, and producers would want to make and sell more of it at any price.

In general,

* cost-saving technological advances increase the supply of a good, shifting the supply curve to the right.
Chapter 3: Supply and Demand

Number of Firms. A change in the number of firms in a market will change the quantity that all sellers together would want to sell at any given price. For example, if—over time—more people decided to open up maple syrup farms because it was a profitable business, the supply of maple syrup would increase. And if maple syrup farms began closing down, their number would be reduced and supply would decrease.

Expected Price. Imagine you’re the president of Sticky’s Maple Syrup, Inc., and you expect that the market price of maple syrup—over which you, as an individual seller, have no influence—to rise next month. What would you do? You’d certainly want to postpone selling some of your maple syrup until the price is higher and your profit greater. Therefore, at any given price now, you might slow down production, or just slow down sales by warehousing more of what you produce. If other firms have similar expectations of a price hike, they’ll do the same. Thus, an expectation of a future price hike will decrease supply in the present.

Suppose instead you expect the market price to drop next month. Then—at any given price—you’d want to sell more now, by stepping up production and even selling out of your inventories. So an expected future drop in the price would cause an increase in supply in the present.

Expected price is especially important when suppliers can hold inventories of goods for later sale, or when they can easily shift production from one time period to another.

Changes in Weather and Other Natural Events. Weather conditions are an especially important determinant of the supply of agricultural goods.

In many markets, an expectation of a future price rise shifts the current supply curve leftward. Similarly, an expectation of a future price drop shifts the current supply curve rightward.

In addition to bad weather, natural disasters such as fires, hurricanes, and earthquakes can destroy or disrupt the productive capacity of all firms in a region. If many sellers of a particular good are located in the affected area, the supply curve for that good will shift leftward. For example, after Hurricanes Katrina and Rita struck the U.S. Gulf Coast in August and September of 2005, 20 percent of the nation’s oil refining capacity was taken out for several weeks, causing a sizable leftward shift of the supply curve for gasoline.

Other Shift Variables. Many other things, besides those listed earlier, can shift the supply curve. For example, a government tax imposed on maple syrup producers would raise the cost of making and selling maple syrup. To suppliers, this would
have the same effect as a higher price for transportation: it would shift the supply curve leftward. We’ll discuss other shift variables for supply as they become relevant in later chapters.

**SUPPLY—A SUMMARY**

Figure 7 summarizes the various factors we’ve discussed that affect the supply side of the market, and how we illustrate them using a supply curve. As with demand, notice which events move us along the supply curve (changes in price) and which shift the curve. To test yourself, you might want to create a list of the shift variables in Figure 4 and Figure 7, in random order. Then explain, for each item, which curve shifts, and in which direction.
Putting Supply and Demand Together

What happens when buyers and sellers, each having the desire and the ability to trade, come together in a market? The two sides of the market certainly have different agendas. Buyers would like to pay the lowest possible price, while sellers would like to charge the highest possible price. Is there chaos when they meet, with buyers and sellers endlessly chasing after each other or endlessly bargaining for advantage, so that trade never takes place? A casual look at the real world suggests not. In most markets, most of the time, there is order and stability in the encounters between buyers and sellers. In most cases, prices do not fluctuate wildly from moment to moment but seem to hover around a stable value. Even when this stability is short-lived—lasting only a day, an hour, or even a minute in some markets—for this short-time the market seems to be at rest. Whenever we study a market, therefore, we look for this state of rest—a price and quantity at which the market will settle, at least for a while.

Economists use the word *equilibrium* when referring to a state of rest. When a market is in equilibrium, both the price of the good and the quantity bought and sold have settled into a state of rest. More formally,

*the equilibrium price and equilibrium quantity are values for price and quantity in the market that, once achieved, will remain constant—unless and until the supply curve or the demand curve shifts.*

Finding the Equilibrium Price and Quantity

Look at Table 5, which combines the supply and demand schedules for maple syrup from Tables 1 and 3. We’ll use Table 5 to find the equilibrium price in this market through the process of elimination.

Prices below the Equilibrium Price

Let’s first ask what would happen if the price were less than $3.00 per bottle—say, $1.00. At this price, Table 5 tells us that buyers would want to buy 75,000 bottles each month, while sellers would offer to sell only 25,000. There would be an *excess demand* of 50,000 bottles. What would happen in this case? Buyers would compete with each other to get more maple syrup than was available, and would

---

**TABLE 5**

<table>
<thead>
<tr>
<th>Price (per bottle)</th>
<th>Quantity Demanded (bottles per month)</th>
<th>Quantity Supplied (bottles per month)</th>
<th>Excess Demand or Supply?</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.00</td>
<td>75,000</td>
<td>25,000</td>
<td>Excess Demand</td>
<td>Price will Rise</td>
</tr>
<tr>
<td>$2.00</td>
<td>60,000</td>
<td>40,000</td>
<td>Excess Demand</td>
<td>Price will Rise</td>
</tr>
<tr>
<td>$3.00</td>
<td>50,000</td>
<td>50,000</td>
<td><em>Neither</em></td>
<td><em>No Change in price</em></td>
</tr>
<tr>
<td>$4.00</td>
<td>40,000</td>
<td>60,000</td>
<td>Excess Supply</td>
<td>Price will Fall</td>
</tr>
<tr>
<td>$5.00</td>
<td>35,000</td>
<td>65,000</td>
<td>Excess Supply</td>
<td>Price will Fall</td>
</tr>
</tbody>
</table>

---

*Equilibrium price* The market price that, once achieved, remains constant until either the demand curve or supply curve shifts.

*Equilibrium quantity* The market quantity bought and sold per period that, once achieved, remains constant until either the demand curve or supply curve shifts.

*Excess demand* At a given price, the amount by which quantity demanded exceeds quantity supplied.
At a price of $1.00 per bottle an excess demand of 50,000 bottles would cause buyers to pay a higher price rather than do without. The price would then rise. The same would occur if the price were $2.00, or any other price below $3.00.

We conclude that any price less than $3.00 cannot be an equilibrium price. If the price starts below $3.00, it would start rising— not because the supply curve or the demand curve had shifted, but from natural forces within the market itself. This directly contradicts our definition of equilibrium price.

Figure 8 illustrates the same process by putting the supply and demand curves together on the same graph. As you can see, at a price of $1.00, quantity supplied of 25,000 bottles is found at point H on the supply curve, while quantity demanded is at point J on the demand curve. The horizontal difference between the two curves at $1.00 is a graphical representation of the excess demand at that price.

At this point, we should ask another question: If the price were initially $1.00, would it ever stop rising? Yes. Since excess demand is the reason for the price to rise, the process will stop when the excess demand is gone. And as you can see in Figure 8, the rise in price shrinks the excess demand in two ways. First, as price rises, buyers demand a smaller quantity—a leftward movement along the demand curve. Second, sellers increase supply to a larger quantity—a rightward movement along the supply curve. Finally, when the price reaches $3.00 per bottle, the excess demand is gone and the price stops rising.

This logic tells us that $3.00 is an equilibrium price in this market—a value that won’t change as long as the supply and demand curves stay put. But is it the only equilibrium price?

**Prices above the Equilibrium Price**

We’ve shown that any price below $3.00 is not an equilibrium, but what about a price greater than $3.00? Let’s see.

Suppose the price of maple syrup was, say, $5.00 per bottle. Look again at Table 5 and you’ll find that, at this price, quantity supplied would be 65,000 bottles...
Chapter 3: Supply and Demand

FIGURE 9 Excess Supply Causes Price to Fall

1. At a price of $5.00 per bottle an excess supply of 30,000 bottles causes the price to drop...

2. ...shrinking the excess supply until price reaches its equilibrium value of $3.00 per month, while quantity demanded would be only 35,000 bottles. There is an excess supply of 30,000 bottles. Sellers would compete with each other to sell more maple syrup than buyers wanted to buy, and the price would fall. Thus, $5.00 cannot be the equilibrium price.

Figure 9 provides a graphical view of the market in this situation. With a price of $5.00, the excess supply is the horizontal distance between points K (on the demand curve) and L (on the supply curve). In the figure, the resulting drop in price would move us along both the supply curve (leftward) and the demand curve (rightward). As these movements continued, the excess supply of maple syrup would shrink until it disappeared, once again, at a price of $3.00 per bottle. Our conclusion: If the price happens to be above $3.00, it will fall to $3.00 and then stop changing.

You can see that $3.00 is the equilibrium price—and the only equilibrium price—in this market. Moreover, at this price, sellers would want to sell 50,000 bottles—the same quantity that households would want to buy. So, when price comes to rest at $3.00, quantity comes to rest at 50,000 per month—the equilibrium quantity.

Equilibrium on a Graph

No doubt, you have noticed that $3.00 happens to be the price at which the supply and demand curves cross. This leads us to an easy, graphical technique for locating our equilibrium:

To find the equilibrium in a competitive market, draw the supply and demand curves. Market equilibrium occurs where the two curves cross. At this crossing point, the equilibrium price is found on the vertical axis, and the equilibrium quantity on the horizontal axis.
Notice that in equilibrium, the market is operating on *both* the supply curve and the demand curve so that—at a price of $3.00—quantity demanded and quantity supplied are equal. There are no dissatisfied buyers unable to find goods they want to purchase, nor are there any frustrated sellers unable to sell goods they want to sell. Indeed, this is why $3.00 is the equilibrium price. It’s the only price that creates consistency between what buyers choose to buy and sellers choose to sell.

But we don’t expect a market to stay at any particular equilibrium forever, as you’re about to see.

**What Happens When Things Change?**

Remember that in order to draw the supply and demand curves in the first place, we had to assume particular values for all the other variables—besides price—that affect demand and supply. If one of these variables changes, then either the supply curve or the demand curve will shift, and our equilibrium will change as well. Let’s look at some examples.

**EXAMPLE: INCOME RISES, CAUSING AN INCREASE IN DEMAND**

In Figure 10, point *E* shows an initial equilibrium in the U.S. market for maple syrup, with an equilibrium price of $3.00 per bottle, and equilibrium quantity of 50,000 bottles per month. Suppose that the incomes of buyers rise because the U.S. economy recovers rapidly from a recession. We know that income is one of the...
shift-variables in the demand curve (but not the supply curve). We also can reason that maple syrup is a normal good, so the rise in income will cause the demand curve to shift rightward. What happens then?

The old price—$3.00—is no longer the equilibrium price. How do we know? Because if the price did remain at $3.00 after the demand curve shifted, there would be an excess demand that would drive the price upward. The new equilibrium—at point $E'$—is the new intersection point of the curves after the shift in the demand curve. Comparing the original equilibrium at point $E$ with the new one at point $E'$, we find that the shift in demand has caused the equilibrium price to rise (from $3.00 to $4.00) and the equilibrium quantity to rise as well (from 50,000 to 60,000 bottles per month).

Notice, too, that in moving from point $E$ to point $E'$, we move along the supply curve. That is, a shift of the demand curve has caused a movement along the supply curve. Why is this? The demand shift causes the price to rise, and a rise in price always causes a movement along the supply curve. But the supply curve itself does not shift because none of the variables that affect sellers—other than the price of the good—has changed.

In this example, income rose. But any event that shifted the demand curve rightward would have the same effect on price and quantity. For example, if tastes changed in favor of maple syrup, or a substitute good like jam rose in price, or a complementary good like pancake mix became cheaper, the demand curve for maple syrup would shift rightward, just as it did in Figure 10. So, we can summarize our findings as follows:

A rightward shift in the demand curve causes a rightward movement along the supply curve. Equilibrium price and equilibrium quantity both rise.

---

**EXAMPLE: BAD WEATHER, SUPPLY DECREASES**

Bad weather can affect supply for most agricultural goods, including maple syrup. An example occurred in January 1998, when New England and Quebec were struck by a severe ice storm. Hundreds of thousands of maple trees were downed, and many more were damaged. In Vermont alone, 10 percent of the maple trees were destroyed. How did this affect the market for maple syrup?

As you’ve learned, weather can be shift-variable for the supply curve. Look at Figure 11. Initially, the supply curve for maple syrup is $S_1$, with the market in equilibrium at Point $E$. When bad weather hits, the supply curve shifts leftward—say, to $S_2$. The result: a rise in the equilibrium price of maple syrup (from $3.00 to $5.00 in the figure) and a fall in the equilibrium quantity (from 50,000 to 35,000 bottles).

Any event that shifts the supply curve leftward would have similar effects. For example, if the wages of maple syrup workers increase, or some maple syrup
An ice storm causes supply to decrease from $S_1$ to $S_2$. At the old equilibrium price of $3.00, there is now an excess demand. As a result, the price increases until excess demand is eliminated at point $E'$. In the new equilibrium, quantity demanded again equals quantity supplied. The price is higher, and fewer bottles are produced and sold.

A leftward shift of the supply curve causes a leftward movement along the demand curve. Equilibrium price rises, but equilibrium quantity falls.

**EXAMPLE: HIGHER INCOME AND BAD WEATHER TOGETHER**

So far, we’ve considered examples in which just one curve shifts due to a change in a single variable that influences either demand or supply. But what would happen if two changes affected the market simultaneously? Then both curves would shift.

Figure 12 shows what happens when we take the two factors we’ve just explored separately (a rise in income and bad weather) and combine them together. The rise in income causes the demand curve to shift rightward, from $D_1$ to $D_2$. The bad weather causes the supply curve to shift leftward, from $S_1$ to $S_2$. The result of all this is a change in equilibrium from point $E$ to point $E'$, where the new demand curve $D_2$ intersects the new supply curve $S_2$.

