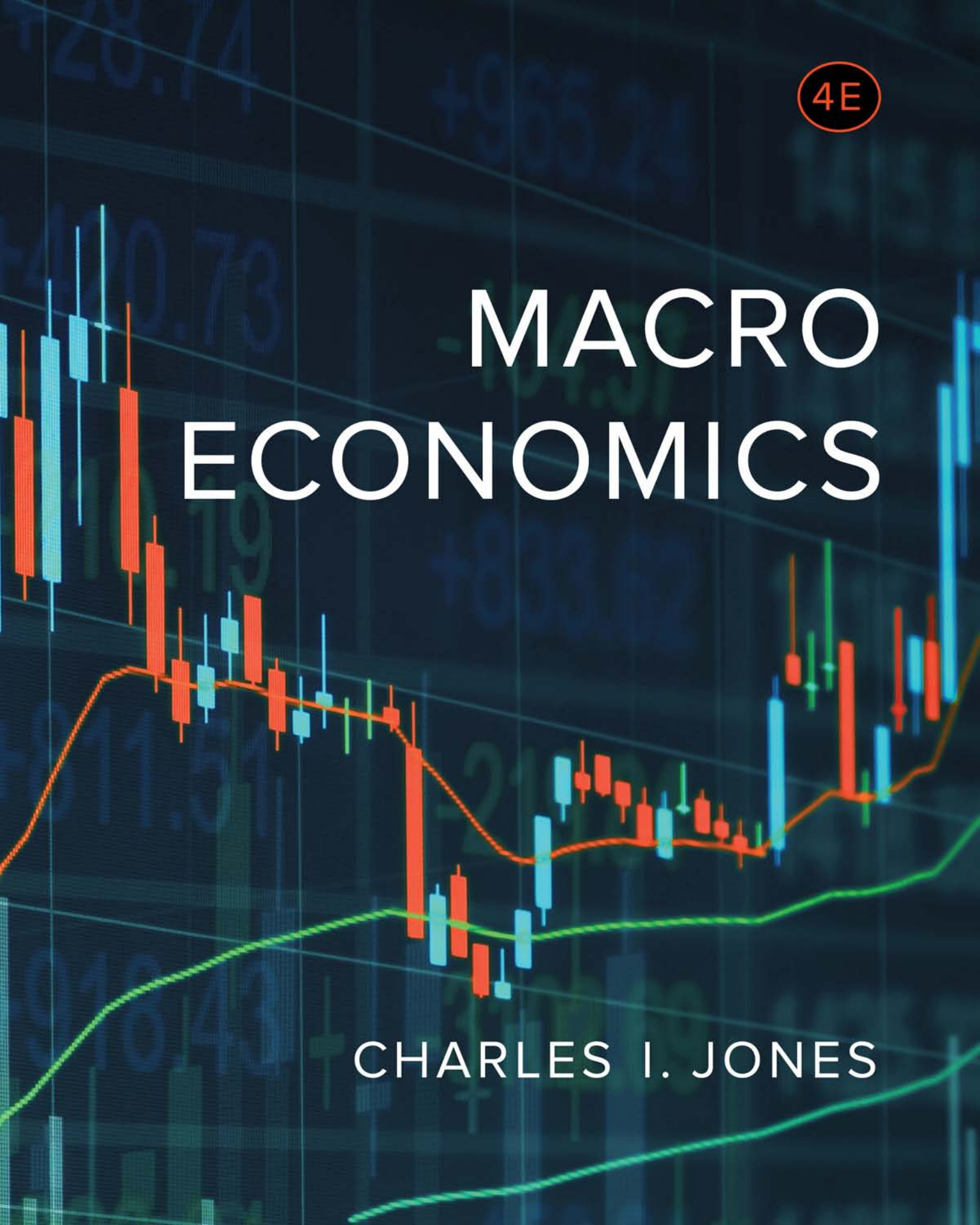
4E
MACRO
ECONOMICS
CHARLES I. JONES

MACROECONOMICS

Fourth Edition

Charles I. Jones

Stanford University, Graduate School of Business

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To Terry; for Audrey and Charlie

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PREFACE TO THE FOURTH EDITION

The macroeconomic events of the last decade are truly breathtaking—a once-in-a-lifetime (we hope) occurrence. While the basics of how economists understand the macroeconomy remain solid, the global financial crisis and the Great Recession take us into waters that, if not uncharted, at least have not been visited in more than half a century. The recovery of the U.S., European, and world economies from these shocks has been remarkably subdued. And, perhaps most troubling of all, the productivity growth that underlies long-run economic performance has been surprisingly slow for more than a decade.

