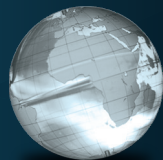


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Olivier Blanchard



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To Noelle



Flexible Organization

Macroeconomics, eighth edition is organized around two central parts: A core and a set of two major extensions. The text's **flexible organization** emphasizes an integrated view of macroeconomics, while enabling professors to focus on the theories, models, and applications that they deem central to their particular course.

The flowchart below quickly illustrates how the chapters are organized and fit within the book's overall structure. For a more detailed explanation of the **Flexible Organization**, and for an extensive list of **Alternative Course Outlines**, see pages 13–14 in the preface.



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Preface

I had two main goals in writing this book:

- To make close contact with current macroeconomic events. What makes macroeconomics exciting is the light it sheds on what is happening around the world, from the major economic crisis which engulfed the world in the late 2000s, to monetary policy in the United States, to the problems of the Euro area, to growth in China. These events—and many more—are described in the book, not in footnotes, but in the text or in detailed boxes. Each box shows how you can use what you have learned to get an understanding of these events. My belief is that these boxes not only convey the life of macroeconomics, but also reinforce the lessons from the models, making them more concrete and easier to grasp.
- To provide an integrated view of macroeconomics. The book is built on one underlying model, a model that draws the implications of equilibrium conditions in three sets of markets: the goods market, the financial markets, and the labor market. Depending on the issue at hand, the parts of the model relevant to the issue are developed in more detail while the other parts are simplified or lurk in the background. But the underlying model is always the same. This way, you will see macroeconomics as a coherent whole, not a collection of models. And you will be able to make sense not only of past macroeconomic events but also of those that unfold in the future.

Solving Learning and Teaching Challenges

Flexible Organization

The book is organized around two central parts: a core, and a set of two major extensions. An introduction precedes the core. The two extensions are followed by a review of the role of policy. The book ends with an epilogue. The flowchart at the beginning of this book makes it easy to see how the chapters are organized and fit within the book's overall structure.

- Chapters 1 and 2 introduce the **basic facts and issues of macroeconomics**. Chapter 1 takes you on an economic

tour of the world, from the Euro area, to the United States, and to China. Some instructors will prefer to cover Chapter 1 later, perhaps after Chapter 2, which introduces basic concepts, articulates the notions of short run, medium run, and long run, and gives the reader a quick tour of the book.

While Chapter 2 gives the basics of national income accounting, I have put a detailed treatment of national income accounts in Appendix 1 at the end of the book. This decreases the burden on the beginning reader and allows for a more thorough treatment in the appendix.

- Chapters 3 through 13 constitute the **core**.

Chapters 3 through 6 focus on the **short run**. Chapters 3 to 5 characterize equilibrium in the goods market and in the financial markets, and derive the basic model used to study short-run movements in output, the IS-LM model. Chapter 6 extends the basic IS-LM model to reflect the role of the financial system. It then uses it to describe what happened during the initial phase of the financial crisis.

Chapters 7 through 9 focus on the **medium run**. Chapter 7 focuses on equilibrium in the labor market and introduces the notion of the natural rate of unemployment. Chapter 8 derives and discusses the relation between unemployment and inflation, known as the Phillips curve. Chapter 9 develops the IS-LM-PC (PC for Phillips curve) model which takes into account equilibrium in the goods market, in the financial markets, and in the labor market. It shows how this model can be used to understand movements in activity and movements in inflation, both in the short and in the medium run.

Chapters 10 through 13 focus on the **long run**. Chapter 10 describes the facts, showing the evolution of output across countries and over long periods of time. Chapters 11 and 12 develop a model of growth and describe how capital accumulation and technological progress determine growth. Chapter 13, which is new, focuses on the challenges to growth, from inequality to climate change.

- Chapters 14 through 20 cover the two major **extensions**.

Chapters 14 through 16 focus on the role of expectations in the short run and in the medium run. Expectations play

a major role in most economic decisions and, by implication, play a major role in the determination of output.

Chapters 17 through 20 examine the implications of openness of modern economies. Chapter 20 looks at the implications of different exchange rate regimes, from flexible exchange rates, to fixed exchange rates, currency boards, and dollarization.

- Chapters 21 through 23 return to **macroeconomic policy**. Although most of the first 20 chapters constantly discuss macroeconomic policy in one form or another, the purpose of Chapters 21 through 23 is to tie the threads together. Chapter 21 looks at the role and the limits of macroeconomic policy in general. Chapters 22 and 23 review fiscal and monetary policy. Some instructors may want to use parts of these chapters earlier. For example, it is easy to move forward the discussion of the government budget constraint in Chapter 22 or the discussion of inflation targeting in Chapter 23.
- Chapter 24 serves as an **epilogue**; it puts macroeconomics in historical perspective by showing the evolution of macroeconomics over the last 80 years, discussing current directions of research, and the lessons of the crisis for macroeconomics.

Alternative Course Outlines

Within the book's broad organization, there is plenty of opportunity for alternative course organizations. I have made the chapters shorter than is standard in textbooks, and, in my experience, most chapters can be covered in an hour and a half. A few (Chapters 5 and 9 for example) might require two lectures to sink in.

- Short courses (15 lectures or less)

A short course can be organized around the two introductory chapters and the core (Chapter 13 can be excluded at no cost in continuity). Informal presentations of one or two of the extensions, based, for example, on Chapter 16 for expectations (which can be taught as a standalone) and on Chapter 17 for the open economy, can then follow, for a total of 14 lectures.

A short course might leave out the study of growth (the long run). In this case, the course can be organized around the introductory chapters and Chapters 3 through 9 in the core; this gives a total of 9 lectures, leaving enough time to cover, for example, Chapter 16 on expectations and Chapters 17 through 19 on the open economy, for a total of 13 lectures.

- Longer courses (20 to 25 lectures)

A full semester course gives more than enough time to cover the core, plus one or both of the two extensions, and the review of policy. The extensions assume knowledge of the core, but are otherwise mostly self-contained. Given the choice, the order in which they are best taught is probably the order in which they are presented in the book. Having studied the role of expectations first helps students to understand the interest parity condition and the nature of exchange rate crises.

Innovative Features

I have made sure never to present a theoretical result without relating it to the real world. In addition to discussions of facts in the text itself, I have written many Focus boxes, which discuss particular macroeconomic events or facts from around the world. Many of those are new to this edition.

I have tried to re-create some of the student–teacher interactions that take place in the classroom by the use of margin notes, which run parallel to the text. The margin notes create a dialogue with the reader and, in so doing, smooth the more difficult passages and give a deeper understanding of the concepts and the results derived along the way.

For students who want to explore macroeconomics further, I have introduced the following two features:

- Short appendixes to some chapters, which expand on points made within the chapter.
- A 'Further Readings' section at the end of most chapters, indicating where to find more information, including key Internet addresses.

Each chapter starts with a one- or two-sentence summary at the end of the introduction, and ends with three ways of making sure that the material in the chapter has been digested:

- A summary of the chapter's main points.
- A list of key terms.
- A series of end-of-chapter exercises. "Quick Check" exercises are easy. "Dig Deeper" exercises are a bit harder, and "Explore Further" activities typically require either access to the Internet or use of a spreadsheet program.
- A list of symbols at the end of the book makes it easy to recall the meaning of the symbols used in the text.

What's New in This Edition

A new Chapter 13 on the challenges to growth. Topics include whether the introduction of robots will lead to mass unemployment, the relation between growth and inequality, and the challenges of climate change.

A revised Chapter 8 on the Phillips curve, reflecting a major change in the US economy. The Phillips curve is now a relation between inflation and unemployment rather than between the change in inflation and unemployment.

A revised Chapter 9 showing how the changes in the Phillips curve relation have led to changes in monetary policy.

A new appendix in Chapter 1, 'What Do Macroeconomists Do?', which will give you a sense of what careers you may pursue if you were to specialize in macroeconomics.

Updated Focus Boxes include:

- NEW! Will Bitcoins Replace Dollars? (Chapter 4)
- From Henry Ford to Jeff Bezos (Chapter 7)
- NEW! Growth and Changes in Standards of Living in Southeast Asia (Chapter 10)
- NEW! Nudging US Households to Save More (Chapter 11)
- What Lies Behind Chinese Growth? (Chapter 12)
- Uncertainty and Fluctuations (Chapter 16)
- NEW! China and the Mundell-Fleming Trilemma (Chapter 19)

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Olivier Blanchard
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A citizen of France, **Olivier Blanchard** has spent most of his professional life in Cambridge, U.S.A. After obtaining his Ph.D. in economics at the Massachusetts Institute of Technology in 1977, he taught at Harvard University, returning to MIT in 1982. He was chair of the economics department from 1998 to 2003. In 2008, he took a leave of absence to be the Economic Counsellor and Director of the Research Department of the International Monetary Fund. Since October 2015, he has been the Fred Bergsten Senior Fellow at the Peterson Institute for International Economics, in Washington. He also remains Robert M. Solow Professor of Economics emeritus at MIT.

He has worked on a wide set of macroeconomic issues, from the role of monetary policy, to the nature of speculative bubbles, to the nature of the labor market and the determinants of unemployment, to transition in former communist countries, and to forces behind the recent global crisis. In the process, he has worked with numerous countries and international organizations. He is the author of many books and articles, including a graduate level textbook with Stanley Fischer.

He is a past editor of the *Quarterly Journal of Economics*, of the *NBER Macroeconomics Annual*, and founding editor of the *AEJ Macroeconomics*. He is a fellow and past council member of the Econometric Society, a past president of the American Economic Association, and a member of the American Academy of Sciences.

Introduction

The first two chapters of this book introduce you to the issues and the approach of macroeconomics.

Chapter 1

Chapter 1 takes you on a macroeconomic tour of the world. It starts with a look at the economic crisis that has shaped the world economy since the late 2000s. The tour then stops at each of the world's major economic powers: the euro area, the United States, and China.

Chapter 2

Chapter 2 takes you on a tour of the book. It defines the three central variables of macroeconomics: output, unemployment, and inflation. It then introduces the three time periods around which the book is organized: the short run, the medium run, and the long run.

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A Tour of the World

1

What is macroeconomics? The best way to answer is not to give you a formal definition, but rather to take you on an economic tour of the world, to describe both the main economic evolutions and the issues that keep macroeconomists and macroeconomic policymakers awake at night.

At the time of this writing (the start of 2019), policymakers are sleeping better than they did a decade ago. In 2008, the world economy entered a major macroeconomic crisis, the deepest since the Great Depression. World output growth, which typically runs at 4% to 5% a year, was negative in 2009. Since then, growth has turned positive, and the world economy has largely recovered. But the crisis, now known as the **Great Financial Crisis**, has left several scars, and some worries remain.