Notice that the equilibrium price rises from $3.00 to $6.00 in our example. This should come as no surprise. A rightward shift in the demand curve, with no other change, causes price to rise. And a leftward shift...
An increase in income shifts the demand curve rightward from \( D_1 \) to \( D_2 \). At the same time, bad weather shifts the supply curve leftward from \( S_1 \) to \( S_2 \). The equilibrium moves from point \( E \) to point \( E' \). While the price must rise after these shifts, quantity could rise or fall or remain the same, depending on the relative sizes of the shifts. In the figure, quantity happens to fall.

In the supply curve, with no other change, causes price to rise. So when we combine the two shifts together, the price must rise. In fact, the increase in the price will be greater than would be caused by either shift alone.

But what about equilibrium quantity? Here, the two shifts work in opposite directions. The rightward shift in demand works to increase quantity, while the leftward shift in supply works to decrease quantity. We can’t say what will happen to equilibrium quantity until we know which shift is greater and thus has the greater influence. Quantity could rise, fall, or remain unchanged.

In Figure 12, it just so happens that the supply curve shifts more than the demand curve, so equilibrium quantity falls. But you can easily prove to yourself that the other outcomes are possible. First, draw a graph where the demand curves shift rightward by more than the supply curve shifts leftward. In your graph, you’ll see that equilibrium quantity rises. Then, draw one where both curves shift (in opposite directions) by equal amounts, and you’ll see that equilibrium quantity remains unchanged.

We can also imagine other combinations of shifts. A rightward or leftward shift in either curve can be combined with a rightward or leftward shift in the other.

Table 6 lists all the possible combinations. It also shows what happens to equilibrium price and quantity in each case, and when the result is ambiguous (a question mark). For example, the top left entry tells us that when both the supply and demand curves shift rightward, the equilibrium quantity will always rise, but the equilibrium price could rise, fall, or remain unchanged, depending on the relative size of the shifts.

Do not try to memorize the entries in Table 6. Instead, remember the advice in Chapter 1: to study economics actively, rather than passively. This would be a good time to put down the book, pick up a pencil and paper, and see whether you can
draw a graph to illustrate each of the nine possible results in the table. When you see a question mark (?) for an ambiguous result, determine which shift would have to be greater for the variable to rise or to fall.

### The Three-Step Process

In this chapter, we built a model—a supply and demand model—and then used it to analyze price changes in several markets. You may not have noticed it, but we took three distinct steps as the chapter proceeded. Economists take these same three steps to answer many questions about the economy, as you’ll see throughout this book.

Let’s review these steps:

**Step 1—Characterize the Market:** Decide which market or markets best suit the problem being analyzed, and identify the decision makers (buyers and sellers) who interact there.

In economics, we make sense of the very complex, real-world economy by viewing it as a collection of markets. Each of these markets involves a group of decision makers—buyers and sellers—who have the potential to trade with each other. At the very beginning of our analysis, we must decide which market or markets to look at (such as the U.S. market for maple syrup).

**Step 2—Find the Equilibrium:** Describe the conditions necessary for equilibrium in the market, and a method for determining that equilibrium.

Once we’ve defined a market, and put buyers and sellers together, we look for the point at which the market will come to rest—the equilibrium. In this chapter, we used supply and demand to find the equilibrium price and quantity in a perfectly competitive market, but this is just one example of how economists apply Step 2.

**Step 3—What Happens When Things Change:** Explore how events or government policies change the market equilibrium.

Once you’ve found the equilibrium, the next step is to ask how different events will change it. In this chapter, for example, we explored how rising income or bad weather (or both together) would affect the equilibrium price and quantity for maple syrup.
Economists follow this same three-step procedure to analyze important questions in both microeconomics and macroeconomics. In this book, we’ll be taking these three steps again and again, and we’ll often call them to your attention.

Using the Theory


Everyday, the world produces more than 80 million barrels of oil and uses up the same amount to produce almost every good and service we enjoy. So when the price of oil changes, every part of the economy is affected.

Figure 13 plots the average monthly price of oil from January 2001 through early 2009. These are prices in the spot market—where crude oil is bought and sold for delivery either immediately or within a few weeks after being pumped out of the ground. Notice the price spike from January 2007 to mid-2008. During this short period, oil prices rose from $58 to $143 per barrel. As a result, gasoline prices shot up around the globe. In the U.S., for example, the price of a gallon of regular gas almost doubled from $2.27 to $4.11 per gallon, making drivers unhappy and causing various culprits to be blamed on blogs, cable TV talk shows, and even U.S. Congressional hearings.

One popular culprit was OPEC (The Organization of Petroleum Exporting Countries). The 12 OPEC nations were accused of limiting production to drive up the market price. Another culprit was speculators (traders who buy something now expecting the price to rise so they can sell at a profit).
Blame was even spread to a conspiracy of speculators, who must have been coordinating their actions to drive the price higher.

Many economists were skeptical about these explanations. To understand why, we’ll use supply and demand, along with the three-step process discussed in this chapter.

**Characterizing the Market**

How should we characterize the market? First, we’ll view it as a global market. It costs just a couple of dollars to ship a barrel of oil halfway around the world, so oil sellers and oil buyers around the globe can easily trade with each other. And our goal is to explain why oil prices rose worldwide, rather than in any particular country or region.

Second, because we want to explain why prices for all types of oil rose together, we’ll look at the market for all types of crude oil—regardless of weight or sulfur content or any other quality. Finally, we’ll regard the market as competitive, enabling us to use supply and demand. True, about one-third of the world’s oil is produced by OPEC, which manipulates its members’ total quantity to influence the world price. This part of the market is not competitive. But the remaining two-thirds of the world’s oil is traded under competitive conditions—with many buyers and sellers, each of whom takes the market price as given. We’ll regard OPEC’s supply decisions as a shift variable for the market supply curve.

**Finding the Equilibrium**

Figure 14 shows market supply and demand curves for oil. The supply curve slopes upward: A higher price, ceteris paribus, increases the total quantity supplied by private and state-owned oil-producing firms in about 50 countries. (Even when OPEC’s quantity is fixed, the total quantity supplied will rise with the price.) The demand curve slopes downward: A higher price, ceteris paribus, reduces the quantity
demanded by oil-buying firms around the world, including oil refineries, electric power plants, plastics makers, and others. These firms use oil to make goods and services (gasoline, jet fuel, electricity, plastic bags) that they sell to households or other firms.

The equilibrium price occurs where quantity supplied and demanded are equal. In Figure 14, the equilibrium price is the one in early January 2007, when it averaged $58 per barrel, and world oil production averaged 84 million barrels per day.

**What Happens When Things Change?**

When we looked at the market for maple syrup, we observed how some event (such as an ice storm) changed the equilibrium. Here, we’ll do the reverse. We know what happened (the equilibrium price rose) and we ask: What caused it?

Let’s first consider the three most popular media explanations at the time.

**Popular Explanation #1: Speculation in the Futures Market**

In the oil futures market, traders sign contracts promising to buy or sell oil months or even years into the future, at a price stated in the contract. Starting in the mid-2000s, the oil futures market became increasingly popular for speculators. Pension funds, hedge funds, and even ordinary households began buying oil futures contracts in huge quantities, betting that the price of oil would continue rising. Could this sort of speculation explain the oil price spike in the spot market, as seen in Figure 13?

Not directly. Futures contracts are virtually always settled in cash, with no one actually buying or selling actual oil to settle a contract. A futures contract is like a bet on tomorrow’s football game. The “game” in this analogy is the spot market for oil—where barrels of physical oil are actually bought and sold. Just as a football bet doesn’t affect the outcome of tomorrow’s game, a bet on the future price of oil has no direct impact on what that price will actually be when buyers and sellers do their trading.

But the futures market can indirectly influence spot market oil prices. For example, suppose that higher futures-market prices make everyone think that oil prices are, in fact, heading up. As you’ve learned, in many markets such an expected price increase can cause supply and demand curves to shift now. Buyers might want to purchase more oil than they currently need, shifting the demand curve rightward. Or producers might want to cut back on sales, shifting the supply curve leftward. So the next step in our analysis is to ask: Did producers cut back production? Did buyers purchase and hoard oil for future use? Let’s look first at producers.

**Popular Explanation #2: Cutbacks by Producers**

Figure 15 shows what would have happened if, ceteris paribus, OPEC or some other group of suppliers decreased supply (say, because they expected higher prices later on or were actually trying to manipulate the price). The market supply curve shifts leftward—from $S_1$ to $S_2$—and the new equilibrium price rises to $143. Such a leftward shift of the supply curve could explain the rise in price, but notice that when the supply curve shifts leftward, equilibrium quantity falls (down to 80 million barrels). Does this match the facts?

No. From 2007 to 2008, the quantity of oil produced and sold rose, in contradiction to the prediction in Figure 15. Even OPEC raised its production during this period. Thus a leftward shifting supply curve alone cannot explain what happened.
While we cannot rule out a leftward shift in the supply curve, it can—at best—be only part of the explanation.

**Popular Explanation #3: Manipulation, Speculation, or Hoarding by Buyers**

Figure 16 shows what would have happened if, ceteris paribus, buyers increased their demand for oil, because they expected higher prices later. Oil users might have decided to buy more than they needed at the time, stocking up for the future. Or speculators might have hoarded oil in order to profit by selling it later. Or maybe buyers were conspiring to drive the price up by taking oil off the market and storing it somewhere. In any of these scenarios, the demand curve shifts rightward, from $D_1$ to $D_2$. Equilibrium price rises from $58$ to $143$, and equilibrium quantity rises too (from 84 million to 87 million barrels per day). This matches what actually happened to price and quantity from January 2007 to July 2008.

In fact, a rightward shift in the demand curve must be part of our explanation. (Look back at Table 6 in the chapter, which tells us that—regardless of what happens to supply—demand must increase in order for both price and quantity to rise.) But could buyer manipulation, speculation, or hoarding in the spot market have been the reason?

Not likely. First, a conspiracy large enough to actually manipulate the market price would have to involve many buyers, and the secret would be hard to keep. But second—and more importantly—to increase demand in the spot market, the manipulators, speculators, or hoarders would have to buy actual oil and store it somewhere for later sale or use. Storing oil is both expensive and difficult. And the data for the U.S., Japan, and Europe show no buildup of oil inventories during this period. Since we have no inventory evidence to support manipulation, speculation, or hoarding, this explanation is not very satisfying.
The Least-Interesting but Most Logical Answer

We’ve concluded that the demand curve for oil in the spot market must have shifted rightward (either by itself or in combination with a supply shift). Otherwise, both price and quantity could not have risen. We’ve also concluded that speculation, manipulation and buyer-hoarding are unlikely explanations for the demand shift. What else is left?

The answer would not make a good premise for a Hollywood thriller. It is far less interesting than crazed speculators or villainous manipulators. The demand for oil seems to have increased because—quite simply—firms wanted to use more oil at any given price. And they wanted to use more because households around the world—with rapidly growing incomes—wanted to buy more goods and services produced from oil.

Indeed, global income growth had been increasing the demand for all throughout the 2000s. But in 2007 and early 2008, income grew even more rapidly, and so did oil demand. This rapid increase in demand by oil-using firms appears to have raised price and quantity, without increasing oil inventories.

Now, if rightward shifts in the supply curve had kept pace with the rightward shifts in the demand curve, more oil could have been produced and sold without any rise in price. But in 2007 and early 2008, no major new oil field was brought into production, and no new cost-saving technology was discovered. Nothing happened that might have shifted the supply curve significantly rightward.

Now look back at Figure 13, where you can see that the price of oil dropped rapidly after mid-2008. In this case, a spreading global recession slowed growth and actually reduced economic activity in some of the largest oil-consuming countries, shifting the demand curve leftward. The OPEC countries tried to prevent the price from falling too rapidly by coordinating a decrease in production (shifting the supply curve leftward), but they seemed unable to shift it fast enough or far enough to prevent a rapid price drop.
In mid-2008, as oil prices fell, the public had no difficulty understanding and accepting economists’ central explanation: that falling incomes were decreasing the demand for oil, causing the price to drop. Yet just six months earlier, many could not accept the same logic in the other direction: that rising incomes were increasing the demand for oil, causing the price to rise.

**SUMMARY**

In a market economy, prices are determined through the interaction of buyers and sellers in markets. Perfectly competitive markets have many buyers and sellers, and none of them individually can affect the market price. If an individual, buyer, or seller has the power to influence the price of a product, the market is imperfectly competitive.

The model of supply and demand explains how prices are determined in perfectly competitive markets. The quantity demanded of any good is the total amount buyers would choose to purchase given the constraints that they face. The law of demand states that quantity demanded is negatively related to price; it tells us that the demand curve slopes downward. The demand curve is drawn for given levels of income, wealth, tastes, prices of substitute and complementary goods, population, and expected future price. If any of those factors changes, the demand curve will shift. A change in price, however, moves us along the demand curve.

The quantity supplied of a good is the total amount sellers would choose to produce and sell given the constraints that they face. According to the law of supply, supply curves slope upward. The supply curve will shift if there is a change in the price of an input, the price of an alternate good, the price in an alternate market, the number of firms, expectations of future prices, or (for some goods) a change in weather. A change in the price of the good, by contrast, moves us along the supply curve.

Equilibrium price and quantity in a market are found where the supply and demand curves intersect. If either or both of these curves shift, price and quantity will change as the market moves to a new equilibrium.