This new edition continues the tradition established in previous versions: providing up-to-date, modern analysis of both current events and classic issues in macroeconomics. For example, new measures of standards of living (Chapter 2), China's impact on U.S. jobs and wage inequality (Chapter 7), the latest research on the Great Recession (Chapters 10 and 14), and the Euro-area financial crisis (Chapter 20) are all incorporated. A new primer in Chapter 12 helps students to bridge the gap between the old IS-LM model and the new IS-MP model, which is rapidly displacing the IS-LM framework as a guide to the short run. A new exercise in virtually every chapter asks students to obtain and analyze up-to-date data from the Federal Reserve's FRED database. This fourth edition also incorporates many new case studies and exercises, extensive updates to tables and figures to reflect the most current data, and improvements on nearly every page in the text.

It is a fascinating time to study macroeconomics, and I look forward to sharing astounding facts about the macroeconomy with you and to discussing the Nobel-caliber ideas that help us understand them.

Innovations

(This section will make the most sense to students with some familiarity with macroeconomics and instructors. Students new to the subject may skip to the Guided Tour.)

Most other books for teaching intermediate macroeconomics were first written more than twenty years ago. Our understanding of the macroeconomy has improved substantially since then. This book provides an accessible and yet modern treatment. Its order and structure will feel familiar to instructors, but the execution, examples, and pedagogy have been updated to incorporate the best that macroeconomics instruction has to offer.

What's special about this book? Innovations occur throughout, but the key ones are described below.

Two Chapters on the Great Recession

The global financial crisis and the Great Recession that followed are obviously the most important macroeconomic events in decades. While these events are discussed throughout in sections devoted to the short run, two chapters explicitly focus on recent events. Chapter 10 (The Great Recession: A First Look) immediately follows the first introductory chapter on the short run, exposing students to the facts of the last several years and to critical concepts like leverage, balance sheets, and securitization. Chapter 14 (The Great Recession and the Short-Run Model), the last chapter of the short-run section, provides a detailed application of the short-run model to recent events, explaining in the process the unconventional aspects of monetary and fiscal policy that featured prominently in the government's response to the crisis.

Rich Treatment of Economic Growth

Economic growth is the first major topic explored in the book. After an overview chapter that describes the facts and some tools, Chapter 4 presents a (static) model based on a Cobb-Douglas production function. Students learn what a model is with this simple structure and see it applied to understanding the 50-fold differences in the per capita GDP observed across countries. Chapter 5 presents the Solow model but with no technological change or population growth, which simplifies the presentation. Students learn Robert Solow's insight that capital accumulation cannot serve as the engine for long-run economic growth.

Chapter 6 offers something absent in most other intermediate macro books: a thorough exposition of the economics of ideas and Paul Romer's insight that the discovery of new ideas can drive long-run growth.

The approach taken in this book is to explain the macroeconomics of the long run before turning to the short run. It is much easier to understand fluctuations in macroeconomic aggregates when one understands how those aggregates behave in normal times.

Familiar Yet Updated Short-Run Model

The modern version of the short-run AS/AD model is the crowning achievement of the short-run section. By *modern,* I mean several things. First and foremost, the AS/AD graph is drawn with inflation on the vertical axis rather than the price level—perfect for teaching students about the threat of deflation that has reared its head following the Great Recession, the Volcker disinflation, and the Great Inflation of the 1970s. All the short-run analysis, including explicit dynamics, can be performed in this single graph.

Another innovation in getting to the AS/AD framework is a focus on interest rates and the absence of an LM curve. Chapter 12 explains how the central bank sets the interest rate. Chapter 13 introduces a simple version of John Taylor's monetary policy rule to get the AD curve.

A final innovation in the short-run model is that it features an open economy from the start: business cycles in the rest of the world are one source of shocks to the home economy. To keep things simple, however, the initial short-run model does not include exchange rates.