My goal in this chapter is to give you a sense of these events and of some of the macroeconomic issues confronting different countries today. I shall start with an overview of the crisis, and then focus on the three main economic powers of the world: the euro area, the United States, and China.

Section 1-1 looks at the crisis.

Section 1-2 looks at the euro area.

Section 1-3 looks at the United States.

Section 1-4 looks at China.

Section 1-5 concludes and looks ahead.

Read this chapter as you would read an article in a newspaper. Do not worry about the exact meaning of the words or about understanding the arguments in detail: The words will be defined, and the arguments will be developed in later chapters. Think of this chapter as background, intended to introduce you to the issues of macroeconomics. If you enjoy reading this chapter, you will probably enjoy reading this book. Indeed, once you have read it, come back to this chapter; see where you stand on the issues, and judge how much progress you have made in your study of macroeconomics.

◀ If you do not, please accept my apologies...

If you remember one basic message from this chapter, it should be: Economies, like people, get sick—high unemployment, recessions, financial crises, low growth. Macroeconomics is about why it happens, and what can be done about it. ▶▶▶

1-1 THE CRISIS

Figure 1-1 shows output growth rates for the world economy, for advanced economies, and for emerging and developing economies, separately, since 2000. As you can see, from 2000 to 2007 the world economy had a sustained expansion. Annual average world output growth was 4.5%, with advanced economies (the group of 30 or so richest countries in the world) growing at 2.7% per year, and emerging and developing economies growing at an even faster 6.6% per year.

In 2007, however, signs that the expansion might be coming to an end started to appear. US housing prices, which had doubled since 2000, started declining. Economists started to worry. Optimists believed that, although lower housing prices might lead to lower housing construction and to lower spending by consumers, the Federal Reserve Bank (the US central bank, called the Fed for short) could lower interest rates to stimulate demand and avoid a recession. Pessimists believed that the decrease in interest rates might not be enough to sustain demand and that the United States might go through a short recession.

Even the pessimists turned out not to be pessimistic enough. As housing prices continued to decline, it became clear that the problems were deeper. Many of the mortgages that had been sold during the previous expansion were of poor quality. Many of the borrowers had taken too large a loan and were increasingly unable to make the monthly payments. And, with declining housing prices, the value of their mortgage often exceeded the price of the house, giving them an incentive to default. This was not the worst of it: The banks that had issued the mortgages had often bundled and packaged them together into new securities and then sold these securities to other banks and investors. These securities had then often been repackaged into yet new securities, and so on. The result is that many banks, instead of holding the mortgages themselves, held these securities, which were so complex that their value was nearly impossible to assess.

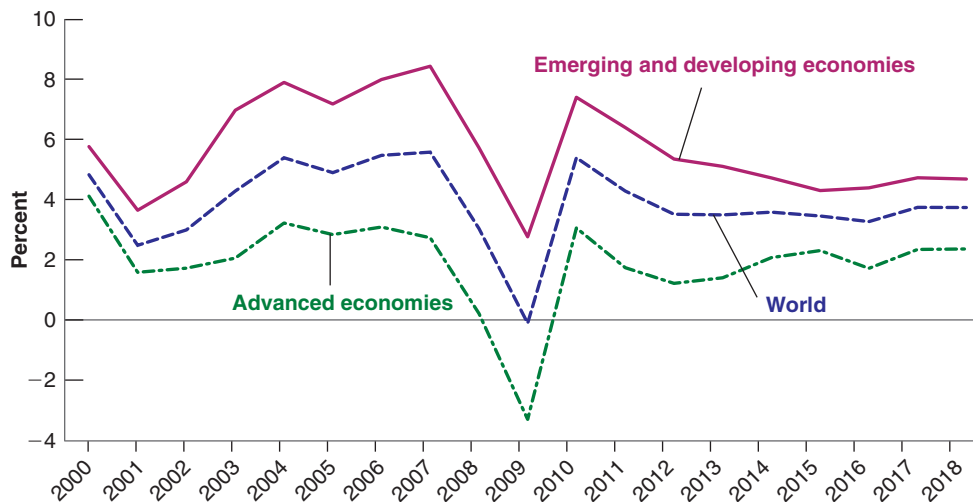
This complexity and opaqueness turned a housing price decline into a major financial crisis, a development that few economists had anticipated. Not knowing the quality of the assets that other banks had on their balance sheets, banks became reluctant to lend to each other for fear that the bank to which they lent might not be able to repay. Unable to borrow, and with assets of uncertain value, many banks found themselves in trouble. On September 15, 2008, a major bank, Lehman Brothers, went bankrupt.

“Banks” here actually means “banks and other financial institutions.” But this is too long to write and I do not want to go into these complications in Chapter 1. ▶

Figure 1-1

Output Growth Rates for the World Economy, for Advanced Economies, and for Emerging and Developing Economies, 2000–2018

Source: IMF, World Economic Outlook Database, July 2018. NGDP_RPCH.A.



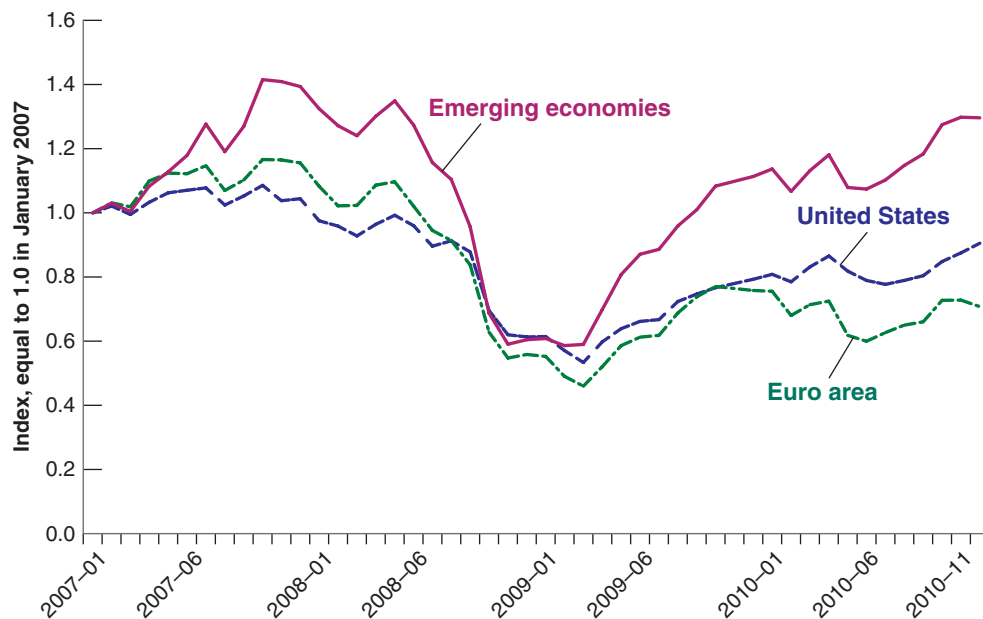


Figure 1-2

Stock Prices in the United States, the Euro Area, and Emerging Economies, 2007–2010

Source: Haver Analytics
USA (S111ACD), Eurogroup (S023ACD), all emerging markets (S200ACD), all monthly averages.

The effects were dramatic. Because the links between Lehman and other banks were so opaque, many other banks appeared at risk of going bankrupt as well. For a few weeks, it looked as if the whole financial system might collapse.

This financial crisis quickly turned into a major economic crisis. Stock prices collapsed. Figure 1-2 plots stock price indexes for the United States, the euro area, and emerging economies from the beginning of 2007 to the end of 2010. The indexes are set equal to 1 in January 2007. Note that, by the end of 2008, stock prices had lost half or more of their value from their previous peak. Note also that, even though the crisis originated in the United States, European and emerging market stock prices decreased by as much as their US counterparts; I shall return to this later.

Hit by the decrease in housing prices and the collapse in stock prices, and worried that this might be the beginning of another Great Depression, people sharply cut their consumption. Worried about sales and uncertain about the future, firms sharply cut back their investment. With housing prices dropping and many vacant homes on the market, very few new homes were built. Despite strong actions by the Fed, which cut interest rates all the way down to zero, and by the US government, which cut taxes and increased spending, demand decreased, and so did output. In the third quarter of 2008, US output growth turned negative and remained so in 2009.

One might have hoped that the crisis would remain largely contained in the United States. As Figures 1-1 and 1-2 both show, this was not the case. The US crisis quickly became a world crisis. Other countries were affected through two channels.

The first channel was trade. As US consumers and firms cut spending, part of the decrease fell on imports of foreign goods. Looking at it from the viewpoint of countries exporting to the United States, their exports went down, and so, in turn, did their output.

The second channel was finance. US banks, badly needing funds in the United States, repatriated funds from other countries, creating problems for banks in those countries as well. As those banks got in trouble, lending came to a halt, leading to a decrease in spending and in output. Also, in several European countries, governments had accumulated high levels of debt and were now running large deficits. Investors began to worry about whether debt could be repaid and asked for much higher interest rates. Confronted

◀ I started my job as chief economist of the International Monetary Fund two weeks before the Lehman bankruptcy. I faced a steep learning curve.

with those high interest rates, governments drastically reduced their deficits, through a combination of lower spending and higher taxes. This led in turn to a further decrease in demand and in output. In Europe, the decline in output was so bad that this aspect of the crisis acquired its own name, the *Euro Crisis*. In short, the US recession turned into a world recession. By 2009, average growth in advanced economies was -3.4% , by far the lowest annual growth rate since the Great Depression. Growth in emerging and developing economies remained positive but was 3.5 percentage points lower than the 2000–2007 average.

Thanks to strong monetary and fiscal policies and to the gradual repair of the financial system, economies turned around and started recovering. As you can see from Figure 1-1, growth in advanced countries turned positive in 2010 and has remained positive since. In some advanced countries, most notably the United States, unemployment is now very low. The euro area, however, is still struggling; growth is positive, but unemployment remains high. Growth in emerging and developing economies has also recovered, but, as you can see from Figure 1-1, it is lower than it was before the crisis.

Now that I have set the stage, let me take you on a tour of the three main economic powers in the world: the United States, the euro area, and China.

1-2 THE EURO AREA

Until a few years ago, the official name was the *European Community*, or EC. You may still encounter that name. EC now stands for *European Commission*, the executive arm of the European Union. ▶

The area also goes by the names of “Eurozone” or “Euroland.” The first sounds too technocratic, and the second reminds one of Disneyland. I shall avoid them. ▶

In 1957, six European countries decided to form a common European market—an economic zone where people, goods, and services could move freely. Over time, 22 more countries joined, bringing the total to 28. This group is now known as the **European Union (EU)** and its scope extends beyond just economic issues. In 2016, the United Kingdom held a referendum in which the government was given the mandate to exit the Union. At this juncture, the number of EU member countries have come down to 27. The United Kingdom withdrew from the EU on January 31, 2020.