Economists frequently use a three-step process to answer questions about the economy. The three steps—taken several times in this chapter are to (1) characterize the market or markets involved in the question; (2) find the equilibrium in the market; and (3) ask what happens when something changes.

**PROBLEM SET**

1. Consider the following statement: “In late 2008, as at other times in history, oil prices came down at the same time as the quantity of oil produced fell. Therefore, one way for us to bring down oil prices is to slow down oil production.” True or false? Explain.

2. In the late 1990s and through 2000, the British public became increasingly concerned about “Mad Cow Disease,” which could be deadly to humans if they ate beef from these cattle. Fearing the disease, many consumers switched to other meats, like chicken, pork, or lamb. At the same time, the British government ordered the destruction of thousands of head of cattle. Illustrate the effects of these events on the equilibrium price and quantity in the market for British beef. Can we determine with certainty the direction of change for the quantity? For the price? Explain briefly.

3. Discuss, and illustrate with a graph, how each of the following events will affect the market for coffee:
   a. A blight on coffee plants kills off much of the Brazilian crop.
   b. The price of tea declines.
   c. Coffee workers organize themselves into a union and gain higher wages.
   d. Coffee is shown to cause cancer in laboratory rats.
   e. Coffee prices are expected to rise rapidly in the near future.
4. The following table gives hypothetical data for the quantity of two-bedroom rental apartments demanded and supplied in Peoria, Illinois:

<table>
<thead>
<tr>
<th>Monthly Rent (thousands)</th>
<th>Quantity Demanded (thousands)</th>
<th>Quantity Supplied (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$800</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>$1,000</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>$1,200</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>$1,400</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>$1,600</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>$1,800</td>
<td>15</td>
<td>22</td>
</tr>
</tbody>
</table>

a. Graph the demand and supply curves.
b. Find the equilibrium price and quantity.
c. Explain briefly why a rent of $1,000 cannot be the equilibrium in this market.
d. Suppose a tornado destroys a significant number of apartment buildings in Peoria, but doesn’t affect people’s desire to live there. Illustrate on your graph the effects on equilibrium price and quantity.

5. The following table gives hypothetical data for the quantity of alarm clocks demanded and supplied per month.

<table>
<thead>
<tr>
<th>Price per Alarm Clock (dollars)</th>
<th>Quantity Demanded (thousands)</th>
<th>Quantity Supplied (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5</td>
<td>3,500</td>
<td>700</td>
</tr>
<tr>
<td>$10</td>
<td>3,000</td>
<td>900</td>
</tr>
<tr>
<td>$15</td>
<td>2,500</td>
<td>1,100</td>
</tr>
<tr>
<td>$20</td>
<td>2,000</td>
<td>1,300</td>
</tr>
<tr>
<td>$25</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>$30</td>
<td>1,000</td>
<td>1,700</td>
</tr>
<tr>
<td>$35</td>
<td>500</td>
<td>1,900</td>
</tr>
</tbody>
</table>

a. Graph the demand and supply curves.
b. Find the equilibrium price and quantity.
c. Illustrate on your graph how a decrease in the price of telephone wake-up services would affect the market for alarm clocks.
d. What would happen if there was a decrease in the price of wake-up services at the same time that the price of the plastic used to manufacture alarm clocks rose?

6. The table at the end of this problem gives hypothetical data for the quantity of electric scooters demanded and supplied per month.

<table>
<thead>
<tr>
<th>Price per Electric Scooter (dollars)</th>
<th>Quantity Demanded (millions)</th>
<th>Quantity Supplied (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$150</td>
<td>500</td>
<td>250</td>
</tr>
<tr>
<td>$175</td>
<td>475</td>
<td>350</td>
</tr>
<tr>
<td>$200</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>$225</td>
<td>425</td>
<td>550</td>
</tr>
<tr>
<td>$250</td>
<td>400</td>
<td>650</td>
</tr>
<tr>
<td>$275</td>
<td>375</td>
<td>750</td>
</tr>
</tbody>
</table>

7. The following table gives hypothetical data for the quantity of gasoline demanded and supplied in Los Angeles per month.

<table>
<thead>
<tr>
<th>Price per Gallon (dollars)</th>
<th>Quantity Demanded (millions)</th>
<th>Quantity Supplied (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.20</td>
<td>170</td>
<td>80</td>
</tr>
<tr>
<td>$1.30</td>
<td>156</td>
<td>105</td>
</tr>
<tr>
<td>$1.40</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>$1.50</td>
<td>123</td>
<td>175</td>
</tr>
<tr>
<td>$1.60</td>
<td>100</td>
<td>210</td>
</tr>
<tr>
<td>$1.70</td>
<td>95</td>
<td>238</td>
</tr>
</tbody>
</table>

a. Graph the demand and supply curves.
b. Find the equilibrium price and quantity.
c. Illustrate on your graph how a rise in the price of automobiles would affect the gasoline market.

8. How would each of the following affect the market for blue jeans in the United States? Illustrate each answer with a supply and demand diagram.

a. The price of denim cloth increases.
b. An economic slowdown in the United States causes household incomes to decrease.

d. What would happen if there was an increase in the wage rate paid to scooter assemblers at the same time that tastes for electric scooters increased?

d. What would happen if there was an increase in the wage rate paid to scooter assemblers at the same time that tastes for electric scooters increased?

9. Indicate which curve shifted—and in which direction—for each of the following. Assume that only one curve shifts.

a. The price of furniture rises as the quantity bought and sold falls.
b. Apartment vacancy rates increase while average monthly rent on apartments declines.
c. The price of personal computers continues to decrease as sales skyrocket.

d. What would happen if there was an increase in the wage rate paid to scooter assemblers at the same time that tastes for electric scooters increased?
oranges will rise or fall.” There is a serious mistake of logic in this forecast. Can you find it? Explain.

11. A couple of months after Hurricane Katrina, an article in The New York Times contained the following passage: “Gasoline prices—the national average is now $2.15, according to the Energy Information Administration—have fallen because higher prices held down demand and Gulf Coast supplies have been slowly restored.” The statement about supply is entirely correct and explains why gas prices came down. But the statement about demand confuses two concepts you learned about in this chapter.
   a. What two concepts does the statement about demand seem to confuse? Explain briefly.
   b. On a supply and demand diagram, show what most likely caused gasoline prices to rise when Hurricane Katrina shut down gasoline refineries on the Gulf Coast.
   c. On another supply and demand diagram, show what most likely happened in the market for gasoline as Gulf Coast refineries were repaired—and began operating again—after the Hurricane.
   d. What role did the demand side of the market play in explaining the rise and fall of gas prices?

12. Draw supply and demand diagrams for market A for each of the following. Then use your diagrams to illustrate the impact of the following events. In each case, determine what happens to price and quantity in each market.
   a. A and B are substitutes, and the price of good B rises.
   b. A and B satisfy the same kinds of desires, and there is a shift in tastes away from A and toward B.
   c. A is a normal good, and incomes in the community increase.
   d. There is a technological advance in the production of good A.
   e. B is an input used to produce good A, and the price of B rises.

13. The Using the Theory section of this chapter points out that when we observe an increase in both price and quantity, we know that the demand curve must have shifted rightward. However, we cannot rule a shift in the supply curve as well. Prove this by drawing a supply and demand graph for each of the following cases:
   a. Demand curve shifts rightward, supply curve shifts leftward, equilibrium price and quantity both rise.
   b. Demand and supply curves both shift rightward, equilibrium price and quantity both rise.
   c. Evaluate the following statement: “During the oil price spike from 2007 to mid-2008, we know the supply curve could not have shifted leftward, because quantity supplied rose.” True or False? Explain.
   d. “During the oil price spike from 2007 to mid-2008, the supply curve may have shifted leftward (say, because a rise in expected price), but the demand curve must have shifted rightward as well.” True or False? Explain.

14. In the second half of 2008, as the equilibrium price and quantity of oil both decreased, OPEC succeeded in reducing oil production by its members, but could not prevent the dramatic drop in price. Illustrate both the original equilibrium (before the price drop) and the final equilibrium (after the price drop) on a supply and demand diagram.

More Challenging

15. Suppose that demand is given by the equation \( Q^D = 500 - 50P \), where \( Q^D \) is quantity demanded, and \( P \) is the price of the good. Supply is described by the equation \( Q^S = 50 + 25P \), where \( Q^S \) is quantity supplied. What is the equilibrium price and quantity? (See Appendix.)

16. While crime rates fell across the country over the past few decades, they fell especially rapidly in Manhattan. At the same time, there were some neighborhoods in the New York metropolitan area in which the crime rate remained constant. Using supply and demand diagrams for rental housing, explain how a falling crime rate in Manhattan could make the residents in other neighborhoods worse off. (Hint: As people from around the country move to Manhattan, what happens to rents there? If people already living in Manhattan cannot afford to pay higher rent, what might they do?)

17. An analyst observes the following equilibrium price-quantity combinations in the market for restaurant meals in a city over a four-year period:

<table>
<thead>
<tr>
<th>Year</th>
<th>( P )</th>
<th>( Q ) (thousands of meals per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$12</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>$15</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>$17</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>$20</td>
<td>50</td>
</tr>
</tbody>
</table>

She concludes that the market defies the law of demand. Is she correct? Why or why not?

---

In the body of this chapter, notice that the supply and demand curves for maple syrup were not graphed as straight lines. This is because the data they were based on (as shown in the tables) were not consistent with a straight-line graph. You can verify this if you look back at Table 1: When the price rises from $1.00 to $2.00, quantity demanded drops by 15,000 (from 75,000 to 60,000). But when the price rises from $2.00 to $3.00, quantity demanded drops by 10,000 (from 60,000 to 50,000). Since the change in the independent variable (price) is $1.00 in both cases, but the change in the dependent variable (quantity demanded) is different, we know that when the relationship between quantity demanded and price is graphed, it will not be a straight line.

We have no reason to expect demand or supply curves in the real world to be straight lines (to be linear). However, it’s often useful to approximate a curve with a straight line that is reasonably close to the original curve. One advantage of doing this is that we can then express both supply and demand as simple equations, and solve for the equilibrium using basic algebra.

For example, suppose the demand for take-out pizzas in a modest-size city is represented by the following equation:

$$Q^D = 64,000 - 3,000 P$$

where $Q^D$ stands for the quantity of pizzas demanded per week. This equation tells us that every time the price of pizza rises by $1.00, the number of pizzas demanded each week falls by 3,000. As we’d expect, there is a negative relationship between price and quantity demanded. Moreover, since quantity demanded always falls at the same rate (3,000 fewer pizzas for every $1.00 rise in price), the equation is linear.1

Now we’ll add an equation for the supply curve:

$$Q^S = -20,000 + 4,000 P$$

where $Q^S$ stands for the quantity of pizzas supplied per week. This equation tells us that when the price of pizza rises by $1.00, the number of pizzas supplied per week rises by 4,000—the positive relationship we expect of a supply curve.2 And like the demand curve, it’s linear: Quantity supplied continues to rise at the same rate (4,000 more pizzas for every $1.00 increase in price).

We know that if this market is in equilibrium, quantity demanded ($Q^D$) will equal quantity supplied ($Q^S$). So let’s impose that condition on these curves. That is, let’s require $Q^D = Q^S$. This allows us to use the definitions for $Q^D$ and $Q^S$ that have price as a variable, and set those equal to each other in equilibrium:

$$64,000 - 3,000 P = -20,000 + 4,000 P$$

This is one equation with a single unknown—$P$—so we can use the rules of algebra to isolate $P$ on one side of the equation. We do this by adding 3,000 $P$ to both sides, which isolates $P$ on the right, and adding 20,000 to both sides, which moves everything that doesn’t involve $P$ to the left, giving us:

$$84,000 = 7,000 P$$

Finally, dividing both sides by 7,000 gives us

$$84,000/7,000 = P$$

or

$$P = 12$$

We’ve found our equilibrium price: $12.

---

1 If you try to graph the demand curve, don’t forget that supply and demand graphs reverse the usual custom of where the independent and dependent variables are plotted. Quantity demanded is the dependent variable (it depends on price), and yet it’s graphed on the horizontal axis.

2 Don’t be troubled by the negative sign ($-20,000$) in this equation. It helps determine a minimum price that suppliers must get in order to supply any pizza at all. Using the entire equation, we find that if price were $5.00, quantity supplied would be zero, and that price has to rise above $5.00 for any pizzas to be supplied in this market. But since a “negative supply” doesn’t make sense, this equation is valid only for prices of $5.00 or greater.
What about equilibrium quantity? In equilibrium, we know quantity demanded and quantity supplied are equal, so we can either solve for $Q^D$ using the demand equation, or solve for $Q^S$ using the supply equation, and we should get the same answer. For example, using the demand equation, and using the equilibrium price of $12:

$$Q^D = 64,000 - 3,000 \ (12)$$

or

$$Q^D = 28,000$$

To confirm that we didn’t make any errors, we can also use the supply equation.

$$Q^S = -20,000 + 4,000 \ (12)$$

or

$$Q^S = 28,000$$

We’ve now confirmed that the equilibrium quantity is 28,000.
In the last chapter, we used supply and demand for a basic but important purpose: to explain how the interactions of buyers and sellers determine the price of a good or service, and how that price changes when the market is free to adjust to events.

But supply and demand can help us answer many other important questions. For example, can the government change the price in a market? And if so, are some ways of doing this more effective than others?

Supply and demand can also help us analyze other types of markets, and understand some of the events that have shaken economies around the globe. What caused the housing boom from the late 1990s to 2006? And why did the boom end so suddenly?