DSGE Models: The Frontier of Business Cycle Research

A well-known tension exists between macroeconomics that is taught in most intermediate courses and one that is practiced by policymakers, central bankers, and researchers. Traditionally, it has been thought that the more difficult mathematics used by practitioners necessitated this divide. However, in Chapter 15, I've found a way to bridge some of this gap by giving students insights into the much richer DSGE models typically used to study macroeconomic fluctuations. Two innovations make this possible. First, I present the "impact effect" of shocks in a DSGE framework by studying the labor market. Second, I introduce impulse response functions graphically and then show estimates of these dynamic effects using state-of-the-art methods, in particular, the estimates of the famous Smets-Wouters model.

Interplay between Models and Data

A tight connection between models and data is a feature of modern macroeconomics, and this connection pervades the book. Many exercises ask students to work with real data, some of which are available in the book, some by using the online resources, and some from a data tool I've put together called Country Snapshots, a pdf file available at www.stanford.edu/~chadj/snapshots.html that contains a page of graphs for each country in the world. The data underlying the graphs can be obtained as a spreadsheet simply by clicking on a link at the top of each page. Finally, a new exercise in almost every chapter asks students to obtain and analyze up-to-date data from the Federal Reserve's FRED database.

Worked Exercises at the End of Each Chapter

One of the most effective ways to learn is by working through problems. So a carefully chosen collection of exercises is included at the end of each chapter; from among these, one or two are

selected and worked out in detail. Students are encouraged to attempt these exercises on their own before turning to the full solution.

More Emphasis on the World Economy

Relative to many intermediate macro books, this text features more emphasis on the world economy in three ways. First, the long-run growth chapters are a main emphasis in the book, and these inherently involve international comparisons. Second, the short-run model features an open economy (albeit without exchange rates) from the very beginning. Finally, the book includes two international chapters in Part 4: Chapter 20 is the standard international finance chapter and Chapter 19 is entirely devoted to international trade.

Better Applications and Microfoundations

Part 4 includes five chapters of applications and microfoundations. The basic structure of this part is traditional. There is a chapter for each component of the national income identity: consumption, investment, the government, and the international economy. However, the material inside is modern and novel. For example, the consumption chapter (Chapter 16) centers around the famous Euler equation that lies at the heart of today's macroeconomics. The investment chapter (Chapter 17) highlights the strong parallels between investment in physical capital and financial investments in the stock market using the "arbitrage equation" approach. The chapter on the government and the macroeconomy (Chapter 18) includes an application to what I call "The Fiscal Problem of the Twenty-First Century"—how to finance the growing expenditures on health care. And, as mentioned above, the international section features two chapters, one on international trade and one on international finance. These chapters are not essential and instructors may wish to skip one or both of them depending on time constraints.

A Guided Tour

The book consists of three main parts: the Long Run, the Short Run, and the Applications and Microfoundations. Surrounding these parts are an introductory section (Part 1: Preliminaries) and a concluding chapter (Chapter 21: Parting Thoughts).

This organization reflects an increasing appreciation of the importance of long-run macroeconomics in the profession. In addition, it makes sense from a pedagogical standpoint to put the long run first. This way students understand what it is that the economy fluctuates *around* when they get to the short-run chapters.

A brief overview of each part follows.

Part 1: Preliminaries

We begin with an overview of macroeconomics: what kind of questions macroeconomics addresses and how it goes about its business. A second chapter discusses the data of macroeconomics in more detail, with a focus on national income accounting.

Part 2: The Long Run

The second part of the book (Chapters 3 through 8) considers the macroeconomy in the long run. Chapter 3 presents an overview of the facts and tools economists use to study long-run macroeconomics, with special attention to economic growth. Chapter 4 introduces the Cobb-Douglas production function as a way to understand the enormous differences in standards of living seen across countries. The interplay between theory and data that is central to macroeconomics makes a starring appearance in this chapter.

Chapter 5 considers the Solow model of economic growth, one of the workhorse models of macroeconomics. Students study the extent to which the Solow model can help them understand (a) why some countries are rich while others are poor, and (b) why people in the advanced countries of the world are so much richer today than they were a hundred years ago. Surprisingly, they will see that the model does not do a good job of explaining long-run economic growth.

For this explanation, Chapter 6 turns to the Romer model, which emphasizes the role played by the discovery of new ideas. Thinking about the economics of ideas may lead to profound changes in the way students understand many areas of economics.

Chapter 7 studies the most important market in modern economies: the labor market. Students learn about the determination of the unemployment rate in the long run and discover that they are already, in some sense, millionaires.

Chapter 8 concludes the long-run portion of the book by considering inflation. The quantity theory of money provides a long-run theory of inflation, which, according to Milton Friedman, occurs because of "too much money chasing too few goods."