In 1999, the EU decided to go a step further and started the process of replacing national currencies with one common currency, called the *euro*. Only 11 countries participated at the start; since then, 8 more have joined. Nineteen countries now belong to this **common currency area**, known as the **euro area**.

As you can see from the numbers in Figure 1-3, the euro area is a strong economic power. At the current exchange rate between the euro and the dollar, its output is equal to two-thirds of US output. (The EU as a whole has an output equal to 90% of that of the United States.)

Table 1-1 gives the numbers for output growth, the unemployment rate, and the inflation rate for 1990–2007, 2008–2009, 2010–2017, and 2018. Just as in the United States, the acute phase of the crisis, 2008–2009, was characterized by negative growth. Whereas the United States recovered, growth in the euro area remained anemic. Indeed, while this is not shown in the table, growth was negative in both 2012 and 2013. Growth has now increased, reaching 2% in 2018, but the unemployment rate remains high, at 8.3%. Inflation remains too low, below the 2% target of the European Central Bank (ECB).

The euro area faces two main issues today. The first is how to reduce unemployment. Second is whether and how it can function efficiently as a common currency area. Let’s look at the two issues in turn.

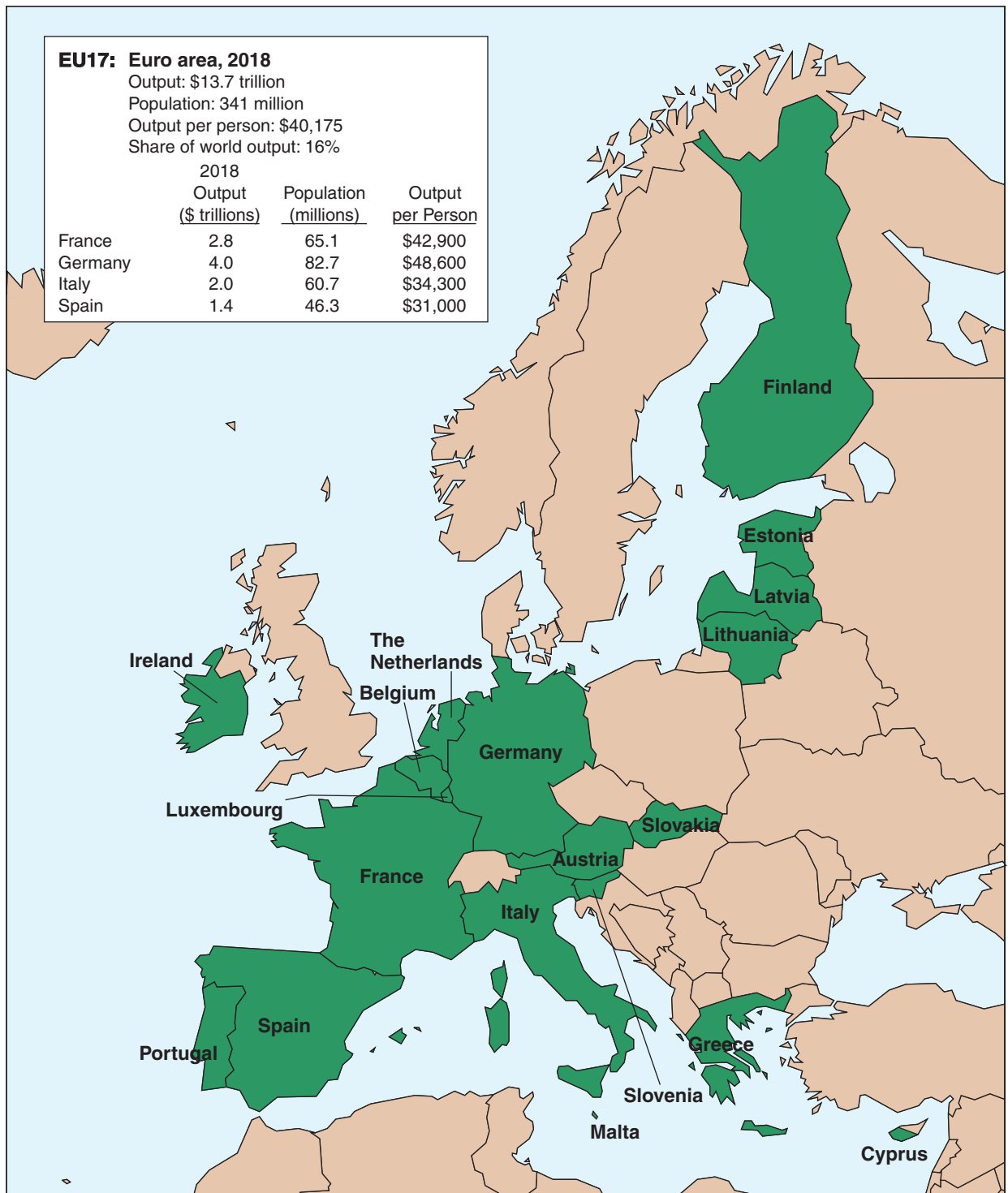


Figure 1-3

The Euro Area, 2018

Table 1-1 Growth, Unemployment, and Inflation in the Euro Area, 1990–2018

Percent	1990–2007 (average)	2008–2009 (average)	2010–2017 (average)	2018
Output growth rate	2.1	–2.0	1.3	2.0
Unemployment rate	9.4	8.6	10.6	8.3
Inflation rate	2.1	1.5	1.0	1.5
Output growth rate: annual rate of growth of output (GDP). Unemployment rate: average over the year. Inflation rate: annual rate of change of the price level (GDP deflator).				
Source: IMF, World Economic Outlook, October 2018.				

Can European Unemployment Be Reduced?

The high average unemployment rate for the euro area, 8.3% in 2018, hides large variations across the euro countries. At one end, Greece and Spain have unemployment rates of 20% and 15%, respectively. At the other, Germany's unemployment rate is close to 3%. In the middle are countries like France and Italy, with unemployment rates of 9% and 11%, respectively. Thus, how to reduce unemployment must be tailored to the specifics of each country.

To show the complexity of the issues, it is useful to look at a country with high unemployment, say Spain. Figure 1-4 shows the striking evolution of the Spanish unemployment rate since 1990. After a long boom starting in the mid-1990s, the unemployment rate decreased from a high of nearly 25% in 1994 to 8% by 2007. But, with the crisis, unemployment exploded again, exceeding 25% in 2013. It has declined since then, but still stands at 15%.

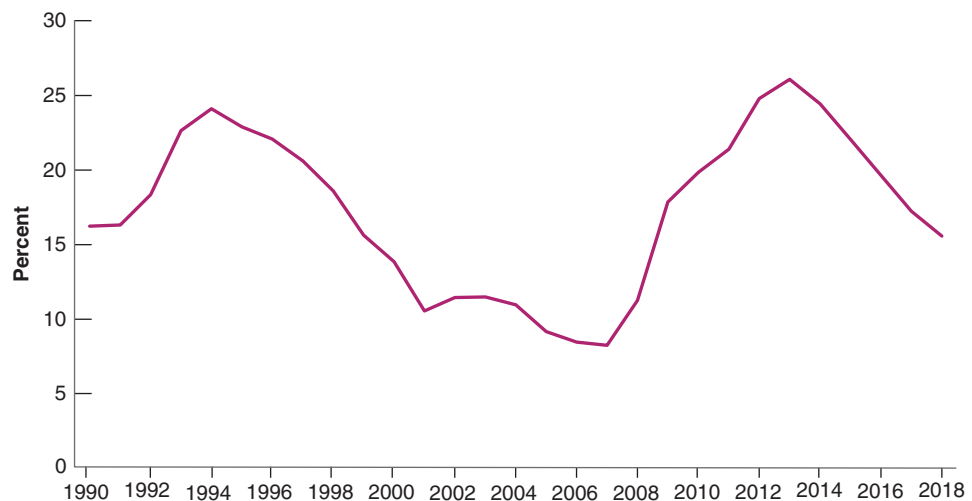
The figure suggests two conclusions:

- Part of the high unemployment rate today is probably still a result of the crisis and the sudden collapse in demand we discussed in the first section. A housing boom that turned into a housing bust, plus a sudden increase in interest rates, triggered the increase in unemployment from 2008 on. One can hope that, eventually, demand will continue to increase, and unemployment will decrease further.

Figure 1-4

Unemployment in Spain since 1990

(Source: International Monetary Fund, World Economic Outlook, October 2018).



- Even at the peak of the boom, the unemployment rate in Spain never went below 8%, nearly three times the unemployment rate in Germany today. This suggests that more is at work than the crisis and the fall in demand. The fact that, for most of the last 20 years, unemployment has exceeded 10%, points to problems in the labor market. The challenge is then to identify exactly what these problems are.

Some economists believe the main problem is that European states protect workers too much. To prevent workers from losing their jobs, they make it expensive for firms to lay off workers. One of the unintended results of this policy is to deter firms from hiring workers in the first place, thus increasing unemployment. Also, to protect workers who become unemployed, European governments provide generous unemployment insurance. But, by doing so, they decrease the incentives for the unemployed to take jobs rapidly; this also may increase unemployment. The solution, these economists argue, is to be less protective, to eliminate these *labor market rigidities*, and to adopt US-style labor market institutions. This is what the United Kingdom has largely done, and its unemployment rate is low.

Others, and this includes me, are more skeptical. They point to the fact that unemployment is not high everywhere in Europe. Yet most European countries provide protection and generous social insurance to workers. This suggests that the problem may lie not so much with the degree of protection but with the way it is implemented. The challenge, these economists argue, is to understand what the low-unemployment European countries are doing right, and whether what they do right can be exported to the other European countries.

Resolving these questions is one of the major tasks facing European macroeconomists and policymakers.

What Has the Euro Done for Its Members?

When the process of conversion from national currencies to the euro ended in early 2002, the euro became the common currency for 11 European countries. (See the Focus Box “The Euro: A Short History.”)

Supporters of the euro point to its enormous symbolic importance. In light of the many past wars among European countries, what better proof of the permanent end to conflict than the adoption of a common currency? They also point to the economic advantages of having a common currency: no more changes in exchange rates for European firms to worry about; no more need to change currencies when crossing borders. Together with the removal of other obstacles to trade among European countries, the euro contributes, they argue, to the creation of a large economic power in the world. There is little question that the move to the euro was indeed one of the main economic events of the start of the 21st century.

Others worry, however, that the symbolism of the euro has come with substantial economic costs. Even before the crisis, they pointed out that a common currency means a common monetary policy, which means the same interest rate across the euro countries. What if, they argue, one country plunges into recession while another is in the middle of an economic boom? The first country needs lower interest rates to increase spending and output; the second country needs higher interest rates to slow down its economy. If interest rates must be the same in both countries, what will happen? Isn't there the risk that one country will remain in recession for a long time or that the other will not be able to slow down its booming economy? A common currency also means the loss of the exchange rate as an instrument of adjustment within the euro area. What if, they argue, a country has a large trade deficit and needs to become more competitive? If it cannot adjust its exchange rate, it must adjust by decreasing prices relative to its competitors. This is likely to be a painful and long process.