This chapter is all about working with supply and demand in new ways, and in different contexts. As you will see, the model—with some modifications—can help us answer all of these questions.

**Government Intervention in Markets**

The forces of supply and demand deserve some credit. They force the market price to adjust until something remarkable happens: The quantity that sellers want to sell is also the quantity that buyers want to buy. Thus, every buyer and seller can turn their intentions into actual market trades.

So, three cheers for supply and demand! Or better make that two cheers. Because while everyone agrees that having prices is necessary for the smooth functioning of our economy, not everyone is happy with the prices that supply and demand give us. Apartment dwellers often complain that their rent is too high, and farmers complain that the price of their crops is too low.

We can also be dissatisfied with market quantities. We might ask government to help increase the number of people attending college, or help decrease the quantity of gasoline that we use.

Responding to these dissatisfactions and desires, governments sometimes intervene to change the market outcome. And government can do so in a variety of ways.

We will first look at two policies in which the government tries to fight the market—that is, to prevent the price from reaching its equilibrium value. Economists are generally skeptical about the effectiveness and efficiency of these policies. Then we’ll turn to methods government uses to manipulate markets—changing the equilibrium itself.
FIGURE 1 A Price Ceiling in the Market for Maple Syrup

1. A price ceiling lower than the equilibrium price...
2. decreases quantity supplied...
3. and increases quantity demanded, creating a shortage equal to the distance between R and V.

FIGHTING THE MARKET: PRICE CEILINGS

Figure 1 shows our familiar market for maple syrup, with an equilibrium price of $3.00 per bottle. Suppose that maple syrup buyers complain to the government that this price is too high. And suppose the government responds by imposing a price ceiling in this market—a regulation preventing the price from rising above, say, $2.00 per bottle.

If the ceiling is enforced, then producers will no longer be able to charge $3.00 for maple syrup but will have to content themselves with $2.00 instead. In Figure 1, we will move down along the supply curve, from point E to point R, decreasing quantity supplied from 50,000 bottles to 40,000. At the same time, the decrease in price will move us along the demand curve, from point E to point V, increasing quantity demanded from 50,000 to 60,000. Together, these changes in quantities supplied and demanded create an excess demand for maple syrup of 60,000 − 40,000 = 20,000 bottles each month. Ordinarily, the excess demand would force the price back up to $3.00. But now the price ceiling prevents this from occurring. What will happen?

A practical observation about markets can help us arrive at an answer:

When quantity supplied and quantity demanded differ, the short side of the market—whichever of the two quantities is smaller—will prevail.

This simple rule follows from the voluntary nature of exchange in a market system: No one can be forced to buy or sell more than they want to. With an excess demand quantity supplied is less than quantity demanded, so sellers are on the short side of the market. Since we cannot force them to sell any more than they want to (40,000 units) the result is a shortage of maple syrup—not enough available to satisfy demand at the going price.
But this is not the end of the story. Because of the shortage, all 40,000 bottles produced each month will quickly disappear from store shelves, and many buyers will be disappointed. The next time people hear that maple syrup has become available, everyone will try to get there first, and we can expect long lines at stores. Those who really crave maple syrup may have to go from store to store, searching for that rare bottle. When we include the opportunity cost of the time spent waiting in line or shopping around, the ultimate effect of the price ceiling may be a higher cost of maple syrup for many consumers.

A price ceiling creates a shortage and increases the time and trouble required to buy the good. While the price decreases, the opportunity cost may rise.

And there is still more. The government may be able to prevent maple syrup producers from selling above the price ceiling. But it may not be able to prevent a black market, where goods are sold illegally at prices higher than the legal ceiling.

Ironically, the black market price will typically exceed the original, freely determined equilibrium price—$3.00 per bottle in our example. To see why, look at Figure 2. With a price ceiling of $2.00, sellers supply 40,000 bottles per month. Suppose all of this is bought by people—maple syrup scalpers, if you will—who then sell it at the highest price they can get.

What price can they charge? We can use the demand curve to find out. At $4.00 per bottle (point T), the scalpers would just be able to sell all 40,000 bottles each month. If they charge more than $4, they would be stuck with unsold bottles every month, so they’d learn to lower the price. If they charged less than $4, quantity demanded would exceed the 40,000 bottles they are trying to sell, so they’d run out of maple syrup and see that they could safely raise the price. Thus, if the price ceiling remains in place, we’d expect the black market price to settle at $4 per bottle.

**FIGURE 2** A Price Ceiling with a Black Market

1. With a price ceiling lower than the equilibrium price and a black market . . .
2. the lower quantity supplied . . .
3. will sell for a price even higher than the equilibrium price.

Black market: A market in which goods are sold illegally at a price above the legal ceiling.
The unintended consequences of price ceilings—long lines, black markets, and, often, higher prices—explain why they are generally a poor way to bring down prices. Experience with price ceilings has generally confirmed this judgment. Many states do have laws to limit price hikes during declared emergencies, thereby creating temporary price ceilings. But permanent or semipermanent price ceilings are exceedingly rare.

There is, however, one type of market in which several cities have imposed long-lasting price ceilings: the market for apartment rentals.

**An Example: Rent Controls**

A price ceiling imposed in a rental housing market is called rent control. Most states have laws prohibiting rent control. But more than a dozen states do allow it. And in four of these states (New York, California, Maryland, and New Jersey), some form of rent control has existed in several cities and towns for decades.

In theory, rent control is designed to keep housing affordable, especially for those with low incomes. But for this purpose, it’s a very blunt instrument because it doesn’t target those with low incomes. Rather, anyone who was lucky enough to be living in one of the affected units when rent control was first imposed gets to pay less than market rent, as long as he or she continues to hold the lease on the unit. Many renters in cities such as New York and Santa Monica have higher incomes and living standards than do the owners from whom they rent.

Second, rent control causes the same sorts of problems as did our hypothetical price ceiling on maple syrup. It creates a persistent excess demand for rental units, so renters must spend more time and trouble finding an apartment. Typically, something akin to the “black market” develops: Real estate brokers quickly “snap up” the rent-controlled apartments (either because of their superior knowledge of the market, or their ability to negotiate exclusive contracts with the owners). Apartment seekers, who don’t want to spend months searching on their own, will hire one of these brokers. Alternatively, one can sublet from a leaseholder, who will then charge market rent for the sublet and pocket the difference. Either way, many renters end up paying a higher cost for their apartment than the rent-controlled price.

Finally, rent controls cause a decrease in the quantity of apartments supplied (a movement along the supply curve). This is because lower rents reduce the incentives for owners to maintain existing apartments in rentable condition, and also reduce incentives to build new ones.

In our example of the market for maple syrup, the decrease in quantity supplied—combined with a black market—caused the average buyer to end up paying a higher price than before the ceiling was imposed (see point $T$ in Figure 2). The same thing can happen in the apartment rental market. As supply decreases, the total price of renting an apartment for a few years can rise above the market equilibrium price—if we include real estate commissions or the unofficial, higher rents paid by those who sublet.

**Fighting the Market: Price Floors**

Sometimes, governments try to help sellers of a good by establishing a price floor—a minimum amount below which the price is not permitted to fall. The most common use of price floors around the world has been to raise prices (or prevent prices from
falling) in agricultural markets. Price floors for agricultural goods are commonly called *price support programs*.

In the United States, price support programs began during the Great Depression, after farm prices fell by more than 50 percent between 1929 and 1932. The Agricultural Adjustment Act of 1933, and an amendment in 1935, gave the president the authority to intervene in markets for a variety of agricultural goods. Over the next 60 years, the United States Department of Agriculture (USDA) put in place programs to maintain high prices for cotton, wheat, rice, corn, tobacco, honey, milk, cheese, butter, and many other farm goods. Although some of these supports were removed in recent years, many remain. For example, government policy still maintains price floors for peanuts, sugar, and dairy products.

To see how price floors work, let’s look at the market for nonfat dry milk—a market in which the USDA has been supporting prices continually since 1933. Figure 3 shows that—before any price floor is imposed—the market is in equilibrium at point *A*, with an equilibrium price of 65 cents per pound and an equilibrium quantity of 200 million pounds per month.

Now let’s examine the impact of the price floor, recently set at $0.80 per pound. At this price, producers want to sell 220 million pounds, while consumers want to purchase only 180 million pounds. There is an excess supply of 220 million – 180 million = 40 million pounds. Our short-side rule tells us that buyers determine the amount actually traded. They purchase 180 million of the 220 million pounds produced, and producers are unable to sell the remainder.

The excess supply of 40 million pounds would ordinarily push the market price down to its equilibrium value: $0.65. But now the price floor prevents this from happening. The result is a **surplus**—continuing extra production of nonfat dry milk that no one wants to buy at the going price.

**FIGURE 3** A Price Floor in the Market for Nonfat Dry Milk

<table>
<thead>
<tr>
<th>Price per Pound</th>
<th>1. A price floor higher than the equilibrium price ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.80</td>
<td>2. decreases quantity demanded ...</td>
</tr>
<tr>
<td>$0.65</td>
<td>3. and increases quantity supplied.</td>
</tr>
</tbody>
</table>

4. The result is a surplus—the distance between *K* and *J*.
Part II: Market and Prices

Maintaining a Price Floor

If the government merely declared a price floor of $0.80 per pound, many farmers who are unable to sell all of their product would be tempted to sell some illegally at a price below the floor. This would take sales away from other farmers trying to sell at the higher price, so they, too, would feel pressure to violate the floor. Soon, the price floor would collapse.

To prevent this, governments around the world have developed a variety of policies designed to prevent surplus goods from forcing down the price. One method, frequently used in the United States, is for the government to promise to buy any unsold product at a guaranteed price. In the market for nonfat dry milk, for example, the government agrees to buy any unsold supplies from sellers at a price of $0.80 per pound. With this policy, no supplier would ever sell at any price below $0.80, since it could always sell to the government instead. With the price effectively stuck at $0.80, private buyers buy 180 million pounds—point K on the demand curve in Figure 3. But since quantity supplied is 220 million, at point J, the government must buy the excess supply of 40 million pounds per year. In other words, the government maintains the price floor by buying up the entire excess supply. This prevents the excess supply from doing what it would ordinarily do: drive the price down to its equilibrium value.

A price floor creates a surplus of a good. In order to maintain the price floor, the government must prevent the surplus from driving down the market price. In practice, the government often accomplishes this goal by purchasing the surplus itself.

In 2009, for example, the USDA expected to purchase more than 100 million pounds of non-fat dry milk, at a cost of almost $100 million.

However, purchasing surplus food is expensive, so price floors are usually accompanied by government efforts to limit any excess supplies. In the dairy market, for example, the U.S. government has developed a complicated management system to control the production and sale of milk to manufacturers and processors, which helps to limit the government’s costs. In other agricultural markets, the government has ordered or paid farmers not to grow crops on portions of their land and has imposed strict limits on imports of food from abroad. As you can see, price floors often get the government deeply involved in production decisions, rather than leaving them to the market.

Price floors have certainly benefited farmers and helped them in times of need. But this market intervention has many critics—including most economists. They have argued that the government spends too much money buying surplus agricultural products, and the resulting higher prices distort the public’s buying and eating habits—often to their nutritional detriment. For example, the General Accounting Office estimated that from 1986 to 2001, price supports for dairy products cost American consumers $10.4 billion in higher prices. And this does not include the cost of the health effects—such as calcium and protein deficiencies.
among poor children—due to decreased milk consumption. The irony is that many of the farmers who benefit from price floors are wealthy individuals or large, powerful corporations that do not need the assistance. Economists argue that assistance to farmers would be more cost-effective if given directly to those truly in need, rather than supporting all farmers—rich and poor alike—with artificially high prices.

With price floors and price ceilings, the government tries to prevent the market price from reaching its equilibrium value. As you’ve seen, these efforts often backfire or have serious unintended consequences. But government can also intervene in a different way: It can try to influence the market outcome using taxes or subsidies—then stand out of the way and let the market help to achieve the desired outcome.

**Manipulating the Market: Taxes**

Taxes are imposed on markets to give the government revenue so it can provide public goods and services, to correct inequities in the distribution of income and wealth, or—to focus in this chapter—to change the price or quantity in a market.

A tax on a specific good or service is called an **excise tax**, which can be collected from either sellers or buyers. As you’re about to see, the impact on the market and each of its participants is the same, regardless of which party is legally obligated to pay the tax, or from which party it is actually collected.

**An Excise Tax on Sellers**

Let’s explore the impact of an excise tax imposed on sellers with an example: Gasoline taxes. In the United States, the gasoline tax—collected from gasoline sellers—originated to fund the building and maintenance of the national highway system. But in recent years, many economists and others have wanted to increase this tax, for both geopolitical goals (to decrease U.S. imports of foreign oil) as well as environmental goals (to help fight pollution, traffic congestion, and climate change). Those who advocate a higher tax point out that gasoline taxes are much higher in Europe (approaching $4 per gallon or more in several European countries), while federal and state gasoline taxes in the U.S. average only 47 cents per gallon.

In our example, we’ll assume that initially there is no gas tax at all, and then we’ll impose a tax of 60 cents per gallon on sellers. How would such a tax affect the market for gasoline?