Part 3: The Short Run

Part 3 is devoted to the branch of macroeconomics that students are probably most familiar with: the study of booms, recessions, and the rise and fall of inflation in the short run. The five chapters in this part form a tight unit that develops the short-run model and applies it to current events.

Chapter 9 provides an overview of the macroeconomy in the short run, summarizing the key facts and providing an introduction to the short-run model that explains these facts. Chapter 10 provides a "first look" at the financial crisis and the Great Recession, carefully laying out the facts of how the crisis evolved and introducing the important concepts of "leverage" and "balance sheets."

The next three chapters then develop the short-run model. Chapter 11 introduces the IS curve, a key building block of the short-run model. The IS curve reveals that a fundamental determinant of output in the short run is the real interest rate. Chapter 12 shows how the central bank in an economy can move the interest rate to keep the economy close to full employment. The chapter also provides the link between the real economy and inflation, called the Phillips curve.

Chapter 13 looks at the short-run model in an aggregate supply/aggregate demand (AS/AD) framework. This framework allows the complete dynamics of the economy in the short run to be studied in a single graph. Using this framework, the chapter emphasizes the key roles played by expectations, credibility, and time consistency in modern macroeconomic policymaking.

Chapter 14 uses the short-run model to help students understand the financial crisis and the Great Recession and discusses the macroeconomic prospects going forward. Chapter 15 presents the DSGE models of macroeconomic fluctuations to take students closer to the frontier of advanced macroeconomics, as discussed earlier in the preface.

Part 4: Applications and Microfoundations

Part 4 includes five chapters of applications and microfoundations. While it may be unapparent to students new to macroeconomics, the organization of these chapters follows the "national income identity," a concept discussed early in the book. These chapters include a number of important topics. Chapter 16 studies how individuals make their lifetime consumption plans. Chapter 17 considers the pricing of financial assets, such as stocks and houses, in the context of a broader chapter on investment.

Chapter 18 studies the role played by the government in the macroeconomy, including the role of budget deficits and the government's budget constraint. The chapter also considers a key problem that governments around the world will face in coming decades: how to finance the enormous increases in health spending that have occurred for the last fifty years and that seem likely to continue.

Both the long-run and the short-run parts of the book place the study of macroeconomics in an international context. The short-run model includes open economy forces from the very beginning, and the final two applications of the book go even farther in this direction.

Chapter 19 focuses on international trade. Why do countries trade? Are trade deficits good or bad? How have globalization and outsourcing affected the macroeconomy? Chapter 20 studies international finance, including the determination of the exchange rate and the Euro-area financial crisis.

Parting Thoughts

Chapter 21 concludes our study of macroeconomics. The chapter summarizes the important lessons learned in the book, and we offer a brief guide to the key questions that remain less than well understood.

Learning Aids

- *Overview:* The opening page of each chapter provides an overview of the main points that will be covered.
- *Boxes around key equations:* Key equations are boxed to highlight their importance.
- *Graphs and tables:* The main point of each figure is summarized in an accompanying marginal text box. Tables are used to summarize the key equations of a model.
- *Guide to notation:* The inside back cover contains a list of symbols, their meaning, and the chapter in which they first appear.
- *Case studies:* Case studies highlight items of interest in each chapter.
- *Chapter summaries:* The main points of each chapter are presented in list form for easy reference and review.
- *Key concepts:* Important economic concepts are set in boldface type where they first appear, and listed at the end of each chapter for review.
- *Review questions:* Review questions allow students to test their understanding of what they have learned.
- *Exercises:* Carefully chosen exercises reinforce the material from the chapter and are intended to be used for homework assignments. These exercises include many different kinds of problems. Some require graphical solutions while others use numbers. Some ask to look for economic data online and interpret it in a particular way. Others ask to write a position paper for a presidential candidate or to pretend to be advising the chair of the Federal Reserve.
- *Worked exercises:* From the exercises, one or two are selected and worked out in detail. These exercises are indicated by an asterisk (*) in the margin. Students will find these answers most helpful if they consult them only after having tried to work through each exercise on their own.
- *Glossary:* An extensive glossary at the end of the book defines terms and provides page numbers where more information can be found.