Until the euro crisis, the debate had remained somewhat abstract. It no longer is. As a result of the crisis, several euro members, from Ireland and Portugal to Greece, have gone

The Euro: A Short History

- As the European Union (EU) celebrated its 30th anniversary in 1988, a number of governments decided the time had come to plan a move to a common currency. They asked Jacques Delors, president of the EU, to prepare a report, which he presented in June 1989. The Delors report suggested moving to a European Monetary Union (EMU) in three stages: Stage I was the abolition of capital controls. Stage II was the choice of fixed parities, to be maintained except for “exceptional circumstances.” Stage III was the adoption of a single currency.
- Stage I was implemented in July 1990.
- Stage II began in 1994, after the exchange rate crises of 1992–1993 had subsided (see the Focus Box “The 1992 EMS Crisis”). A minor but symbolic decision involved choosing the name of the new common currency. The French liked ECU (European currency unit), which is also the name of an old French currency. But its partners preferred euro, and the name was adopted in 1995.
- In parallel, EU countries held referendums on whether they should adopt the Maastricht treaty. The treaty, negotiated in 1991, set three main conditions for joining the EMU: low inflation, a budget deficit below 3%, and a public debt below 60%. The Maastricht treaty was not popular, and in many countries the outcome of the popular vote was close. In France, the treaty passed with only 51% of the votes. In Denmark, the treaty was rejected. The United Kingdom negotiated an “opt-out” clause that allowed Britain not to join the new currency union.
- In the mid-1990s, it looked as if few European countries would satisfy the Maastricht conditions. But

several countries took drastic measures to reduce their budget deficit. When the time came to decide, in May 1998, which countries would be members of the euro area, 11 countries made the cut: Austria, Belgium, Finland, France, Germany, Italy, Ireland, Luxembourg, the Netherlands, Portugal, and Spain. The United Kingdom, Denmark, and Sweden decided to stay out. Greece did not qualify initially and didn’t join until 2001. (After it joined, it was revealed that it had “cooked the books” and understated the size of its budget deficit in order to qualify.) Since then, Cyprus, Estonia, Malta, Slovakia, and Slovenia have joined.

- Stage III began in January 1999. Parities between the 11 currencies and the euro were “irrevocably” fixed. The new European Central Bank (ECB) based in Frankfurt became responsible for monetary policy for the euro area.

From 1999 to 2002, the euro existed as a unit of account, but euro coins and bank notes did not exist. In effect, the euro area was still functioning as an area with fixed exchange rates. The next and final step was the introduction of euro coins and bank notes in January 2002. For the first few months of 2002, national currencies and the euro circulated side by side. Later in the year, national currencies were taken out of circulation. Today, the euro is the only currency used in the euro area. The numbers of countries adopting the euro reached 19 when Latvia and Lithuania joined.

For more on the euro, go to www.euro.ecb.int/. The Wikipedia page on the euro is also very good.

At the time of this writing, some Italian politicians argue that Italy, which suffers from low growth, would be better off outside the euro and advocate euro exit. ►

through deep recessions. If they had their own currency, they could have depreciated their currency vis-à-vis other euro members to increase the demand for their exports. Because they shared a currency with their neighbors, this was not possible. Thus, some economists conclude, some countries should drop out of the euro and recover control of their monetary policy and their exchange rate. Others argue that such an exit would be both unwise because it would give up the other advantages of being in the euro and extremely disruptive, leading to even deeper problems for the country that exited. This issue is likely to remain a hot one for some time to come.

1-3 THE UNITED STATES

Can you guess some of the countries with a higher standard of living than the United States? *Hint:* Think of oil producers and financial centers. For answers, look for “Gross Domestic Product per capita, in current prices” in the WEO database (see the chapter appendix for the web address). ►

When economists look at a country, the first two questions they ask are: How big is the country from an economic point of view? And what is its standard of living? To answer the first, they look at output—the level of production of the country as a whole. To answer the second, they look at output per person. The answers, for the United States, are given in Figure 1-5: The United States is big, with an output of \$20.5 trillion in 2018, accounting for 24% of world output. And the standard of living in the United States is high: Output per person is \$62,500. It is not the country with the highest output per person in the world, but it is close to the top.

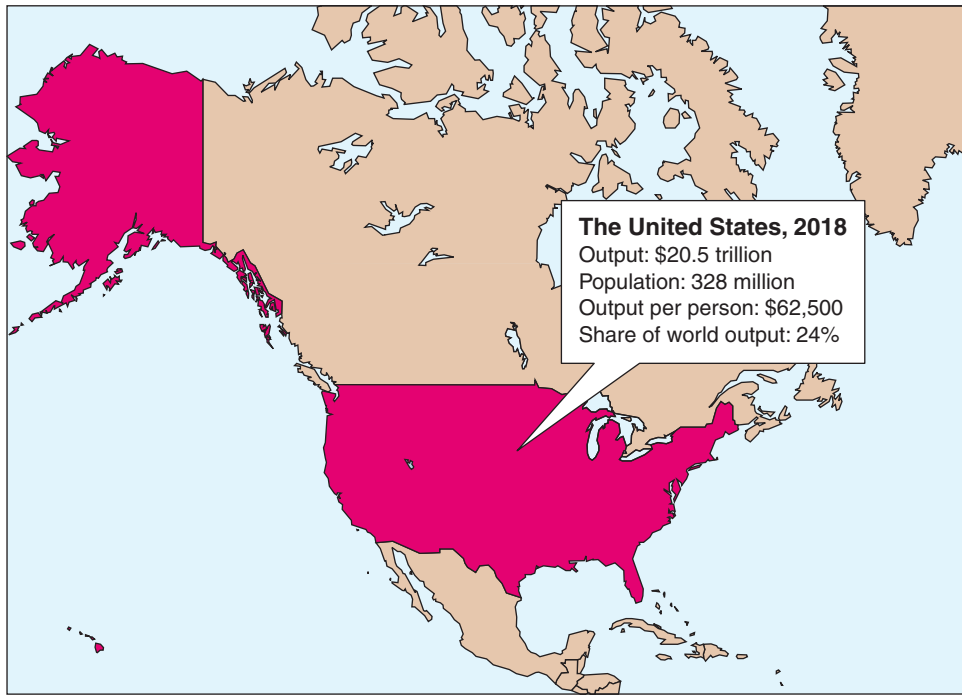


Figure 1-5

The United States, 2018

When economists want to dig deeper and look at the health of the country, they look at three basic variables:

- *Output growth*—the rate of change of output
- The *unemployment rate*—the proportion of workers in the economy who are not employed and are looking for a job
- The *inflation rate*—the rate at which the average price of goods in the economy is increasing over time

Numbers for these three variables for the US economy are given in Table 1-2. To put current numbers in historical perspective, the first column gives the average value of each of the three variables for the period 1990 up to 2007, the year before the crisis. The second column shows numbers for the acute part of the crisis, the years 2008 and 2009. The third column shows the numbers from 2010 to 2017, and the last column gives the numbers for 2018.

By looking at the numbers for 2018, you can see why economists are upbeat about the US economy at this point. Growth in 2018 is 2.9%, close to the 1990–2007 average. The unemployment rate, which increased during the crisis and its aftermath (it reached

Table 1-2 Growth, Unemployment, and Inflation in the United States, 1990–2018

Percent	1990–2007 (average)	2008–2009 (average)	2010–2017 (average)	2018
Output growth rate	3.0	–1.3	2.2	2.9
Unemployment rate	5.4	7.5	6.8	3.7
Inflation rate	2.3	1.3	1.6	2.3
Output growth rate: annual rate of growth of output (GDP). Unemployment rate: average over the year. Inflation rate: annual rate of change of the price level (GDP deflator).				
Source: IMF, World Economic Outlook, October 2018.				

10% during 2010), has steadily decreased and is now 3.7%, substantially lower than the 1990–2007 average. Inflation is also low, equal to its 1990–2007 average. In short, the US economy seems to be in good shape, having largely left the effects of the crisis behind.

So what are the main macroeconomic problems facing US policymakers? I shall pick two. The first concerns the short run, namely whether policymakers have the necessary tools to handle a recession. The second is how to increase productivity growth in the long run. Let's look at both issues in turn.

Do Policymakers Have the Tools to Handle the Next Recession?

The recovery from the financial crisis started in the United States in June 2009. Since then, output growth has been positive, and at the time of writing, the expansion has gone on for 115 months. If it goes on until July 2019, it will be the longest expansion on record since 1945.

If history is any guide, however, the sad reality is that expansions do not go on forever, and the United States will, sooner or later, go through another recession. It may come from several places. It may be triggered by a trade war, leading, for example, to a sharp decrease in exports. It may come from increased uncertainty, leading people to consume less and firms to invest less. It may come from another financial crisis, despite the measures that have been taken since 2009 to decrease risk. Or it may come, as has happened many times in the past, from events we simply have not thought about.

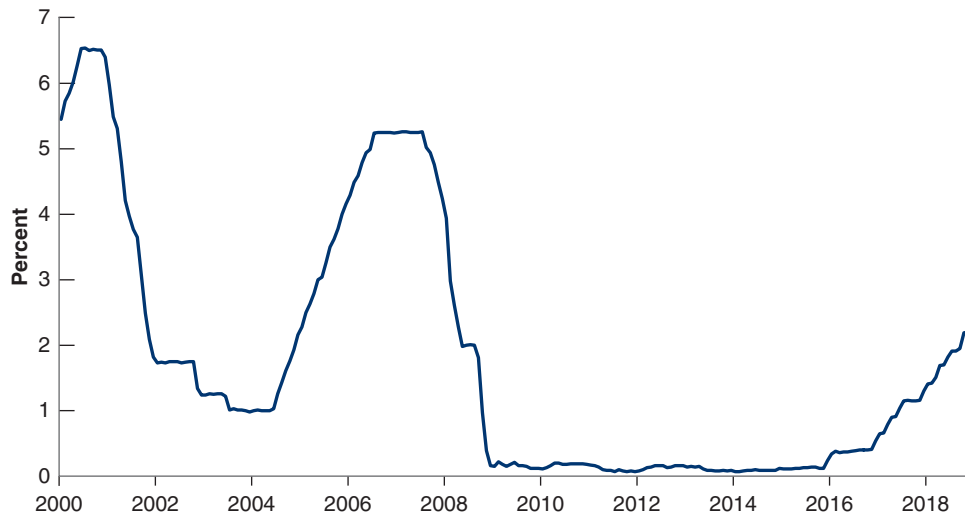
Donald Rumsfeld, a past secretary of defense, had a very insightful quote. "There are known unknowns. But there are also unknown unknowns. And it is the latter category that tend to be the difficult ones."