Suppose that before the tax is imposed, the supply curve for gasoline is $S_1$ in Figure 4. (Ignore the curve above it for now). Point $A$ on this curve tells us that 400 million gallons will be supplied if the price is $3 per gallon. Let’s rephrase this another way: **In order for the gasoline industry to supply 400 million gallons they must get $3 per gallon.**

What happens when our tax collector gets $0.60 for each gallon sold? What price must the industry charge now to supply the same 400 million gallons? The answer is $3.60, at point $A’$. Only by charging $0.60 more for each gallon could they continue to get the amount ($3) that makes it just worth their while to supply 400 million gallons. The same is true at any other quantity we might imagine: The price would have to be $0.60 more than before to get the industry to supply that same quantity.
So imposing a $0.60 tax on gas suppliers shifts the entire supply curve upward by $0.60, to $S_{\text{After Tax}}$.

Now look at Figure 5, which shows the market for gasoline. Before the tax is imposed, with supply curve $S_1$ and demand curve $D_1$, the equilibrium is at point $A$, with price at $3$ and quantity at 400 million. After the $0.60$ tax is imposed and the supply curve shifts up to $S_{\text{After Tax}}$, the new equilibrium price is $3.40$, with 300 million gallons sold.

Who is paying this tax? Let’s take a step back and think about it. Although the tax is collected from gas sellers, who really pays—that is, who sacrifices funds they would otherwise have if not for the tax—is an entirely different question. Economists call the distribution of this sacrifice the tax incidence.

In our example, buyers paid $3$ for each gallon before the tax, and $3.40$ after. So buyers are really paying $0.40$ of this tax each time they buy a gallon of gas in the form of a higher price.

What about sellers? Before the tax, they got $3.00 per gallon. After the tax, they collect $3.40 from drivers but $0.60 of that goes to the government. If we want to know how much sellers get after taxes, we have to go back to the old supply curve $S_1$, which lies below the new supply curve by exactly $0.60$. In effect, the old supply curve deducts the tax and shows us what the sellers really receive. When the sellers charge $3.40, the original supply curve $S_1$ shows us that they receive only $2.80$. This is $0.20$ less than they received before, so sellers end up paying $0.20$ of the tax.
Chapter 4: Working with Supply and Demand

FIGURE 5  The Effect of an Excise Tax Imposed on Sellers

In general,

*The incidence of a tax that is collected from sellers generally falls on both sides of the market. Drivers pay more, and sellers receive less, for each unit sold.*

An Excise Tax on Buyers

Suppose that, instead of collecting the $0.60 tax from the airlines, the tax was collected directly from buyers. Before the tax is imposed, the demand curve for gasoline is $D_1$ in Figure 6. Point A on this curve tells us that 400 million gallons will be demanded by buyers each day if the price they have to pay is $3.00. Or, rephrased, *in order for buyers to demand 400 million gallons, each gallon must cost them $3.00.* If the cost per gallon is any more than that, buyers will not buy all 400 million gallons.

Now let’s impose the $0.60 tax on buyers. (Imagine a government tax collector standing at the pump, requiring each buyer to hand over $0.60 for every gallon they buy.) What price will buyers now be willing to pay and still buy all 400 million gallons? The answer is $2.40, at point $A’$. We know this because only if they pay $2.40 will gasoline continue to cost them the $3.00 per gallon which makes it just worth their while to demand all 400 million gallons. The same is true at any other quantity we might imagine: The price would have to be $0.60 less than before to induce buyers to demand that same quantity. So imposing a $0.60 tax on buyers shifts the entire demand curve downward by $0.60, to $D_{\text{After Tax}}$.

*A tax collected from buyers shifts the demand curve downward by the amount of the tax.*

Figure 7 shows the impact on the market. Before the tax is imposed, with demand curve $D_1$ and supply curve $S$, the equilibrium is at point A, with price at $3.00 and...
Part II: Market and Prices

quantity at 400 million. After the $0.60 tax is imposed, and the demand curve shifts downward. For example, before the tax, 400 million gallons would be demanded at $3 per gallon (point $A$); after the tax, that same quantity would be demanded at a price of $2.40 (point $A'$).

What is the incidence of this tax? Let’s see... Buyers paid $3.00 for each gallon of gas before the tax, and $2.80 after. But they also have to pay $0.60 to the government. If we want to know how much buyers pay including the tax, we have to go back to the old demand curve $D_1$, which lies above the new demand curve by exactly $60. As you can see, when buyers pay $2.80 to the gas station they pay a total of $3.40. This is $0.40 more than they paid in total before, so buyers end up paying $0.40 of the tax.

After a $0.60 per gallon tax is imposed on buyers, the price at which any given quantity would be demanded is $0.60 less than before, so the demand curve shifts downward. For example, before the tax, 400 million gallons would be demanded at $3 per gallon (point $A$); after the tax, that same quantity would be demanded at a price of $2.40 (point $A'$).

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After a $0.60 per gallon tax is imposed on buyers, the price at which any given quantity would be demanded is $0.60 less than before, so the demand curve shifts downward. For example, before the tax, 400 million gallons would be demanded at $3 per gallon (point $A$); after the tax, that same quantity would be demanded at a price of $2.40 (point $A'$).

After a $0.60 excise tax is imposed on buyers, the market equilibrium moves from point $A$ to point $C$, with buyers paying sellers $2.80 per gallon. But buyers pay a total of $2.80 + $0.60 = $3.40 per gallon when the tax is included. Thus, the tax causes buyers to pay $0.40 more, and sellers to get $0.20 less, just as when the tax is imposed on sellers.
What about sellers? Sellers received $3.00 for each gallon before the tax, and $2.80 after. So sellers are really paying $0.20 of this tax, in the form of a lower price.

**The incidence of a tax that is collected from buyers falls on both sides of the market. Buyers pay more, and sellers receive less, for each unit sold.**

**Tax Incidence Versus Tax Collection**

The numerical incidence of any tax will depend on the shapes of the supply and demand curves. But you may have noticed that the incidence in our example is the same whether the tax is collected from buyers or sellers. In both cases, buyers pay $0.40 of the tax per gallon and sellers pay $0.20. If you’ll excuse the rhyme, this identical incidence is no coincidence.

**The incidence of a tax (the distribution of the burden between buyers and sellers) is the same whether the tax is collected from buyers or sellers.**

Why? Because the two methods of collecting taxes are not really different in any important economic sense. Whether the tax collector takes the $0.60 from the gas station owner when the gas is sold, or takes $0.60 from the driver when the gas is sold, one fact remains: Buyers will pay $0.60 more than the sellers receive. The market finds a new equilibrium reflecting this. In our example, this new equilibrium occurs where each gallon costs drivers $3.40 in total, and the gas suppliers receive $2.80 of this, because that is the only incidence at which quantity demanded and supplied are equal.¹

**Manipulating the Market: Subsidies**

A **subsidy** is the opposite of a tax. Instead of the government demanding a payment from the buyer or seller, the government makes a payment to the seller or buyer. And whereas a tax raises the price to the buyer and decreases purchases of the product, a subsidy does the reverse: It lowers prices to buyers and encourages people to buy it. In the United States, federal, state, and local governments subsidize a variety of goods and services, including medical care for the poor and elderly, energy-saving equipment, smoking-cessation programs, and college education.

**A Subsidy to Buyers**

Let’s explore the impact of a subsidy given to buyers with an example: Tuition assistance to college students.

Every year in the United States, federal and state governments provide more than $100 billion in subsidies—scholarships and other assistance—to help students pay the cost of a college education. The reasons for these policies are clear: We want to encourage more people to get college degrees. A college education gives substantial benefits to the degree-holders themselves, in the form of higher future incomes. And a more educated population creates benefits for society as a whole. There are also important equity considerations: Financial assistance increases the number of students from poor households, many of whom might otherwise have to forgo the benefits of college.

¹ In this chapter, we’ve considered only one type of burden caused by the tax: changes in price. But another burden of the tax is a decrease in quantity. In Chapter 14, you’ll learn a more comprehensive method of measuring the burden of a tax that takes into account changes in both price and quantity.
FIGURE 8 A Subsidy for Students Attending College

After a $10,000 subsidy is given to college students, the market equilibrium moves from point A to point B, with students paying colleges $31,000 per year. But students pay a total of $31,000 = $10,000 = $21,000 when their subsidy is deducted. Thus, the subsidy causes students to pay $4,000 less per year, and causes colleges to get $6,000 more per year.

Figure 8 shows the market for attending college. Initially, without any government involvement, demand curve $D_1$ intersects supply curve $S$ at point A. Four million students attend college each year, with each paying a total of $25,000 in tuition.

Now, let’s introduce financial assistance: a subsidy of $10,000 per year for each student, and we’ll assume here that the subsidy is paid out to buyers—college students—to help them pay tuition.

The subsidy shifts the demand curve upward by $10,000, to $D_{After Subsidy}$. Why? The old demand curve told us that if the price were $25,000, 4 million students would attend college. After a subsidy, the same 4 million students would choose to attend only if what they paid from their own pockets is still $25,000. A price of $35,000, with $10,000 kicked in from the government, would give us the same attendance of 4 million.

A subsidy paid to buyers shifts the demand curve upward by the amount of the subsidy.

However, the subsidy changes the market equilibrium from point A to point B. Now, 4.8 million students decide to attend college. But notice that the price is higher as well: Colleges are now charging $31,000 per year.
In general,

A subsidy paid to buyers benefits both sides of a market. Buyers pay less and sellers receive more for each unit sold.

Who benefits from the subsidy? Colleges benefit: They get more for each student who attends ($31,000 instead of $25,000). Students benefit as well: They pay $31,000 to the colleges, but the government pays $10,000 of that, so the cost to students has dropped to $21,000. However, notice that the $10,000 subsidy has not reduced the cost of college by a full $10,000. In our example, only $4,000 of the subsidy ends up as a direct benefit to the student, while the other $6,000 goes to the college.

A Subsidy to Sellers

As you learned earlier, the burden (incidence) of a tax is the same, regardless of whether it is collected from sellers or buyers. What about a subsidy? Is the benefit to each side of the market the same, regardless of which side the payment is given to? Indeed it is.

We leave it to you to do the analysis, but here’s a hint: If the subsidy in our example had been paid to colleges (the sellers) instead of students (the buyers), the supply curve would shift downward by the amount of the subsidy. If you draw the graph, using the same initial supply and demand curves as in Figure 8 and the same $10,000 subsidy, you’ll see that students will pay $21,000 (and not receive anything from the government), while colleges will collect $31,000 when we include the subsidy. What buyers end up paying, and what sellers end up receiving, is the same as in Figure 8.

In general,

The distribution of benefits from a subsidy is the same, regardless of whether the subsidy is paid to buyers or sellers.

Supply and Demand in Housing Markets

So far in this text, we’ve used supply and demand to analyze a variety of markets—for maple syrup, crude oil, higher education, and more. All of these markets have one thing in common: they are markets in which business firms sell currently produced goods or services.

But the supply and demand model is a versatile tool. With a bit of modification, we can use it to analyze almost any market in which something is traded at a price, including markets for labor, foreign currencies, stocks, bonds and more. Our only requirement is that there are many buyers and sellers, and each regards the market price (or a narrow range of prices) as given. In the remainder of this chapter, we’ll use supply and demand to understand a type of market that has been at the center of recent economic events: the market for residential housing.

What’s Different about Housing Markets

Housing markets differ in an important way from others we’ve considered so far. When people buy maple syrup, they buy newly produced bottles, not previously owned ones. But when people shop for a home, they generally consider newly constructed homes and previously-owned homes to be very close substitutes. After all, a house is a house. If properly maintained, it can last for decades or even centuries. Indeed, most of the homes that people own, and most that change hands each year, were originally built and sold long before.
Part II: Market and Prices

This key difference—that housing markets are dominated by previously-owned homes—means we’ll need to think about supply and demand in a somewhat different way. To understand this new approach, we first need to take a short detour.

A Detour: Stock and Flow Variables

Many economic variables fall into one of two categories: stocks or flows.

A **stock variable** measures a quantity in existence at a moment in time. A **flow variable** measures a process that takes place over a period of time.

To understand the difference, think of a bathtub being filled with water. At any given moment, there are a certain number of gallons actually in the tub. This volume of water is a stock variable: a quantity that exists at a moment in time (such as 15 gallons). But each minute, a certain volume of water flows into the tub. This rate of flow is a flow variable: a process that takes place over a period of time (such as, 2 gallons per minute).

In this book you’ve encountered both types of variables. In Chapter 3, for example, the quantity of maple syrup demanded or supplied was a flow: a certain number of bottles bought or sold per month. Similarly, household income is a flow: so many dollars earned per month or per year. But household wealth—the total value of what someone owns minus the total owed—is a stock variable. Wealth is measured in dollars at a particular point in time.

Now let’s think about housing. New home *construction* and new home *purchases* are flow variables: so many homes are built or purchased per month or per year. By contrast, the number of homes that people own at a given time—say, 100 million homes on January 1, 2011—is a stock variable. Indeed, we often refer to this number of homes as the housing stock. Of course, as time passes and new homes are built, the housing stock rises. But at any given point in time, the housing stock is a fixed number of homes.

Which of these two concepts—the flow of new homes or the housing stock—should we use in our supply and demand model for housing? Let’s see. If we use the flow of new homes, then equilibrium occurs when the number of new homes built per period is equal to the number of new homes people want to buy per period. But this leaves out the vast majority of homes that people can trade—homes built in previous periods and still standing. The most important changes in the housing market originate with these previously-built homes. So our concept of equilibrium should involve these homes as well.

This is why it is best to think of the supply and demand for homes in terms of the housing stock. At a given point in time, the housing stock blends together all homes built up to that time—whether recently or long ago, and whether previously owned or never occupied. When we view the market in this way, we see that equilibrium occurs when the total number of homes people want to own is equal to the total number available for ownership—the housing stock.