Country Snapshots

www.stanford.edu/~chadj/snapshots.html

To accompany the book, I have put together a resource containing data from more than 200 countries. Each page of the file snapshots.pdf corresponds to a country and provides graphs of that country's key macroeconomics statistics. Moreover, the data underlying the graphs can be obtained as a spreadsheet simply by selecting a link at the top of each page. Whenever students read about a particular country in the newspaper or in this book, detailed macroeconomics statistics are only a click away.

Available Formats for Students

The text is available in a number of student formats, including paperback and loose leaf, three-hole-punch versions at reduced costs. In addition, the Norton ebook reader provides students and instructors with an enhanced reading experience at a fraction of the cost of a print textbook. Instructors can guide student reading through notes they can share with the class; notes can include embedded images and videos. Reports on access and time on task, at both the individual and class levels, allow instructors to monitor student reading and engagement. The Norton ebook reader can be integrated into the instructor's campus learning management system, which allows students to link directly to the ebook from their LMS without having to sign in.

Norton Coursepacks

Maria Apostolova-Mihaylova, *Centre College*

Available free to adopters and their students, the Norton Coursepack for the Fourth Edition can be downloaded from the Norton instructor resource site, and it works directly in Blackboard, D2L, Moodle, and Canvas LMS systems. The coursepack includes easy to use materials, including:

- Flashcards
- Chapter Summaries
- Review Quizzes
- Review Discussion Questions
- Country Studies Snapshot Documents

Lecture PowerPoints

Emily C. Marshall, *Dickinson College*

The revised PowerPoint slides for this edition provide a lecture-ready resource for the instructor. Concise and visually rich, these slides help guide students through concepts in each chapter, especially those most misunderstood. Integrated teaching tips are designed to provide additional instructor support.

Instructor's Resource Site

Downloadable resources will include the test bank in rich-text and ExamView® formats, the coursepack, graphs in jpeg format and as PowerPoints, the Instructor's Manual, and lecture PowerPoints.

Instructor's Manual

Anthony Laramie, *Boston College*, with contributions from Pavel Kapinos, *Carleton College*, and Kenneth Kuttner, *Williams College*

This valuable instructor's resource includes an overview, a suggested approach to the chapter lecture, expanded case studies, additional case studies, and complete answers to the end-of-chapter problems for each chapter.

Test Bank

Robert Sonora, *Fort Lewis College*, with contributions from Todd Knoop, *Cornell College*, and Dietrich Vollrath, *University of Houston*

Available for download in rich-text and ExamView® formats, the updated test bank includes carefully constructed true/false, multiple-choice, and short answer/numerical questions.

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MACROECONOMICS

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PART 1

PRELIMINARIES

CHAPTER 1

INTRODUCTION TO MACROECONOMICS

OVERVIEW

In this chapter, we learn

- what macroeconomics is and consider some macroeconomic questions: What determines the wealth of nations? How do we understand the recent global financial crisis and the Great Recession that resulted? What caused the Great Inflation of the 1970s, and why has inflation been so much lower in recent decades?
- how macroeconomics uses models to answer such questions.
- the book's basic three-part structure: the long run, the short run, and issues for the future.

> We shall not cease from exploration
> And the end of all our exploring
> Will be to arrive where we started
> And know the place for the first time.
>
> –T. S. ELIOT, *FOUR QUARTETS*

1.1 What Is Macroeconomics?

Macroeconomics is the study of collections of people and firms and how their interactions through markets determine the overall economic activity in a country or region. The other main area of economics, microeconomics, focuses on the study of individual people, firms, or markets. These two branches, however, are much closer than their standard separation into different courses would lead you to believe. Just as cosmologists who study black holes draw on concepts both large (general relativity) and small (quantum mechanics), macroeconomists look to individual behavior—which economists refer to as "microfoundations"—in creating their theories of aggregate economic activity. In this sense, macroeconomics is just one large black hole!