When the recession comes, the question will be what policymakers can do to limit the decline in output. The Fed will have to play a central role. This is for two reasons. First, because part of the mandate of the Fed is indeed to fight recessions. Second, because it has the best policy instrument to do so, namely control of the interest rate. By decreasing the interest rate, the Federal Reserve can stimulate demand, increase output, and decrease unemployment. By increasing the interest rate, it can slow down demand and increase unemployment.

The problem that the Fed faces at this point, however, is shown in Figure 1-6, which shows the path of the policy interest rate (called the *Federal Funds Rate*) since 2000. Note how much the Fed decreased the interest rate when the crisis hit, from 5.3% in July 2008 to close to 0% in December 2008. Note then that the rate remained close to 0% until the end of 2015, and how it has increased a little since then and now stands at 2.4%.

Figure 1-6

The US Federal Funds Rate, since 2000



Why did the Fed stop at zero? It would have liked to decrease the interest rate further, but it could not because the interest rate cannot be negative. If it were, then nobody would hold bonds; everybody would want to hold cash instead—because cash pays a zero interest rate. This constraint is known as the *zero lower bound*, and this is the bound the Fed ran into in December 2008.

Now that the interest rate has increased, why is the zero lower bound still an issue? Because the interest rate remains very low by historical standards. And this implies that there is little room for the Fed to decrease it. If another recession were to happen, the Fed could decrease the policy rate by only about 2%, not enough to have a large effect on demand.

Are there other tools that the Fed could use? Can fiscal policy help? The answer to both questions, as we shall see later in the book, is yes. But whether these other tools will be enough is far from certain. This is why many economists are worried that it might be difficult to limit the depth of the next recession.

Because keeping cash in large sums is inconvenient and dangerous, people might be willing to hold some bonds even if those pay a small negative interest rate. But there is a clear limit to how negative the interest rate can go before people switch to cash.

By the time you read this book, a recession may have started. If so, you will know what the correct answer was.

How Worrisome Is Low Productivity Growth?

In the short run, what happens to the economy depends, as we just discussed, on movements in demand and the decisions of the central bank. In the longer run, however, growth is determined by other factors, the main one being productivity growth: Without productivity growth, there just cannot be a sustained increase in income per person. And, here, the news is worrisome. Table 1-3 shows average US productivity growth by decade since 1990 for the private nonfarm business sector and for the manufacturing sector. As you can see, productivity growth in the 2010s has been, so far, much lower than it was in the previous two decades.

How worrisome is this? Productivity growth varies a lot from year to year, and some economists believe that it may just be a few bad years and not much to worry about. Others believe that measurement issues make it difficult to measure output and that productivity growth may be underestimated. For example, how do you measure the productivity of a new smartphone relative to an older model? For the same price as an older model, it does many things that the older model could not do. Put another way, it is much more productive, and we may not be very good at measuring the improvement in productivity. Yet others believe that the United States has truly entered a period of lower productivity growth, that the major gains from the current innovations in information technology (IT) may already have been obtained, and that progress is likely to be less rapid, at least for some time.

One particular reason to worry is that this slowdown in productivity growth is happening in the context of growing inequality. When productivity growth is high, most are likely to benefit, even if inequality increases. The poor may benefit less than the rich, but they still see their standard of living increase. This is not the case today in the United States. Since 2000, the real earnings of workers with a high school education or less have actually decreased. If policymakers want to invert this trend, they need to either raise productivity growth or limit the rise of inequality, or both. These are two major challenges facing US policymakers today.

Increasing inequality is a problem affecting not just the United States but many advanced economies. It has serious political implications.

Table 1-3 Labor Productivity Growth, by Decade, 1990–2018

Percent change; year on year (average)	1990s	2000s	2010–2018
Private nonfarm business sector	2.2	2.8	0.9
Manufacturing	4.1	3.6	0.4

Source: FRED database. PRS85006092, MPU490063

1-4 CHINA

China is in the news every day. It is perceived as one of the major economic powers in the world. Is the attention justified? A first look at the numbers in Figure 1-7 suggests it may not. True, the population of China is enormous, together with India it accounts for 37% of the world's population. But its output, expressed in dollars by multiplying the number in yuan (the Chinese currency) by the dollar–yuan exchange rate, is still only \$13.5 trillion, about 60% of that of the United States. Output per person is about \$9,700, only roughly 15% of output per person in the United States.

So why is so much attention paid to China? There are two main reasons:

To understand the first, we need to go back to the number for output per person. When comparing output per person in a rich country like the United States and a relatively poor country like China, one must be careful. The reason is that many goods are cheaper in poor countries. For example, the average price of a restaurant meal in New York City is about \$40; the average price of a restaurant meal in Beijing is about 50 yuan, or, at the current exchange rate, about \$7.50. Put another way, the same income (expressed in dollars) buys you much more in Beijing than in New York City. If we want to compare standards of living, we must correct for these differences; measures that do so are called PPP (for *purchasing power parity*) measures. Using such a measure, China's output is estimated to be \$25.3 trillion, thus higher than that of the United States. And output per person in China is estimated to be about \$18,100, a bit less than one-third of the output per person in the United States. This gives a more accurate picture of the standard of living in China. It is obviously still much lower than that of the United States or other rich countries. But it is higher than suggested by the numbers in Figure 1-7.

Second, and more importantly, China has been growing very rapidly for more than three decades. This is shown in Table 1-4, which, like the previous tables for the euro area and the United States, gives output growth, unemployment, and inflation for 1990–2007, 2008–2009, 2010–2017, and 2018.

The first line of the table tells the basic story. From 1990 (indeed, from 1980, if we were to extend the table back by another 10 years) to the late 2000s, China grew at close to 10% a year. This represents a doubling of output every 7 years. Compare this to the numbers

The issue is less important when comparing two rich countries. Thus, this was not a major issue when comparing standards of living in the United States and the euro area. ▶

Figure 1-7

China, 2018

Source: IMF, World Economic Outlook, October 2018.



for Europe and for the United States, and you understand why the weight of the emerging economies in the world economy, China being the main one, is increasing so rapidly.

There are two other interesting aspects to Table 1-4.

The first is how difficult it is to see the effects of the crisis in the data. Growth barely decreased during 2008 and 2009, and unemployment barely increased. The reason is not that China is closed to the rest of the world. Chinese exports slowed during the crisis. But the adverse effect on demand was nearly fully offset by a major fiscal expansion by the Chinese government, with, in particular, a major increase in public investment. The result was sustained growth of demand and, in turn, of output.

The second is the decline in growth rates from 10% before the crisis to less than 8% after the crisis, and to 6.6% for 2018. This raises questions both about how China maintained such a high growth rate for so long, and whether it is now entering a period of lower growth.

A preliminary question is whether the numbers are for real. Could it be that Chinese growth was and is still overstated? After all, China is still officially a communist country, and government officials may have incentives to overstate the economic performance of their sector or their province. Economists who have looked at this carefully conclude that this is probably not the case. The statistics are not as reliable as they are in richer countries, but there is no major bias. Output growth has indeed been very high in China. So where has growth come from? It has come from two sources: The first was high accumulation of capital. The investment rate (the ratio of investment to output) in China is 46%, a very high number. For comparison, the investment rate in the euro area is only 23.3%. More capital means higher productivity and higher output. The second is rapid technological progress. One of the strategies followed by the Chinese government has been to encourage foreign firms to relocate and produce in China. As foreign firms are typically much more productive than Chinese firms, this has increased productivity and output. Another aspect of the strategy has been to encourage joint ventures between foreign and Chinese firms. By making Chinese firms work with and learn from foreign firms, the productivity of the Chinese firms has increased dramatically.

When described in this way, achieving high productivity and high output growth appears easy and a recipe that every poor country could and should follow. In fact, things are less obvious. China is one of several countries that made the transition from central planning to a market economy. Most of the other countries, from those in Central Europe to Russia and the other former Soviet republics, experienced a large decrease in output at the time of transition. Most still have growth rates far below that of China. In many countries, widespread corruption and poor property rights make firms unwilling to invest. So why has China fared so much better? Some economists believe that this is the result of a slower transition: The first Chinese reforms took place in agriculture as early as 1980, and even today, many firms remain owned by the state. Others argue that the fact that the communist party has remained in control has actually helped the economic

A useful rule, called the rule of 70: The number of years it takes for a variable to double is equal to 70 divided by the growth rate of the variable.

This transfer of technology is the subject of strong criticism by the United States government, which argues that part of it has been done illegally, and is a source of trade tensions between the two countries.

Table 1-4 Growth, Unemployment, and Inflation in China, 1990–2018				
Percent	1990–2007 (average)	2008–2009 (average)	2010–2017 (average)	2018
Output growth rate	10.2	9.4	7.9	6.6
Unemployment rate	3.3	4.3	4.1	4.0
Inflation rate	5.9	3.7	2.9	2.2
Output growth rate: annual rate of growth of output (GDP). Unemployment rate: average over the year. Inflation rate: annual rate of change of the price level (GDP deflator).				
Source: IMF, World Economic Outlook, October 2018.				

Tight political control has allowed corruption to develop, and corruption can also threaten investment. China is now in the midst of a strong anti-corruption campaign.

transition; tight political control has allowed for better protection of property rights, at least for new firms, giving them incentives to invest. Getting the answers to these questions, and thus learning what other poor countries can take from the Chinese experience, can clearly make a huge difference, not only for China but for the rest of the world.

At the same time, the recent growth slowdown raises a new set of questions: Where does the slowdown come from? Should the Chinese government try to maintain high growth or accept the lower growth rate? Most economists and, indeed, the Chinese authorities themselves believe that lower growth is now desirable, that the Chinese people will be better served if the investment rate decreases, allowing more output to go to consumption. Achieving the transition from investment to consumption is the major challenge facing the Chinese authorities today.

1-5 LOOKING AHEAD

This concludes our whirlwind world tour. There are many other regions of the world and many other macroeconomic issues we could have looked at:

- India, another poor and large country, with a population of 1,330 million, which, like China, is now growing very fast and becoming a world economic power.
- Japan, whose growth performance for the 40 years following World War II was so impressive that it was referred to as an economic miracle, but has done very poorly in the last two decades. Since a stock market crash in the early 1990s, Japan has been in a prolonged slump, with average output growth only around 1% per year.
- Latin America, which went from high inflation to low inflation in the 1990s, and then sustained strong growth. Recently, however, its growth has slowed, as a result, in part, of a decline in the price of commodities.
- Central and Eastern Europe, which shifted from central planning to a market system in the early 1990s. In most countries, the shift was characterized by a sharp decline in output at the start of transition. Since then, however, most countries have achieved high growth rates, and are catching up with Western Europe.
- Sub-Saharan Africa, which has suffered decades of economic stagnation, but where, contrary to common perceptions, growth has been high since 2000, averaging 5% per year and reflecting growth in most of the countries of the continent.