To see how this works, let’s take a closer look at supply and demand as stock variables, and illustrate them graphically.

**Supply and Demand Curves in a Housing Market**

The two panels in Figure 9 show supply and demand curves for a local housing market in a small city. Look first at the supply curve $S$ in panel (a). It represents the housing stock: the number of homes that exist in the area. The curve is vertical at 600,000 because, at this moment in time, the housing stock is fixed at 600,000.
Chapter 4: Working with Supply and Demand

Figure 9: Supply and Demand Curves in a Housing Market

The supply curve for housing tells us the number of homes that exist at a particular time, which does not depend on the price. The demand curve tells us how many homes people in the market want to own. The lower the price, the greater the quantity of homes demanded.

Whether the price is $200,000, $150,000 or $100,000, the number of homes in existence at this moment will still be 600,000.

The demand curve D in panel (b) represents the demand for the housing stock. It tells us the number of homes that everyone in the area would like to own at each price, holding constant all the other variables that influence demand. To keep things simple, we'll imagine for most of our discussion that households or families can own a maximum of one home each. In that case, the demand curve tells us the number of families who want to be homeowners at each price. (Later in the chapter, we'll discuss the role of owning multiple homes in the recent housing boom.)

Behind the Demand Curve: Ownership Costs

Notice that the demand curve in panel (b) slopes downward: As the purchase price of a home falls, more people want to own them. Why? Anyone deciding whether they want to become a homeowner, or continue being one, will compare the cost of owning with the cost of the next best alternative: renting. Because rent is paid monthly, it's natural to think about the costs of homeownership on a monthly basis as well.

There are several components to the monthly cost of owning a home, including maintenance, property taxes, and—the largest component—interest. As you are about to see, this monthly cost depends on the price of the home—not just for current buyers, but even for those who bought long ago.

Home Prices and Monthly Costs for Prospective Owners. Let's first consider monthly ownership costs for those thinking of becoming owners by buying a home. Suppose first that a buyer pays entirely with his or her own funds. Then those funds can no longer be invested elsewhere (such as, in a bank account), where they would
earn interest. Thus, buying a home means foregoing monthly interest—an implicit cost of owning. The greater the purchase price, the greater the monthly interest foregone.

Most prospective homeowners, however, do not pay the entire purchase price themselves. Instead, they pay for a small part of the purchase with their own funds—called the down payment—and borrow the rest, getting a housing loan called a mortgage. The mortgage is paid back monthly over many years. For most of that time, the monthly payments will consist largely of interest charges. The higher the purchase price of the home, the bigger the mortgage loan, and the greater the monthly mortgage payment.

So far, we’ve seen that for a prospective homeowner, the monthly cost of owning the home will vary directly with the price of the home. This remains true whether the buyer is planning to take out a mortgage, or buy the home without borrowing.

But what about someone who already owns a home? Would a later change in the home’s price affect monthly costs for that owner?

Home Prices and Monthly Costs for Current Owners. You might think that, once someone has purchased a home, monthly ownership costs should depend only on the price paid earlier, at the time of purchase, and be immune from any later price change. But in fact, any change in the home’s price—even after it was purchased—will change the owner’s monthly costs.

To see why, remember that anyone who owns a home could always choose to sell it. The owner could then pay back any amount that might be remaining on the mortgage and also get some cash back (since the selling price is usually greater than the amount owed on the mortgage). That cash could earn interest. Continued ownership, therefore, means continued foregone interest.

Of course, the higher the selling price for the house, the more cash the owner would get from selling, and the more interest the owner sacrifices by not selling. So once again, a rise in home prices increases the monthly cost of ownership.

Let’s summarize what we’ve found about ownership costs:

Both current and prospective homeowners face a monthly cost of ownership. This monthly cost rises when home prices rise, and falls when home prices fall.

Now you can understand why the demand curve in Figure 9(b) slopes downward. When housing prices fall and nothing else changes, the monthly cost of owning a home declines as well. With lower monthly costs, more people will prefer to own rather than rent, so the quantity of homes demanded increases.

dangerous curves

Misinterpreting the Supply and Demand Curves for Homes. It’s very easy to slip into thinking that the supply and demand curves for housing have the “flow” interpretation of the previous chapter; instead of the proper “stock” interpretation here. So remember: the supply curve does not represent the number of homes people want to sell over a period of time. Rather, it represents the number of homes that exist at a point in time. Similarly, the demand curve does not tell us how many homes people would like to buy over a period of time. Rather, it tells us how many homes people want to own at a point in time.

Shifts versus Movements Along the Demand Curve

As with any demand curve, when we change the price and move along the curve, we hold constant all other influences on demand. For example, in Figure 9(b), if the price of a home falls from $150,000 to $100,000, ceteris paribus, we move along the demand curve from point B to point C. The number of families who want to own rises from 600,000 to 900,000. The opposite happens when home prices rise from $150,000 to $200,000: Fewer people want to own, and we move along the demand curve from point B to point A.
But as we make these movements, we are holding constant the monthly cost of renting a home, interest rates in the economy, tastes for homeownership, average income, population—anything that might affect number of people who want to own homes in the market other than the price of a home. If any of these other factors change, the demand curve will shift. We’ll look at examples of these shifts a bit later.

**Housing Market Equilibrium**

Figure 10 combines the supply and demand curves from Figure 9. The equilibrium, as always, occurs where the two curves intersect, at point $B$, with the price of a house at $150,000. But because this is a new type of market, it’s worth spending a little time understanding why equilibrium occurs at this price.

Suppose the price of homes in this area was $100,000, which is less than the equilibrium price. The demand curve at point $C$ tells us that 900,000 people would want to own homes at this price. But the supply curve tells us that only 600,000 homes are available—that is, only 600,000 homes can be owned. So with a price of $100,000, there is an excess demand for homes. What will happen?

People who want homes, but don’t yet have them, will try to buy them from the current owners, bidding up prices. Because the housing stock is constant (at least for now), the rise in price will not change the quantity of homes available. But it will move us along the demand curve (upward and leftward from point $C$), as higher

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**FIGURE 10** Equilibrium in a Housing Market

The equilibrium in this market is at point $B$, where the price of homes is $150,000. If the price were higher—say $200,000—the number of homes people want to own (300,000 at point $A$) would be less than the number in existence and currently owned (600,000). Owners would try to sell, and the price would fall until all 600,000 homes were demanded. If the price were lower than the equilibrium price—say $100,000—the number of homes people want to own (900,000 at point $C$) would be less than the number in existence and currently owned (600,000). People would try to buy homes, and the price would rise until only 600,000 were demanded.
home prices (and higher monthly ownership cost) reduce the number of people who want to own. The price will continue rising until the number of people who want to own a home is equal to the number of homes that can be owned: the 600,000 that exist. This occurs when the price reaches $150,000, at point $B$.

What if the price started higher than $150,000—say, $200,000? Then only 300,000 people would want to own homes, at point $A$. But remember: 600,000 homes exist, and at any time, every one of them must be owned by someone. So at a price of $200,000, half of the current homeowners would prefer not to own. What will happen?

Those who prefer not to own will try to sell, causing home prices to fall. As the price drops, and we move rightward along the demand curve, more people decide they want to own. The price continues dropping until it reaches $150,000, at point $B$, where people are content to own all 600,000 homes in existence.

The equilibrium price in a housing market is the price at which the quantity of homes demanded (the number that people want to own) and quantity supplied (the housing stock) are equal.

**What Happens When Things Change**

So far, in Figure 10, we've identified the equilibrium at a particular point in time. We did so by assuming that the housing stock was fixed at 600,000, and all influences on demand other than the price of homes were held constant.

But *over time*, in most housing markets, both the supply and demand curves will shift rightward. The supply curve shifts rightward as the housing stock rises (new homes are built). And the demand curve shifts rightward for a variety of reasons, including population growth and rising incomes. As a result, the market equilibrium will move rightward over time as well. But what happens to home prices depends on the *relative* shifts in the supply and demand curves. Let's look at three possibilities.

**Equal Changes in Supply and Demand: A Stable Housing Market**

Figure 11 illustrates a stable housing market, in which increases in the housing stock just keep pace with increases in housing demand over time. Let's start with the initial situation, at point $B$, with a housing stock of 600,000 homes and a price of $150,000. Over the next year, population and income growth shifts the demand curve rightward to $D_2$. At each price, the demand for homes is 10,000 more than before. New construction increases the housing stock by 10,000 as well, shifting the supply curve to $S_2$. The equilibrium moves to point $E$, with a new, higher housing stock of 610,000, and an unchanged equilibrium price of $150,000.

When the housing stock grows at the same rate as housing demand, housing prices remain unchanged.

We should note that Figure 11 is not entirely realistic. In most housing markets, construction costs for labor and raw materials tend to rise over time. In order to cover these rising costs and continue increasing the housing stock, average home prices must rise over time, at least modestly. You'll learn more about these types of
market adjustments when you study perfectly competitive markets in more detail, in microeconomics. In the figure, we’ve ignored rising construction costs.

But in some cases, we observe home prices rising much faster than can be explained by rising construction costs alone. When home prices rise especially rapidly, we know that increases in demand must be outpacing increases in supply. Let’s consider two possible ways this could happen.

### Restrictions on New Building: Rapidly Rising Prices

In some housing markets, local restrictions on new building can prevent the housing stock from keeping up with ongoing increases in demand. This is illustrated in Figure 12. As in our previous example, the initial market equilibrium is at point B, with price equal to $150,000. And once again, the demand curve shifts rightward over the year by 10,000 units, due to population and income growth. But now, we assume that restrictions allow construction of only 3,000 new homes, so the supply curve shifts by less than in the previous figure: to $S_2$. After the demand shift, people want to own 610,000 homes (at point F) at a price of $150,000, but only 603,000 exist. The excess demand of 7,000 homes drives up home prices, and we move leftward along the demand curve, until only 603,000 homes are demanded. At the new equilibrium (point G), the price is $200,000.

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**When restrictions on new building prevent the housing stock from growing as fast as demand, housing prices rise.**

Restrictions on new building explain why housing prices have risen rapidly for decades in cities like New York and in many areas of California. The demand for housing in these areas increases in most years, but various restrictions on new building or the limited supply of coastal land prevent the housing stock from keeping up.
Faster Demand Growth: Rapidly Rising Prices

Several factors could cause the demand curve for housing to begin shifting rightward more rapidly than in the past: population shifts (a sudden influx of new residents), rapid income growth (because of a booming industry in the area), or a change in expectations about future prices. Let’s take a closer look at this last factor: expectations.

So far, we’ve considered home ownership as an alternative to renting. That is, whether you own or rent, you get valuable services—a roof over our head and a place to watch TV. And we’ve discussed these alternatives in terms of their relative monthly costs.

But a house is more than just a place to live. It is also an example of an asset—something of value that someone owns. An asset can be sold in the future at whatever price prevails in the market at that time. If the asset is sold at a higher price than the purchase price, the seller enjoys a capital gain. If the asset is sold for less than the purchase price, the seller suffers a capital loss.

Anticipated capital gains are one of the reasons that people hold assets, including homes. In fact, capital gains and losses are especially important in the housing market, for one reason: A home is one of the most leveraged financial investments that most people ever make.

The appendix to this chapter discusses leverage in more detail, and some special features of leverage in the housing market. But the takeaway from the appendix is this: Leverage magnifies the impact of a price change on the rate of return you will get from an asset. When home prices rise, your rate of return from investing in a home can be several times the percentage growth in housing prices. This makes the demand for housing particularly sensitive to changing expectations about future home prices.

Let’s suppose that people begin to think housing prices will increase more rapidly over the next few years than they’ve risen in the past. With housing seen as an even more profitable investment than before, more people want to be homeowners.
at any given price for homes. The demand curve will shift rightward by more than it otherwise would.

Figure 13 illustrates the result. The demand curve—instead of shifting to $D_3$ as in Figure 11, now shifts further, to $D_2'$. But notice that the supply curve continues to shift only to $S_2$ (the housing stock rises by only 10,000 units), just as in Figure 11. Why doesn’t the housing stock keep up with the suddenly higher demand?

Because it takes time for new construction to be planned and completed. The change in the housing stock over the current year is based on how many construction projects were initiated in the previous year. And the number of projects started in the previous year was based on prices then—before the surge in demand. With the demand curve shifting to $D_1'$, and the supply curve to $S_2$, the equilibrium moves to point $J$, with a new equilibrium price of $185,000$.

Note that with higher housing prices construction firms will have an incentive to increase building. Unless restrictions prevent them from doing so, the housing stock will rise at a faster rate—in future years. Eventually, the housing stock can catch up to the higher demand, but that will happen much later. In the meantime, the main impact of the rapid increase in demand is higher home prices.

In summary:

*When the demand for housing begins rising faster than previously, the housing stock typically lags behind, and housing prices rise.*

Changes in expectations—and rapidly shifting demand curves—were a major cause of the housing bubble from the late 1990s through 2006, and the housing bust that immediately followed, as you are about to see.
Using the Theory

THE HOUSING BOOM AND BUST OF 1997–2008

Figure 14 shows an index measure of inflation-adjusted U.S. housing prices. (The inflation adjustment removes the effects of general inflation from the change in home prices, making comparisons over time more meaningful.) The index begins with a value of 100 in 1975. In any other year, its value tells us the percentage by which the median inflation-adjusted home price exceeded the median price in 1975. For example, in 1991, the index’s value was 107.12, telling us that the median home in 1991, after adjusting for inflation, cost about 7% more than the median home in 1975.