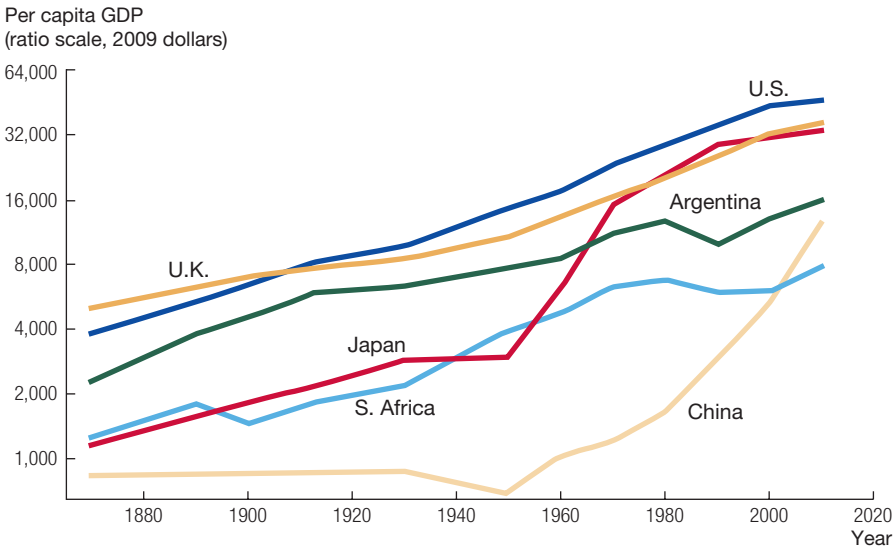
One good way to get a sense of macroeconomics is to consider the questions it deals with, some of the most important in all of economics:

- Why is the typical American today more than 10 times richer than the typical American a century ago?
- Why is the American of today 50 times richer than the typical Ethiopian? Some of the data that motivate these first two questions are shown in Figure 1.1, a graph of GDP per person since 1870 for seven countries. (GDP stands for gross domestic product, an overall measure of income that we will study in more detail in Chapter 2.)
- How do we understand the global financial crisis, the Great Recession, and the European debt crisis of recent years? As shown in Figure 1.2, this latest recession has seen the largest sustained decline in employment in the United States in many decades. More generally, what causes recessions and booms in the overall economy?
- What determines the rate of inflation; that is, what determines how rapidly prices are increasing in an economy? Why was inflation so high in much of the world in the 1970s, and why has it fallen so dramatically in many of the richest countries since the early 1980s? These facts are shown in Figure 1.3. Why do some countries experience hyperinflation, where the price level can explode and rise by a thousandfold or more, essentially rendering the currency worthless?
- Why has the unemployment rate—the fraction of the labor force that would like to work but does not currently have a job—been nearly twice as high in Europe as in the United States the past two decades? Consider

As we will see in Chapter 2, per capita GDP is a useful, though imperfect, measure of economic welfare. Notice both the large differences across countries as well as the increases in per capita GDP over time.

FIGURE 1.1

Per Capita GDP in Seven Countries

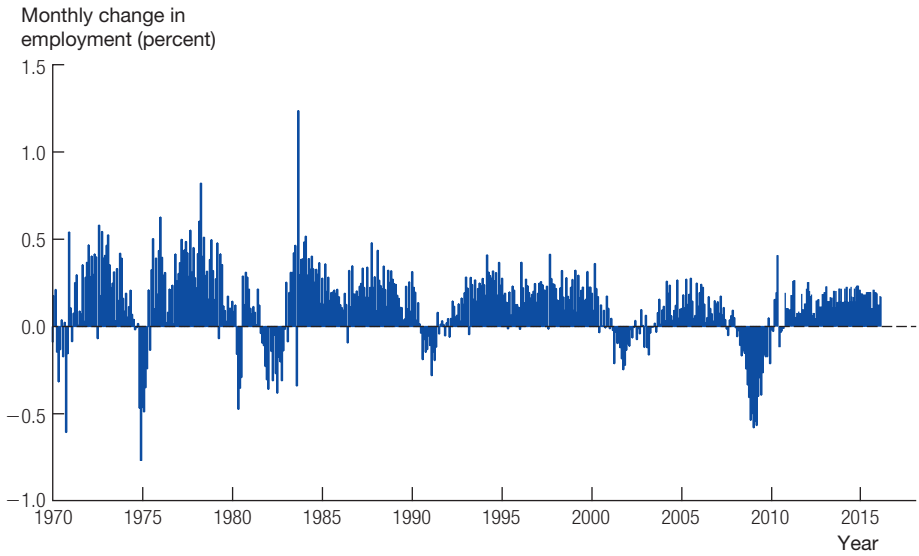


Source: The Maddison-Project, www.ggdc.net/maddison/.

Employment typically rises each month. But the latest recession led to the largest sustained decline in employment in many decades.