There is a limit to how much you can absorb in this first chapter. Think about the issues to which you have been exposed:

- The big issues triggered by the crisis: What caused the crisis? Why was it transmitted from the United States to the rest of the world? In retrospect, what could and should have been done to prevent it? Were the monetary and fiscal responses appropriate? Why has the recovery been so slow in Europe? How was China able to maintain high growth during the crisis?
- How can monetary and fiscal policies be used to fight recessions? What are the pros and cons of joining a common currency area such as the euro area? What measures could be taken in Europe to reduce persistently high unemployment?
- Why do growth rates differ so much across countries, even over long periods of time? Can advanced economies achieve sustained growth without increasing inequality? Can poor countries emulate China and grow at the same rate? Should China slow down?

The purpose of this book is to give you a way of thinking about these questions. As we develop the tools you need, I shall show you how to use them by returning to these questions and showing you the answers that the tools suggest.

KEY TERMS

Great Financial Crisis, 21
European Union (EU), 24

euro area, 24
common currency area, 24

QUESTIONS AND PROBLEMS

QUICK CHECK

1. Using the information in this chapter and by referring to the IMF data mapper (<http://www.imf.org/external/datamapper/datasets/WEO/3>) or the World Bank database (<https://data.worldbank.org/>) for updated information, label each of the following statements true, false, or uncertain. Explain briefly.

- Output growth was negative in both advanced as well as emerging and developing countries in 2009.
- World output growth recovered to its pre-recession level after 2009.
- Stock prices around the world fell between 2007 and 2010 and then recovered to their pre-recession level.
- The rate of unemployment in the United Kingdom is much lower than in much of the rest of Europe.
- China's seemingly high growth rate is a myth; it is a product solely of misleading official statistics.
- The high rate of unemployment in Europe started when a group of major European countries adopted a common currency.
- The Central Banks lower interest rates when they want to avoid a recession and raise interest rates when they want to slow the rate of growth in an economy.
- Output per person is different in the Euro area, the United States, and China
- Interest rates in the United States were at or near zero from 2009 to 2015.

2. Macroeconomic policy in Europe

Beware of simplistic answers to complicated macroeconomic questions. Consider each of the following statements and comment on whether there is another side to the story.

- There is a simple solution to the problem of high European unemployment: Reduce labor market rigidities.
- What can be wrong about joining forces and adopting a common currency? Adoption of the euro is obviously good for Europe.

DIG DEEPER

3. Chinese economic growth is the outstanding feature of the world economic scene over the past two decades.

- In 2018, US output was \$20.5 trillion, and Chinese output in 2017 was \$13.5 trillion. Suppose that from 2017 the output of China grows at an annual rate of 7.9%, whereas the output of the United States grows from 2018 at an annual rate of 2.2%. These are the values in each country for the most recent periods in Tables 1-2 and 1-4, respectively. Using these assumptions and a spreadsheet, calculate and plot US and Chinese output from 2017 or 2018 over the next 100

years. How many years will it take for China to have a total level of output equal to that of the United States?

- When China catches up with the United States in total output, will residents of China have the same standard of living as US residents? Explain.
- Another term for *standard of living* is *output per person*. How has China raised its output per person in the last two decades? Are these methods applicable to the United States?
- Do you think China's experience in raising its standard of living (output per person) provides a model for developing countries to follow? Explain.

4. The rate of growth of output per person was identified as a major issue facing the United States as of the writing of this chapter. Go to the 2018 Economic Report of the President (www.whitehouse.gov/wp-content/uploads/2018/02/ERP_2018_Final-FINAL.pdf) and find a table titled "Productivity and Related Data" (Table B-16). It can be downloaded as an Excel file.

- Find the column with numbers that describe the level of output per hour worked of all persons in the nonfarm business sector. This value is presented as an index number equal to 100 in 2009. Calculate the percentage increase in output per hour worked from 2009 to 2010. What does that value mean?
- Now use the spreadsheet to calculate the average percent increase in output per hour worked for the decades 1970–1979, 1980–1989, 1990–1999, 2000–2009, and 2010–2017. How does productivity growth in the most recent decade compare to the other decades?
- If a more recent *Economic Report of the President* is available, update your estimate of the average growth rate of output per hour worked to include years past 2017. Is there any evidence of an increase in productivity growth?

EXPLORE FURTHER

5. US recessions

This section looks at US recessions over the past 60 years.

To work out this problem, first obtain quarterly data on US output growth for the period 1960 to the most recent data from www.bea.gov. Table 1.1.1 presents the percent change in real gross domestic product (GDP). The data can be downloaded to a spreadsheet. Plot the quarterly GDP growth rates from 1960:1 to the latest observations. Which, if any, quarters have negative growth? Using the definition of a recession as two or more consecutive quarters of negative growth, answer the following questions.

- How many recessions has the US economy undergone since 1960, quarter 2?
- How many quarters has each recession lasted?

- c. In terms of length and magnitude, which two recessions have been the most severe?

6. From Problem 5, write down the quarters in which the recessions started. Find the monthly series in the Federal Reserve Bank of St. Louis (FRED) database for the seasonally adjusted unemployment rate in the United States entitled **civilian unemployment rate**. Retrieve the monthly data series on the unemployment rate for the period 1969 to the end of the data. Make sure all data series are seasonally adjusted.

- a. Look at each recession since 1969. What was the unemployment rate in the first month of the first quarter of negative growth? What was the unemployment rate in the last month of the last quarter of negative growth? By how much did the unemployment rate change?
- b. Which recession had the largest increase in the rate of unemployment? Begin with the month before the quarter in which output first falls and measure to the highest level of the unemployment rate before the next recession.

7. European unemployment

The FRED database contains updates of the unemployment rate in Spain (Figure 1-6) as well as unemployment rates for the European Union as a whole and for individual countries for the seasonally adjusted unemployment rate. Retrieve the monthly data series for the unemployment rates below starting in the year 2000 to the latest data:

Harmonized Unemployment Rate: Total: All Persons for the European Union

Harmonized Unemployment Rate: Total: All Persons for Spain

Harmonized Unemployment Rate: Total: All Persons for the United Kingdom

- a. Is the most recent unemployment rate in the United Kingdom much lower than that in the European Union or in Spain?
- b. How does the change in Spanish unemployment from its peak near April 2013 compare to the change in the unemployment rate for the European Union as a whole from its peak in May 2013?

APPENDIX 1: Where to Find the Numbers

Suppose you want to find the numbers for inflation in Germany over the past five years. Fifty years ago, the answer would have been to learn German, find a library with German publications, find the page where inflation numbers were given, write them down, and plot them by hand on a clean sheet of paper. Today, improvements in the collection of data, the development of computers and electronic databases, and access to the internet make the task much easier. This appendix will help you find the numbers you are looking for, be it inflation in Malaysia last year, or consumption in the United States in 1959, or unemployment in Ireland in the 1980s.

To Find Data

Four good sources of free and easily downloadable data are:

- **FRED:** Federal Reserve Economic Database. A continuously updated database maintained by the Federal Reserve Bank of Saint Louis, giving many macroeconomic and financial data, mostly for the United States, but also for other countries. <https://fred.stlouisfed.org/>
- **WEO:** World Economic Outlook Database. A database maintained by the **International Monetary Fund (IMF)**, an international organization including most countries (at this point, 189) in the world. Updated twice a year, giving basic macroeconomic data for all member countries. The October 2018 data can be found at www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx
- **OECD.stat:** A database maintained by the **Organization for Economic Cooperation and Development (OECD)**, an international organization that includes most of the rich countries in the world. Together, these countries account for about 70% of the world's output. One strength of the OECD data is that, for many variables, the OECD tries to make the variables comparable across member countries (or tells you when they are not comparable). <https://stats.oecd.org/>
- **AMECO:** An *annual macroeconomic* database, maintained by the Commission of the European Union, that gives detailed macroeconomic data for all European Union members. http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

For (sometimes much) longer historical time series, the following are good sources:

- For the United States, *Historical Statistics of the United States, Colonial Times to 1970*, Parts 1 and 2, published by the US Department of Commerce, Bureau of the Census (www.census.gov/prod/www/statistical_abstract.html).
- For long-term historical statistics for several countries, Angus Maddison's *Monitoring the World Economy, 1820–1992*, Development Centre Studies, OECD, Paris, 1995. This study gives data going back to 1820 for 56 countries. Two even longer and broader sources are *The World Economy: A Millennial Perspective*, Development Studies, OECD, 2001, and *The World Economy: Historical Statistics*, Development Studies, OECD 2004, both also by Angus Maddison.

To Keep Current

By the time you read this chapter, many new events will have occurred. If you want to keep informed of current economic events, you will find the following three sources very useful:

- The WEO, which describes major economic events in the world and in specific member countries.
- The OECD Economic Outlook, published by the OECD twice a year, which describes major economic events in OECD countries. www.oecd.org/eco/outlook/economic-outlook/
- *The Economist*, published each week. *The Economist* is a highly informative, often opinionated magazine on economic and political events around the world. The last four pages give the most recent numbers on output, unemployment, inflation, exchange rates, interest rates, and stock prices for a large number of countries. Unfortunately, most of the articles and data are behind a paywall.

Key Terms

Organization for Economic Cooperation and Development (OECD), 37
International Monetary Fund (IMF), 37

APPENDIX 2: What Do Macroeconomists Do?

There might be many reasons why you are taking a course in macroeconomics. Some of you simply want to have a better understanding of what is happening around you. Some of you are taking the class to fulfill a major, get an undergraduate degree in economics, and go to the job market. Others need the course to get a more advanced degree, be it a master's or a doctorate in economics.

For those who want to specialize in macroeconomics, you may want to know what jobs you can expect to get, what you will be doing in those jobs, and how much you can expect to

earn. In short, with an undergraduate degree, you can expect to work in the private sector, be it in large firms or in financial institutions, helping them assess the economic situation. Jobs in central banks such as the Fed, or in international organizations such as the IMF or the World Bank, are likely to require you to have a PhD. Jobs in academia have a similar requirement. You can get much more information by going to the American Economic Association website page devoted to careers in economics. www.aeaweb.org/resources/students/careers

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A Tour of the Book

2

The words *output*, *unemployment*, and *inflation* appear daily in newspapers and on the evening news. So when I used these words in Chapter 1, you knew roughly what we were talking about. It is now time to define these words more precisely, and this is what I do in the first three sections of this chapter.

Section 2-1 looks at output.

Section 2-2 looks at the unemployment rate.

Section 2-3 looks at the inflation rate.

Section 2-4 introduces two important relations between these three variables: Okun's law and the Phillips curve.