The most glaring feature of this graph is the startling price increase from 1997 to 2006. During that period, the housing price index almost doubled. (Remember—this is the rise in the index after we remove any increase due to general inflation.) Something special must have been happening with housing.

The rapid rise in housing prices—especially after 2001—has been described as a housing “bubble.” The term bubble suggests something that is destined to burst. And Figure 16 shows this is just what happened: In mid-2006, U.S. housing prices began falling. And as the months went by, they continued to fall—faster. A similar pattern of bubble and burst occurred in many other countries. In some of them, such as Britain and Ireland, the boom and bust were even more extreme than in the United States.

What caused housing prices to behave this way? A complete answer requires some additional tools and concepts that you will learn later in microeconomics and macroeconomics. But at the center of this economic storm were the familiar forces of supply and demand.

The Housing Boom: Rapidly Rising Demand

As you’ve learned, rapid increases in home prices can occur when demand begins increasing faster than supply. From 1997 to 2006, several factors caused the demand for housing to grow more rapidly each year. While supply increased as well, it lagged behind—more and more each year—because of the ever-more-rapid increases in demand. The result was a surge in housing prices.

What caused demand to increase so rapidly during this period?

Economic Growth

In the United States and many other countries, the 1990s were a period of prosperity and rising incomes. Higher incomes increase the demand for most goods, including housing. In addition, after years of high employment, people felt increasingly confident about the future, and more willing to take on the long-term financial obligations associated with homeownership.
FIGURE 14  Index of Home Prices, Adjusted for Inflation

After adjusting for price changes from general inflation, the housing boom began in 1997, and home prices increased every-more rapidly until 2006. That marked the beginning of the housing bust, with prices dropping dramatically for the next few years.
Source: S&P/Case-Shiller Home Price Index

Interest Rates

Beginning in 2001, interest rates on many types of loans trended downward, including the interest rate on mortgage loans. The reasons for this general decline in interest rates are somewhat controversial. The policy of the U.S. Federal Reserve played a key role. But global financial forces may have contributed as well. Indeed, the decline in interest rates was observed in many other countries not just the United States.

In macroeconomics, you’ll learn more about how interest rates in the overall economy are determined, and what causes them to change. In this section, we’ll just note that a drop in interest rates reduces the monthly cost of homeownership and increases the number of homes demanded at any given home price. Thus, the general drop in interest rates contributed to the rightward shift in the demand for housing.

Government Policy

In the United States (more so than most other countries), owning a home has been viewed as a desirable way to promote financial security for individuals and responsible citizenship for local communities. For this reason, the government has long encouraged homeownership in two major ways.

First, it allows homeowners to deduct mortgage interest payments from their taxable income. The government in effect says, “If you shift some of your spending from other things to mortgage payments, we will give you some of your tax dollars back.” This amounts to a subsidy: a payment from the government to the borrower for each dollar of interest paid on a mortgage loan, lowering monthly homeownership costs.

Second, government agencies2 have increased the funds available for mortgage lending by purchasing mortgages from banks and other financial institutions, giving

2 The two main agencies are the Federal National Mortgage Association, informally known as “Fannie Mae” and the Federal Home Loan Mortgage Corporation, known as “Freddie Mac”
them fresh cash to lend out again for another mortgage. This resulting increase in funding for mortgages has helped to keep mortgage interest rates—and monthly homeownership costs—low.

These policies have caused the demand for housing to be greater than it would otherwise be. But they had been in place for decades, so their mere existence cannot explain the housing boom. However, at the start of the boom, both policies were stepped up significantly. Government agencies expanded their purchases of mortgage loans, helping to push mortgage interest rates even lower. And in 1997, the government added another tax policy for homeowners: It raised the “capital gains exclusion” on home sales from $125,000 to $500,000, and made it easier to apply the exclusion to a second home. This meant that the first $500,000 of capital gains from selling a home would be entirely tax free. Thus, owning one or more homes with a mortgage—already an attractive, highly leveraged investment—became even more attractive.

Financial Innovations

Two types of financial innovation—both of which had existed prior to the boom—became more prevalent as the boom developed. The first type of innovation involved more-attractive terms for borrowers. The adjustable rate mortgage (ARM), for example, offered a very low initial interest rate (and low monthly payments). The interest rate and monthly payments would leap upward later, usually after two years. But during the initial low-payment period, ARMs lowered monthly homeownership costs, and increased the demand for housing.

A second type of innovation made mortgage lending more attractive. Traditionally, a mortgage lender such as a bank would hold onto a mortgage and collect the monthly payments from the homeowner for the life of the loan, typically 30 years. But a technique called securitization pooled many mortgages together, and then divided them into smaller financial assets called mortgage backed securities. Each mortgage backed security promised its holder monthly payments that came not from one homeowner’s monthly mortgage payments, but from hundreds of homeowners monthly payments.

Though mortgage backed securities had been around for decades, they became more popular during the housing boom because of other financial innovations. These included new ways for lenders to quantify the risks of individual mortgage loans (called “credit scoring”), which enabled them to quantify the overall risk of any mortgage backed security. Also, new ways of combining and re-dividing the securities themselves were developed, which seemed to reduce their risks further.

Financial institutions in the U.S. and around the world—hungry for new, low-risk opportunities to lend—purchased hundreds of billions of dollars of these new securities each year. In this way, an entirely new group of global investors—and an entirely new source of funds—became available for mortgage lending. Mortgage interest rates—and monthly costs for new home buyers—fell further. The demand curve for homes shifted further rightward.

Lending Standards

Banks and other financial institutions that make mortgage loans take a risk: If housing prices decline, and an owner owes more on the mortgage than the home is worth, the owner might default (stop making payments).

When a family defaults, it ultimately moves out of the home—either by walking away or because they are forced out by foreclosure. This process is costly, and when the home is resold, it is usually a distress sale, at a bargain price. All in all, 50% or
more of the remaining value of the loan can be lost in a default. These losses are then transmitted to the lender or anyone currently holding the mortgage backed security that contains that mortgage as part of its larger pool.

Traditionally, lenders have guarded against homeowner defaults in two ways (1) lending only to those whose incomes and credit histories suggest a small probability of default; and (2) requiring the borrower to make a sizeable down payment—traditionally 20% of the home’s value. The down payment gives the borrower something at stake—and a reason to continue making payments—even if the price of the home declines modestly.

However, as the boom proceeded, with huge amount of funds flowing into the mortgage market and lenders competing with each other to find borrowers, lending standards deteriorated. Lenders began making increasing numbers of so-called sub-prime loans: loans to borrowers who previously would not have qualified due to low or unstable incomes or bad credit histories. (Credit scoring, discussed earlier, suggested that the risks of such loans could be quantified and therefore managed.) In 2006 alone, more than $600 billion in subprime mortgage loans were made—about one-fifth of all mortgage lending.

Down payments began to shrink as well. From 2005 to 2007, more than half of the subprime mortgage loans in the U.S. actually had no down payment at all. In Britain, some large banks offered mortgages for 125% of the value of the home—in effect, a negative down payment!

The decline in lending standards contributed to the housing boom by opening up the prospect of homeownership to millions of people who would not otherwise have qualified. This caused a further rightward shift in the demand curve for housing.

Speculation

Once housing prices had increased rapidly for several years, and people began expecting them to keep rising at those rates, speculation took over. Remember that—even with a 20% down payment—housing is a highly leveraged investment (see the appendix). If the housing market gives you a way to turn a $40,000 investment into $100,000 or more in a few years, why not buy a home? And why just one? Why not buy two, three, or as many as you can obtain mortgages for? You can always rent out the ones you aren’t using. Your ARMs will have low monthly payments for a couple of years, and when the interest rates reset to higher, unaffordable levels, you can always sell your house for a capital gain.

Once this kind of thinking takes over a market, it feeds on itself. People want to speculate in housing because they expect the price to keep rising, and the price keeps rising because more and more people are speculating and shifting the demand for housing ever rightward.

An Example: The Boom in Las Vegas

Figure 15 shows an example of how all of these forces drove up housing prices in one particular city—Las Vegas—where a full-forced bubble began in mid-2003 (a bit later than in some other cities). Initially, with demand curve $D_{2003}$ and supply curve $S_{2003}$, the market was in equilibrium at Point A, with the median home worth $179,000. Then, for all of the reasons we’ve discussed, the demand curve for homes in Las Vegas shifted rightward each year, reaching $D_{2006}$ in mid-2006. As housing prices rose, new construction picked up as well, increasing the housing stock and shifting the supply curve rightward, ultimately to $S_{2006}$. But, as discussed in this chapter, when demand increases rapidly, the housing stock often lags behind. That
is what happened in Las Vegas. As shown in the figure, demand increased substantially more than supply, so home prices soared—rising to $324,000 in June 2006.

Unfortunately, what happened in Vegas didn’t stay in Vegas. The same bubbles developed in many areas of the country—especially in towns and cities in California, Arizona, and Florida.

**The Housing Bust: A Sudden Drop in Demand**

Every bubble bursts at some point. If nothing else, there are natural limits to its growth. If home prices had continued to rise at such a rapid pace, eventually new buyers would not be able to make monthly mortgage payments, even with low interest rates. The speculation would ultimately slow, and then reverse direction when people realized that prices were no longer rising.

But a bubble can burst before it reaches a natural limit. And in U.S. housing markets, problems began to occur in mid-2006, largely due to two simultaneous events: (1) oil and gasoline prices spiked, so many new homeowners were struggling to make ends meet; and (2) interest rates on a large group of adjustable rate mortgages reset to higher levels. Suddenly, people noticed a disturbing rise in defaults—especially on subprime mortgages with no down payments. Around the world, lenders to the U.S. mortgage market began to take a closer look at market conditions, and they did not like what they saw: more ARMs resetting to higher levels over the next several years, and more defaults down the road. Everyone suddenly took notice of how high home prices had risen, and how far they could fall.

For the first time, it seemed, investors began to ask questions about the statistical analysis used by financial institutions to measure the risk of ARMs and subprime mortgages, and the risks of their associated mortgage backed securities. And it turned out that every financial institution had made the same assumption: That housing prices would continue rising or, at worst, fall only modestly. No one seemed to consider what would happen if housing fell more dramatically.

Now, with the prospect of higher default rates, and the possibility of falling home prices, the former flood of funding for new mortgages turned into a drought. Interest rates on new mortgages—to the extent they were available at all—rose. The
demand curve for housing shifted leftward. And the fears of mortgage lenders became self-fulfilling: Housing prices fell.

Moreover, once housing prices began to fall, speculative fever worked in reverse. By 2007, what had been a near-certain, highly-leveraged gain for home-buyers turned into the prospect of a highly-leveraged loss. Anyone buying a home with a traditional down payment risked losing the entire investment in a few years or less. And many of those who already owned homes suddenly wished they didn’t. The demand curve for housing shifted further leftward, and housing prices fell even more rapidly.

**An Example: The Bust in Las Vegas**

Figure 16 illustrates how these events affected the housing market in Las Vegas. Initially, at the peak of the bubble in mid-2006, with demand curve $D_{2006}$ and supply curve $S_{2006}$, the market was at point $B$, with the average price of a home at $324,000$. But then, the demand curve shifted leftward, and by late 2008, it reached a location like that of $D_{2008}$. The supply curve, of course, did not shift leftward. Houses generally last a long time, and the homes built during the bubble had now become permanent additions to the housing stock. Moreover, the housing stock continued to grow—even as home prices dropped. (Remember: Construction projects are started long in advance. Also, housing prices—while dropping—still remained high by historical standards for many months after the bubble burst, providing continued incentives to build.)

In the figure, the new equilibrium price is depicted at $160,000$ for 2008. But in reality, the average home price in Las Vegas at the end of 2008, while still heading downward, had fallen only to $178,000$. Why does the figure show an equilibrium price lower than the actual price at the time? The reason is: While housing prices tend to rise rapidly to a new, higher equilibrium, they tend to fall to a lower equilibrium very slowly. Thus, the market price at the end of 2008 had probably not yet reached its equilibrium. One reason that prices fall so slowly is psychological: sellers who bought at higher prices resist selling at a lower price and acknowledging that they’ve lost money on their most significant investment. Instead, they may hang on and refuse to sell for months or years, waiting in vain for a higher offer that never
comes. An unfortunate consequence is that a housing bust can last for years, continuing to affect the economy long after the bubble initially bursts.

By the end of 2008, the average price of a home in the U.S. had fallen almost 30% from the peak of the bubble. (Las Vegas home prices were down about 45%). Few economists at the time believed that home prices had reached their ultimate lows. But in early 2009, new government programs to increase the demand for housing were put in place. The goal was to raise the equilibrium price, so that actual home prices would have less to fall before reaching that equilibrium. By mid-2009, there were some encouraging signs these policies might be having an effect.

### SUMMARY

The model of supply and demand is a powerful tool for understanding all sorts of economic events. For example, governments often intervene in markets through price ceilings or price floors, designed to prevent the market from reaching equilibrium. Economic analysis shows that these policies are often ineffective in achieving their goal of helping one side of the market, and often create additional problems.

Governments also intervene in markets with taxes and subsidies. Taxes increase the equilibrium price and decrease the equilibrium quantity, while subsidies do the opposite: decreasing price and increasing quantity. Taxes and subsidies have the same effect on the market regardless of whether the tax is imposed on (or the subsidy given to) buyers or sellers.