FIGURE 1.2

Changes in U.S. Employment

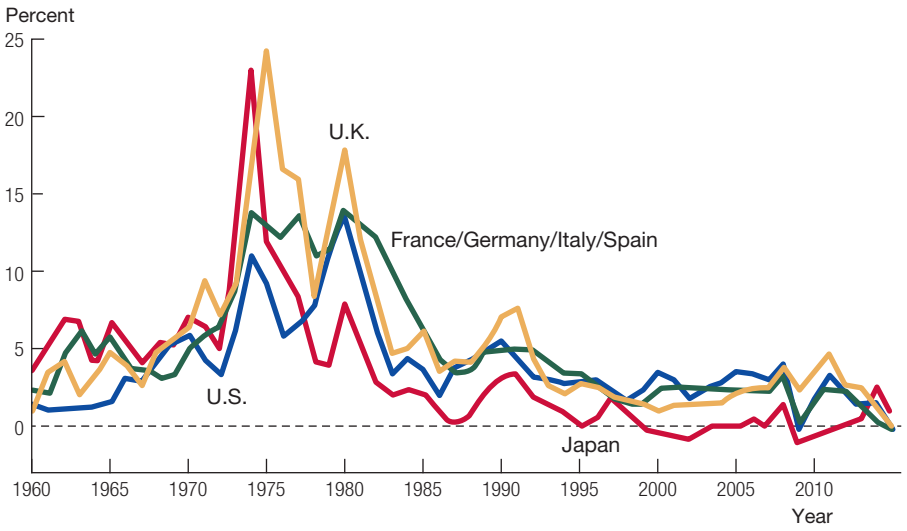


Source: Federal Reserve Economic Data (FRED), courtesy of the Federal Reserve Bank of St. Louis.

FIGURE 1.3

In many rich countries, inflation was high in the 1970s and has been low since the late 1980s.

Inflation Rates in Certain Rich Countries



Source: The OECD.Stat database at stats.oecd.org. The inflation rate measures the percentage change in the overall price level.

the evidence shown in Figure 1.4. This experience is particularly surprising in light of the fact that unemployment rates in Europe were much lower than in the United States up until about 1980. Why has unemployment in Japan been so low for most of this period?

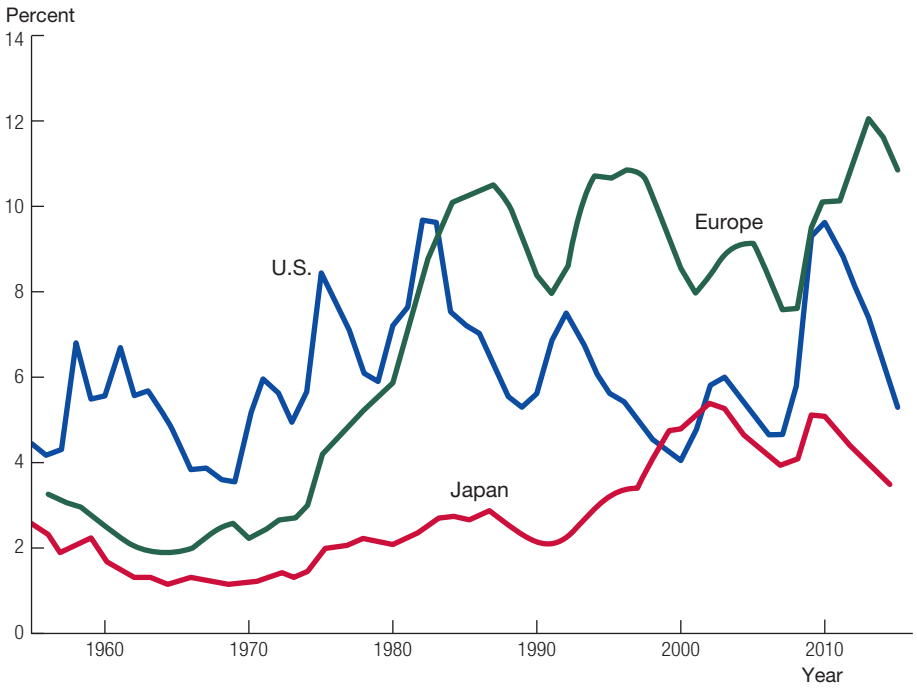
- What role does the government, both the fiscal authority and the monetary authority, play in recessions and booms and in determining the rate of inflation?
- Budget deficits result when the government borrows money to finance its spending. Trade deficits result when one economy borrows from another. Why would an economy run a high budget deficit or a high trade deficit, or both? What are the consequences of these deficits? Figure 1.5 shows the evolution of both deficits in the United States since 1960. Are large deficits a problem?
- What prompted the currency crises in Mexico in the mid-1990s and in many Asian economies at the end of the 1990s? What are the consequences of the recent decision by China to let its currency, the renminbi, appreciate after it was fixed for many years relative to the dollar?
- What role do financial markets like the stock market play in an economy? What is a "bubble," and how can we tell if the stock market or the housing market is in one?