Section 2-5 then introduces the three central concepts around which the book is organized:

- The *short run*: What happens to the economy from year to year
- The *medium run*: What happens to the economy over a decade or so
- The *long run*: What happens to the economy over a half century or longer

Building on these three concepts, Section 2-6 gives you a road map to the rest of the book.

If you remember one basic message from this chapter, it should be: The three central macroeconomic variables are output, unemployment, and inflation. ▶▶▶

2-1 AGGREGATE OUTPUT

Economists studying economic activity in the 19th century or even during the Great Depression had no measure of aggregate activity (*aggregate* is the word macroeconomists use for *total*) on which to rely. They had to put together bits and pieces of information, such as the shipments of iron ore, or sales at some department stores, to try to infer what was happening to the economy as a whole.

Two economists, Simon Kuznets, from Harvard University, and Richard Stone, from Cambridge University, received the Nobel Prize for their contributions to the development of the national income and product accounts—a gigantic intellectual and empirical achievement.

You may come across another term, **gross national product**, or **GNP**. There is a subtle difference between “domestic” and “national,” and thus between GDP and GNP. We examine the distinction in Chapter 18 and in Appendix 1 at the end of the book. For now, ignore it.

It was not until the end of World War II that **national income and product accounts** (or national income accounts, for short) were put together. Measures of aggregate output have been published on a regular basis in the United States since October 1947. (Measures of aggregate output for earlier times have been constructed retrospectively.)

Like any accounting system, the national income accounts first define concepts and then construct measures corresponding to these concepts. You need only to look at statistics from countries that have not yet developed such accounts to realize that precision and consistency in such accounts are crucial. Without precision and consistency, numbers that should add up do not; trying to understand what is going on feels like trying to balance someone else’s checkbook. I shall not burden you with the details of national income accounting here. But because you will occasionally need to know the definition of a variable and how variables relate to each other, Appendix 1 at the end of the book gives you the basic accounting framework used in the United States (and, with minor variations, in most other countries) today. You will find it useful whenever you want to look at economic data on your own.

GDP: Production and Income

The measure of **aggregate output** in the national income accounts is called the **gross domestic product**, or **GDP**. To understand how GDP is constructed, it is best to work with a simple example. Consider an economy composed of just two firms:

- In reality, not only workers and machines are required for steel production, but so are iron ore, electricity, and so on. I ignore these to keep the example simple.
- Firm 1 produces steel, employing workers and using machines to produce the steel. It sells the steel for \$100 to Firm 2, which produces cars. Firm 1 pays its workers \$80, leaving \$20 in profit to the firm.
- Firm 2 buys the steel and uses it, together with workers and machines, to produce cars. Revenues from car sales are \$200. Of the \$200, \$100 goes to pay for steel and \$70 goes to workers in the firm, leaving \$30 in profit to the firm.

We can summarize this information in a table:

Steel Company (Firm 1)		Car Company (Firm 2)	
Revenues from sales	\$100	Revenues from sales	\$200
Expenses	\$80	Expenses	\$170
Wages	\$80	Wages	\$70
		Steel purchases	\$100
Profit	\$20	Profit	\$30

An intermediate good is a good used in the production of another good. Some goods can be both final goods and intermediate goods. Potatoes sold directly to consumers are final goods.

Potatoes used to produce potato chips are intermediate goods. What are some other examples?

How would you define aggregate output in this economy? As the sum of the values of all goods produced in the economy—the sum of \$100 from the production of steel and \$200 from the production of cars, so \$300? Or as just the value of cars, which is equal to \$200?

Some thought suggests that the right answer must be \$200. Why? Because steel is an **intermediate good**: It is used in the production of cars. Once we count the production

of cars, we do not want to also count the production of the goods that went into the production of these cars.

This leads to the first definition of GDP:

1. *GDP Is the Value of the Final Goods and Services Produced in the Economy during a Given Period.*

The important word here is *final*. We want to count only the production of **final goods**, not intermediate goods. Using our example, we can make this point in another way. Suppose the two firms merged, so that the sale of steel took place in the new firm and was no longer recorded. The accounts of the new firm would be given by the following table:

Steel and Car Company	
Revenues from sales	\$200
Expenses (wages)	\$150
Profit	\$50

All we would see would be one firm selling cars for \$200, paying workers $\$80 + \$70 = \$150$ and making $\$20 + \$30 = \$50$ in profits. The \$200 measure would remain unchanged—as it should. We do not want our measure of aggregate output to depend on whether firms decide to merge or not.

This first definition gives us one way to construct GDP: by recording and adding up the production of all final goods—and this is indeed roughly the way actual GDP numbers are put together. But it also suggests a second way of thinking about and constructing GDP.

2. *GDP Is the Sum of Value Added in the Economy during a Given Period.*

The **value added** by a firm is defined as the value of its production minus the value of the intermediate goods used in production.

In our two-firms example, the steel company does not use intermediate goods. Its value added is simply equal to the value of the steel it produces, \$100. The car company, however, uses steel as an intermediate good. Thus, the value added by the car company is equal to the value of the cars it produces minus the value of the steel it uses in production, $\$200 - \$100 = \$100$. Total value added in the economy, or GDP, equals $\$100 + \$100 = \$200$. (Note that aggregate value added would remain the same if the steel and car firms merged and became a single firm. In this case, we would not observe intermediate goods at all—because steel would be produced and then used to produce cars within the single firm—and the value added in the single firm would simply be equal to the value of cars, \$200.)

This definition gives us a second way of thinking about GDP. Put together, the two definitions imply that the value of final goods and services—the first definition of GDP—can also be thought of as the sum of the value added by all the firms in the economy—the second definition of GDP.

So far, we have looked at GDP from the *production side*. The other way of looking at GDP is from the *income side*. Go back to our example and think about the revenues left to a firm after it has paid for its intermediate goods: Some of the revenues go to pay workers—this component is called *labor income*. The rest goes to the firm—that component is called *capital income* or *profit income* (the reason it is called capital income is that you can think of it as remuneration for the owners of the capital used in production).

Of the \$100 of value added by the steel manufacturer, \$80 goes to workers (labor income) and the remaining \$20 goes to the firm (capital income). Of the \$100 of value added by the car manufacturer, \$70 goes to labor income and \$30 to capital income.

The labor share in the example is thus 75%. In advanced countries, the share of labor is indeed typically between 60% and 75%.

Two lessons to remember:

- i. GDP is the measure of aggregate output, which we can look at from the production side (aggregate production) or the income side (aggregate income); and
- ii. Aggregate production and aggregate income are always equal.

Warning! People often use *nominal* to denote small amounts. Economists use *nominal* for variables expressed in current prices, and they surely do not refer to small amounts: The numbers typically run in the billions or trillions of dollars.

You may wonder why I chose these three particular years. The explanation will be given when I look at the actual numbers for the United States.

For the economy as a whole, labor income is equal to \$150(\$80 + \$70) and capital income is equal to \$50(\$20 + \$30). Value added is equal to the sum of labor income and capital income: \$200(\$150 + \$50). This leads to the third definition of GDP.

3. GDP Is the Sum of Incomes in the Economy during a Given Period.

To summarize: You can think about aggregate output—GDP—in three different but equivalent ways.

- From the *production side*: GDP equals the value of the final goods and services produced in the economy during a given period.
- Also from the *production side*: GDP is the sum of value added in the economy during a given period.
- From the *income side*: GDP is the sum of incomes in the economy during a given period.

Nominal and Real GDP

US GDP was \$20,500 billion in 2018, compared to \$543 billion in 1960. Was US output really almost 38 times higher in 2018 than in 1960? Obviously not: Much of the increase reflected an increase in prices rather than an increase in quantities produced. This leads to the distinction between nominal GDP and real GDP.

Nominal GDP is the sum of the quantities of final goods produced times their current price. This definition makes clear that nominal GDP increases over time for two reasons:

- First, the production of most goods increases over time.
- Second, the price of most goods also increases over time.

If our goal is to measure production and its change over time, we need to eliminate the effect of increasing prices on our measure of GDP. That's why **real GDP** is constructed as the sum of the quantities of final goods times *constant* (rather than *current*) prices.

If the economy produced only one final good, say, a single car model, constructing real GDP would be easy: We would use the price of the car in a given year and multiply the quantity of cars produced in each year. An example will help here. Consider an economy that only produces cars—and to avoid issues we shall tackle later, assume the same model is produced every year. Suppose the number and the price of cars in three successive years are given by:

Year	Quantity of Cars	Price of Cars	Nominal GDP	Real GDP (in 2012 dollars)
2011	10	\$20,000	\$200,000	\$240,000
2012	12	\$24,000	\$288,000	\$288,000
2013	13	\$26,000	\$338,000	\$312,000

Nominal GDP, which is equal to the quantity of cars times their price, goes up from \$200,000 in 2011 to \$288,000 in 2012—a 44% increase—and from \$288,000 in 2012 to \$338,000 in 2013—a 17% increase.

- To construct real GDP, we need to multiply the number of cars in each year by a *common* price. Suppose we use the price of a car in 2012 as the common price. This approach gives us *real GDP in 2012 dollars*.

- Using this approach, real GDP in 2011 (in 2012 dollars) equals $10 \text{ cars} \times \$24,000 \text{ per car} = \$240,000$. Real GDP in 2012 (in 2012 dollars) equals $12 \text{ cars} \times \$24,000 \text{ per car} = \$288,000$, the same as nominal GDP in 2012. Real GDP in 2013 (in 2012 dollars) is equal to $13 \times \$24,000 = \$312,000$. So real GDP goes up from \$240,000 in 2011 to \$288,000 in 2012—a 20% increase—and from \$288,000 in 2012 to \$312,000 in 2013—an 8% increase.
- How different would our results have been if we had decided to construct real GDP using the price of a car in, say, 2013 rather than 2012? Obviously, the level of real GDP in each year would be different (because the prices are not the same in 2013 than in 2012); but its rate of change from year to year would be the same as shown.

To check, compute real GDP in 2013 dollars, and compute the rate of growth from 2011 to 2012, and from 2012 to 2013.

The problem when constructing real GDP in practice is that there is obviously more than one final good. Real GDP must be defined as a weighted average of the output of all final goods, and this brings us to what the weights should be.

The *relative prices* of the goods would appear to be the natural weights. If one good costs twice as much per unit as another, then that good should count for twice as much as the other in the construction of real output. But this raises the question: What if, as is typically the case, relative prices change over time? Should we choose the relative prices of a particular year as weights, or should we change the weights over time? More discussion of these issues, and of the way real GDP is constructed in the United States, is in the appendix to this chapter. Here, what you should know is that the measure of real GDP in the US national income accounts uses weights that reflect relative prices and change over time. The measure is called **real GDP in chained (2012) dollars**. It says 2012 because, as in our example, at this point in time 2012 is the year when, by construction, real GDP is equal to nominal GDP. It is our best measure of the output of the US economy, and its evolution shows how US output has increased over time.