Supply and demand can also be used to understand markets other than those for currently produced goods and services. One important example is the market for residential housing, which is usefully analyzed as stock variables (quantities that exist at a moment in time), rather than flow variables (processes that take place over a period of time). In the housing market, the supply curve tells us the quantity of homes in existence, and the demand curve tells us the number of homes that the population would like to own. The demand curve slopes downward because housing entails an ongoing ownership cost, with interest cost (paid or foregone) one of its major components. The lower the price of a home, the lower the monthly ownership cost, and the more attractive owning is compared to renting.

In a stable housing market, the housing stock keeps pace with demand growth, so prices remain stable. But restrictions on new building, or a sudden acceleration of demand, can cause housing prices to soar. Because people usually buy homes with mortgage loans, housing is a highly leveraged financial investment: the value of the home is a multiple of the funds invested. As a result, the demand for housing is especially sensitive to changes in expected prices. This played a role in the most recent housing boom, and the housing bust that followed.

### PROBLEM SET

1. The market for rice has the following supply and demand schedules:

<table>
<thead>
<tr>
<th>$P$ (per ton)</th>
<th>$Q^D$ (tons)</th>
<th>$Q^S$ (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10$</td>
<td>100</td>
<td>0</td>
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<td>$20$</td>
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To support rice producers, the government imposes a price floor of $50 per ton.

a. What quantity will be traded in the market? Why?

b. What steps might the government have to take to enforce the price floor?

2. In Figure 2, a price ceiling for maple syrup caused a shortage, which led to a black market price ($4) higher than the initial equilibrium price ($3). Suppose that the price ceiling remains in place for years. Over time, some maple syrup firms go out of business. With fewer firms, the supply curve in the figure shifts leftward by 10,000 bottles per month. After the shift in the supply curve:

a. What is the shortage caused by the $2 price ceiling?

b. If all of the maple syrup is once again purchased for sale on the black market, how will the black market price be greater, less than, or the same as that in Figure 2? Explain briefly.
3. In the chapter, you learned that one way the government enforces agricultural price floors is to buy up the excess supply itself. If the government wanted to follow a similar kind of policy to enforce a price ceiling (such as rent control), and thereby prevent black-market-type activity, what would it have to do? Is this a sensible solution for enforcing rent control? Briefly, why or why not?

4. In Figure 5, prove that the incidence of a $0.60 tax imposed on sellers could not be split equally between buyers and sellers, given the supply and demand curves as drawn. [Hint: What price would gasoline sellers have to charge after the tax for an even split? What would happen in the market if the airlines change their force?]

5. Figure 8 shows the impact of a $10,000 subsidy on the market for college education when the subsidy is paid to college students. Starting with the same initial supply and demand curves, show what happens when the same $10,000 subsidy per student is paid to the colleges they attend. Suggestion: Trace the relevant curves from the figure on your own sheet of paper. (Hint: If a subsidy is paid directly to the colleges, which curve will shift? In what direction?)

6. State whether each of the following is a stock variable or a flow variable, and explain your answer briefly.
   a. Total farmland acreage in the U.S.
   b. Total spending on food in China
   c. The total value of U.S. imports from Europe
   d. Worldwide iPhone sales
   e. The total number of parking spaces in Los Angeles
   f. The total value of human capital in India
   g. Investment in new human capital in India

7. Suppose you buy a home for $200,000 with a $20,000 down payment and finance the rest with a home mortgage.
   a. Suppose that if you default on your mortgage loan, you lose the home, but nothing else. By what percentage would housing prices have to fall to create an economic incentive for you to default on the loan? Explain briefly.
   b. Suppose that if you default on your mortgage loan, you not only lose the home, but also $10,000 in moving and relocating expenses. By what percentage would housing prices have to fall now to create an economic incentive for default?

8. Every year, the housing market in Monotone, Arizona, has the same experience: The demand curve for housing shifts rightward by 500 homes, 500 new homes are built, and the price of the average home doesn’t change. Using supply and demand diagrams, illustrate how each of the following new events, ceteris paribus, would affect the price of homes in Monotone during the current year, and state whether the price rises or falls.
   a. Because of special tax breaks offered to Monotone home builders, 800 new housing units are built during the current year.
   b. Because of events in the overall economy, interest rates fall.
   c. The Monotone city council passes a new zoning law that prevents any new home construction in Monotone during the year.
   d. Because of the new zoning law, and the resulting change in home prices, people begin to think that homes in Monotone are a better investment than they had thought before.
   e. 500 new homes are built in Monotone during the year, but that same year, an earthquake destroys 2,000 preexisting homes. As a result of the earthquake, 3,000 homeowners decide they no longer want to live or own homes in Monotone.

9. Every year in Houseville, California, builders construct 2,000 new homes—the most the city council will allow them to build. And every year, the demand curve for housing shifts rightward by 2,000 homes as well. Using supply and demand diagrams, illustrate how each of the following new events, ceteris paribus, would affect the price of homes in Houseville during the current year, and state whether home prices would rise or fall.
   a. Houseville has just won an award for the most livable city in the United States. The publicity causes the demand curve for housing to shift rightward by 5,000 this year.
   b. Houseville’s city council relaxes its restrictions, allowing the housing stock to rise by 3,000 during the year.
   c. An earthquake destroys 1,000 homes in Houseville. There is no affect on the demand for housing, and the city council continues to allow only 2,000 new homes to be built during the year.
   d. The events in a., b., and c. all happen at the same time.

10. [Requires appendix] Suppose you buy a home for $400,000 with a $100,000 down payment and finance the rest with a home mortgage.
    a. Immediately after purchasing your home, before any change in price, what is the value of your equity in the home?
    b. Immediately after purchasing your home, before any change in price, what is your simple leverage ratio on your investment in the home?
    c. Now suppose that over the next three years, the price of your home has increased to $500,000. Assuming you have not borrowed any additional funds using the home as collateral, but you still...
owe the entire mortgage amount, what is the new value of your equity in the home? Your new simple leverage ratio?
d. Evaluate the following statement: “An increase in the value of a home, with no additional borrowing, increases the degree of leverage on the investment in the home.” True or false? Explain.

11. [Requires appendix] Suppose, as in the previous problem, you buy a home for $400,000 with a down payment of $100,000 and take out a mortgage for the remainder. Over the next three years, the price of the home rises to $500,000. However, during those three years, you also borrow $50,000 in additional funds using the home as collateral (called a “home equity loan”). Assume that, at the end of the three years, you still owe the $50,000 as well as your original mortgage.
a. What is your equity in the home at the end of the three years?
b. How many times are you leveraged on your investment in the home at the end of the three years?
c. By what percentage could your home’s price fall (after it reaches $500,000) before your equity in the home is wiped out?

More Challenging

12. [Requires Appendix] Suppose, as in the previous problem, you buy a home for $400,000 with a down payment of $100,000 and take out a mortgage for the remainder. Over the next three years, the price of the home rises to $500,000. However, during those three years, you borrow the maximum amount you can borrow without changing the value of your home equity. Assume that, at the end of the three years, you still owe all that you have borrowed, including your original mortgage.
a. How much do you borrow (beyond the mortgage) over the three years?
b. What is your simple leverage ratio at the end of the three years?
c. By what percentage could your home’s price fall (after it reaches $500,000) before your equity in the home is wiped out?

13. [Requires appendix] Could any combination of home price, mortgage, or further borrowing on a home result in a simple leverage ratio of 1/2? If yes, provide an example. If no, briefly explain why.
This appendix discusses the concept of leverage: what it means, how it can be measured, and its implications for owning an asset. Our focus here is on the housing market. But leverage can be applied to many other markets, as you will see later in this text.

Let’s start by exploring how the housing market would operate without leverage. Imagine that you had to pay for a home in full, using only your own funds. In that case, if you have $100,000 available for buying a home, you could buy a home worth $100,000, and no more.

Suppose you bought a home for $100,000, and over the year, housing prices rose 10%. The home would then be worth $110,000. If you then sold it (and if we ignore selling costs and maintenance) your $100,000 investment would have turned into $110,000—a capital gain of $10,000. This gives you a 10% rate of return on your financial investment of $100,000. We’ll also note that, if the price of the home fell by 10%, down to $90,000, you would have a capital loss of $10,000—again, 10% of your financial investment.

Notice that, when you use only your own funds, your rate of return on your investment (\( \frac{\text{10\%}}{\text{10\%}} \)) is the same as the rate of change for the home’s price.

This example is not how most people buy a home. In the United States and many other countries, if you have $100,000 to invest in a home, you will use it for just part of the purchase—called the down payment—and borrow the remainder. This allows you to buy a home worth substantially more than $100,000. Using borrowed money to buy a home is an example of a leveraged financial investment.

To see how this works in practice, let’s once again assume you have $100,000 of your own funds available. But now, you’ll use it as a down payment, equal to 20% of the home’s purchase price. You’ll buy a home for $500,000, and take out a mortgage loan for the amount not covered by your down payment: $400,000. Panel (a) of Figure A1 illustrates how this works: You use your own $100,000, plus $400,000 from the mortgage lender, to purchase a home worth $500,000. In return, you sign a mortgage contract, promising to pay back $400,000 over time.

Now let’s suppose, once again, that housing prices rise by 10% over the year. Because you own a $500,000 home, its price has risen to $550,000. Panel (b) shows what happens when you sell this home. You sell the house for $550,000, pay back what you owe the bank ($400,000), and the mortgage contract is paid in full. You now have $150,000 left over. Remember: Your original investment was $100,000, and you now have $150,000, for a capital gain of $50,000. Thus, a 10% rise in housing prices has given you a 50% rate of return on your investment.

Of course, if the price fell by 10%, your home would be worth only $450,000. If you sold it at that price, and paid off the $400,000 loan, you’d be left with only $50,000 of the $100,000 you started with. In that case, you’d have lost 50% of your initial investment.

As you can see, when you borrow to buy a home, the potential capital gains and losses on your original investment are magnified. This magnification of gains and losses through borrowing is called leverage.

**MEASURING LEVERAGE**

For many purposes, it’s useful to calculate the degree of leverage associated with an investment, such as a home purchase. There are various ways of measuring leverage, but all of them rely on the concept of equity:

**An owner’s equity in an asset is the difference between the asset’s value and any unpaid debts on the asset (that is, debts for which the asset was used as collateral):**

\[
\text{Equity in Asset} = \text{Value of Asset} - \text{Debt Associated with Asset}
\]

Notice that an owner’s equity depends on the asset’s value. For assets owned by individuals or families, we use the current market value of the asset—the price at which it could be sold.\(^3\) So, for example, a homeowner’s equity is the price at which the home could be sold, minus any

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\(^3\) Owner’s equity for a business firm is defined very much like equity for a household: The total value of its assets minus what it owes to others. But for firms, asset values are typically based on historical prices paid, rather than current market value, until the asset is actually sold or officially revalued. So, for example, a building purchased long ago and still owned by a firm will be valued at its original purchase price, with some adjustment for depreciation.
debts for which the home was used as collateral. The equity represents the part of the asset’s value that truly belongs to its owner. It is what the owner would get if the asset were sold, after paying back the associated debt.

The concept of equity leads directly to one way of measuring leverage, which we’ll call the simple leverage ratio:

\[
\text{Simple Leverage Ratio} = \frac{\text{Value of Asset}}{\text{Equity in Asset}}
\]

Now, let’s apply these concepts to home ownership. Suppose, as in our first example, you use only your own funds to buy a $100,000 home, and never use the home as collateral for a loan. Using the definitions above, your equity in the home is $100,000 − $0 = $100,000. Your simple leverage ratio is $100,000/$100,000 = 1. A leverage ratio of 1 means no leverage at all: There is no borrowing to magnify capital gains and losses.

Now let’s calculate the leverage ratio in our second example, in which you make a $100,000 down payment on a $500,000 home, and borrow the remaining $400,000. Your equity in the home is $500,000 − $400,000 = $100,000. And your simple leverage ratio is $500,000/$100,000 = 5. In words, we’d say you are “leveraged five times.”

**FIGURE A1** Leverage Buying and Selling

(a) This year: Buy home

Financial Institution

$400,000 Borrowed

Mortgage Contract

$400,000

Home

$100,000

You

(b) Next year: Sell home

Financial Institution

$400,000 Paid Back

Mortgage Contract (paid in full)

$550,000

Home

$150,000

You

Home Seller

Home Buyer

**LEVERAGE AND RATE OF RETURN**

The simple leverage ratio serves as a “rate-of-return multiplier.” That is, we can multiply the rate of change in a home’s price by the leverage ratio to get the rate of return on the (leveraged) investment. For example, we found earlier that, when you buy a $500,000 home and are leveraged 5 times, a 10% rise in housing prices gives you a 50% rate of return on your investment—five times the percentage increase in the home’s price.

As you can see, when asset prices rise, leverage can increase your rate of return dramatically. But when asset prices fall, leverage increases the chance of wiping out your entire investment. With no leverage, your home’s price would have to fall by 100% before your owner’s equity would disappear. If you are leveraged 5 times, a drop of 20% eliminates your equity. And if you’re leveraged 20 times, it takes only a 5% drop in prices to wipe out your entire investment.

One last word. In this appendix, we’ve been applying the concept of leverage, and the simple leverage ratio, to a single asset. But leverage can also refer to the combined assets of a household or business firm, or even to an entire sector of the economy. If you are studying macroeconomics, you’ll see in a later chapter that high degrees of financial sector leverage in the U.S. and several other countries played a crucial role in the recent global recession.