To study questions such as these, macroeconomists construct mathematical models, similar in spirit to the models used in microeconomics. Yet one of the most

What explains the very different histories of the unemployment rate in the United States, Europe, and Japan?

FIGURE 1.4

The Unemployment Rate in the United States, Europe, Japan

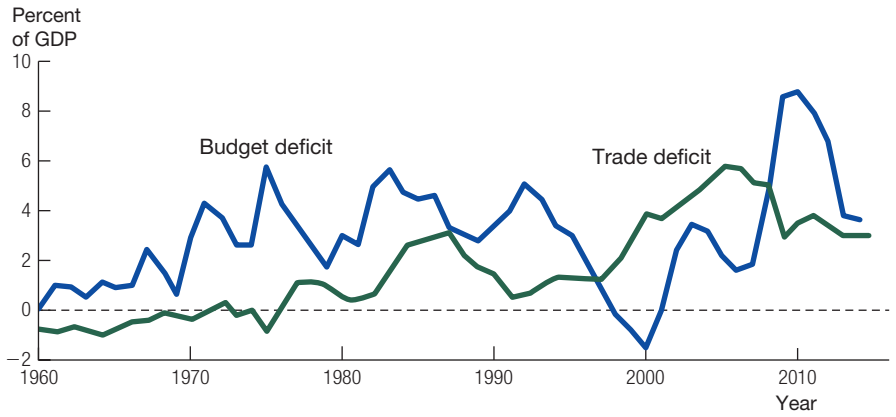


Sources: OECD Main Economic Indicators and the U.S. Bureau of Labor Statistics.

The U.S. budget and trade deficits have been relatively high in recent years.

FIGURE 1.5

Budget and Trade Deficits in the United States



Source: Department of Commerce, Bureau of Economic Analysis.

exciting features of macroeconomics is the way it combines these models with real-world phenomena—history, politics, and economic policy. This interaction between theory and practice is a key reason students enjoy studying macroeconomics.

1.2 How Macroeconomics Studies Key Questions

The questions above all concern the economy taken as a whole. This is obvious in the case of economic growth, but it is true of the other questions as well. For example, we care about budget and trade deficits because they may affect standards of living for the economy in the future. We care about bubbles in financial markets because the collapse of a bubble may send the economy into a recession.

Macroeconomics is also unified in a different way: by the approach it takes to studying these questions. In general, this approach consists of four steps:

1. Document the facts.
2. Develop a model.
3. Compare the predictions of the model with the original facts.
4. Use the model to make other predictions that may eventually be tested.

1. First, we document the key facts related to the question we want to consider. For example, suppose we ask, "Why are people in Europe so much richer today than a century ago?" Our first step is to gather economic *data* to document how rich Europeans are today and how rich they were a hundred years ago. With such data we can make precise, quantitative statements.

2. Next, we develop a model. You are already familiar with one of the most important models in economics, that of supply and demand. Models are extremely useful because they allow us to abstract from the nearly infinite number of forces at play in the real world in order to focus on those that are most relevant. For example, in studying the effect of a minimum wage law, economists will use a supply-and-demand model of the labor market. We act as if there is a single labor market that pays a single wage in a world with no schooling decisions, on-the-job training, or geography. This abstract model is an unrealistic picture of the real world, but it nevertheless allows us to learn important lessons about the effect of introducing minimum wage legislation.

All models in economics share an important general structure, shown in Figure 1.6. Each takes as inputs a set of parameters and exogenous variables: the features of the economy that the model builder gets to pick in advance, features that are outside the model, or given. **Parameter** refers to an input that is generally fixed over time, except when the model builder decides to experiment by changing it. In our labor market model, the level of the minimum wage would be an example of a parameter. **Exogenous variable** ("exo-" means "outside") refers to an input that is allowed to change over time, but in a way that is completely determined ahead of time by the model builder. For example, we might assume the population in the economy grows over time at a constant, exogenous rate, regardless of