The year used to construct prices, at this point 2012, is called the *base year*. The base year is changed from time to time, and when you read this book, it may have changed again.

Figure 2-1 plots the evolution of both nominal GDP and real GDP since 1960. By construction, the two are equal in 2012. Real GDP in 2018 was about 5.7 times its level of 1960—a considerable increase, but clearly much less than the 38-fold increase in

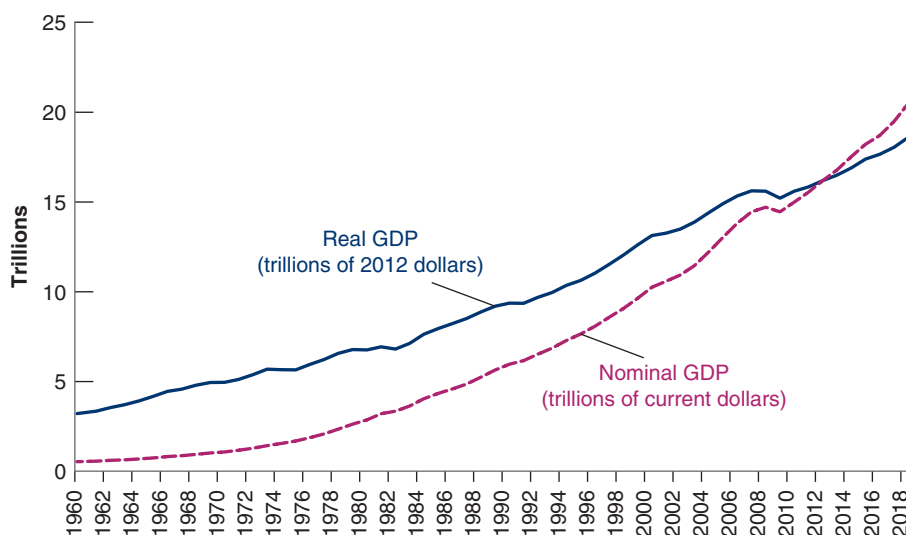


Figure 2-1

Nominal and Real US GDP, 1960–2018.

From 1960 to 2018, nominal GDP increased by a factor of 38. Real GDP increased by a factor of 5.7.

Source: FRED. Series GDP, GDP.

Suppose real GDP was measured in 2000 dollars rather than 2012 dollars. Where would the nominal GDP and real GDP lines on the graph intersect?

nominal GDP over the same period. The difference between the two results comes from the increase in prices over the period.

The terms *nominal GDP* and *real GDP* each have many synonyms, and you are likely to encounter them in your readings:

- Nominal GDP is also called **dollar GDP** or **GDP in current dollars**.
- Real GDP is also called **GDP in terms of goods**, **GDP in constant dollars**, **GDP adjusted for inflation**, or **GDP in chained (2012) dollars**, or **GDP in 2012 dollars** (if the year in which real GDP is set equal to nominal GDP is 2012, as is the case in the United States at this time).

In the chapters that follow, unless I indicate otherwise,

- GDP will refer to *real GDP* and Y_t will denote *real GDP in year t* .
- Nominal GDP, and variables measured in current dollars, will be denoted by a dollar sign in front of them—for example, $\$Y_t$ for nominal GDP in year t .

GDP: Level versus Growth Rate

We have focused so far on the *level* of real GDP. This is an important number that gives the economic size of a country. A country with twice the GDP of another country is economically twice as big as the other country. Equally important is the level of **real GDP per person**, the ratio of real GDP to the population of the country. It gives us the average standard of living of the country.

In assessing the performance of the economy from year to year, economists focus however on the rate of growth of real GDP, often called just **GDP growth**. Periods of positive GDP growth are called **expansions**. Periods of negative GDP growth are called **recessions**.

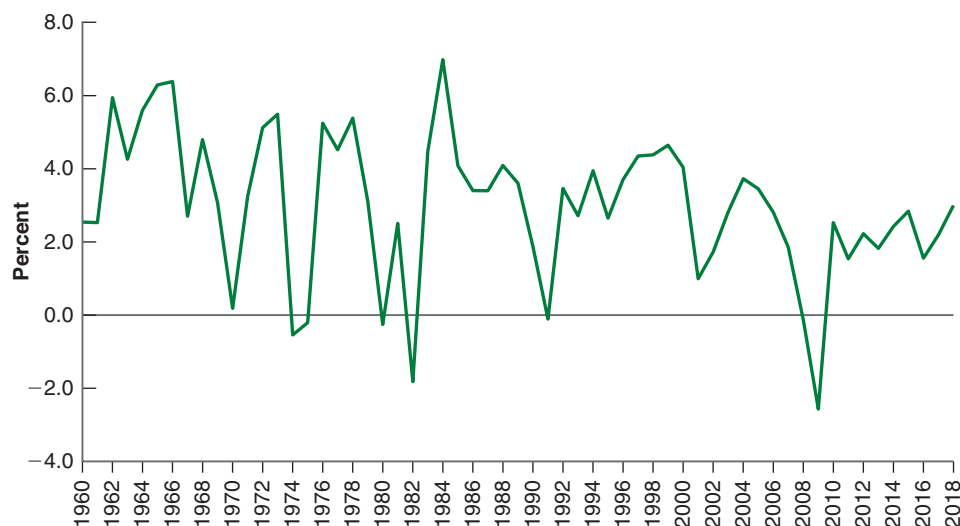
GDP growth in the United States since 1960 is given in Figure 2-2. GDP growth in year t is constructed as $(Y_t - Y_{t-1})/Y_{t-1}$ and expressed as a percentage. The figure shows how the US economy has gone through a series of expansions (periods of positive growth), interrupted by short recessions. Again, you can see the effects of the recent crisis: zero growth in 2008, and a large negative growth rate in 2009.

Figure 2-2

Growth Rate of US GDP, 1960–2018.

Since 1960, the US economy has gone through a series of expansions, interrupted by short recessions. The 2008–2009 recession was the most severe recession in the period from 1960 to 2018.

Source: Calculated using series GDCP in Figure 2-1.



Real GDP, Technological Progress, and the Price of Computers

A tough problem in calculating real GDP is how to deal with changes in quality of existing goods. One of the most difficult cases is computers. It would clearly be absurd to assume that a personal computer in 2019 is the same good as a personal computer produced, say, 20 years ago: The 2019 version can clearly do much more than the 1999 version. But how much more? How do we measure it? How do we take into account the improvements in internal speed, the size of the RAM (random access memory) or of the hard disk, faster access to the internet, and so on?

The approach used by economists to adjust for these improvements is to look at the market for computers and how it values computers with different characteristics in a given year. Example: Suppose the evidence from prices of different models on the market shows that people are willing to pay 10% more for a computer with a speed of 4 GHz (4,000 megahertz) rather than 3 GHz. (The first edition of this book, published in 1996, compared two computers, with speeds of 50 and 16 megahertz, respectively. This change is a good indication of technological progress.) Suppose new computers this year have a speed of 4 GHz compared to a speed of 3 GHz for new computers last year. (A further indication of the complexity of technological progress is that, in the more recent past, progress has been made not so much by increasing the speed of processors but rather by using multicore processors, which allow for faster parallel processing. We shall leave this aspect aside here, but people in charge of national income accounts cannot.) And suppose the dollar price of new computers this year is the same as the dollar price of new computers last

year. Then economists in charge of computing the adjusted price of computers will conclude that new computers are in fact 10% cheaper than last year.

This approach, which treats goods as providing a collection of characteristics—for computers, speed, memory, and so on—each with an implicit price, is called **hedonic pricing** (“hedone” means “pleasure” in Greek. What matters in assessing the value of a good is how much utility (“pleasure”) it provides). It is used by the Department of Commerce—which constructs real GDP—to estimate changes in the price of complex and fast-changing goods, such as automobiles and computers. Using this approach, the Department of Commerce estimates, for example, that for a given price, the quality of new laptops has increased on average by 20% a year since 1999 (if you want to look, the series is given by PCU33411133411172 in the FRED database). Put another way, a typical laptop in 2019 delivers $1.20^{21} = 46$ times the computing services a typical laptop delivered in 1999. (Interestingly, in light of the discussion of slowing US productivity growth in Chapter 1, the rate of quality improvement has decreased substantially in the recent past, and is now closer to 10%.)

Not only do laptops deliver more services, they have become cheaper as well: Their dollar price has declined by about 7% a year since 1999. Putting this together with the information in the previous paragraph, this implies that their quality-adjusted price has fallen at an average rate of $20\% + 7\% = 27\%$ per year. Put another way, a dollar spent on a laptop today buys $1.27^{21} = 151$ times more computing services than a dollar spent on a laptop in 1999.

2-2 THE UNEMPLOYMENT RATE

Because it is a measure of aggregate activity, GDP is obviously the most important macroeconomic variable. But two other variables, unemployment and inflation, tell us about other important aspects of how an economy is performing. This section focuses on the unemployment rate.

We start with two definitions: **Employment** is the number of people who have a job. **Unemployment** is the number of people who do not have a job but are looking for one. The **labor force** is the sum of employment and unemployment:

$$\begin{array}{rcl} L & = & N \quad + \quad U \\ \text{labor force} & = & \text{employment} + \text{unemployment} \end{array}$$

The **unemployment rate** is the ratio of the number of people who are unemployed to the number of people in the labor force:

$$u = \frac{U}{L}$$

unemployment rate = unemployment/labor force

Constructing the unemployment rate is less obvious than it might seem. Determining whether somebody is employed is relatively straightforward. Determining whether somebody is unemployed is more difficult. Recall from the definition that, to be classified as unemployed, a person must meet two conditions: he or she does not have a job, and he or she is looking for one; this second condition is harder to assess.

Until the 1940s in the United States, and until more recently in most other countries, the only available source of data on unemployment was the number of people registered at unemployment offices, and so only those workers who were registered in unemployment offices were counted as unemployed. This system led to a poor measure of unemployment. The number of those who were looking for jobs and were registered at the unemployment office varied both across countries and across time. Those who had no incentive to register—for example, those who had exhausted their unemployment benefits—were unlikely to take the time to come to the unemployment office, so they were not counted. Countries with less generous benefit systems were likely to have fewer unemployed people registered, and therefore smaller measured unemployment rates.

Today, most rich countries rely on large surveys of households to compute the unemployment rate. In the United States, this survey is called the **Current Population Survey (CPS)**. It relies on interviews of 60,000 households every month. The survey classifies a person as employed if he or she has a job at the time of the interview; it classifies a person as unemployed if he or she does not have a job *and has been looking for a job in the last four weeks*. Most other countries use a similar definition of unemployment. In the United States, estimates based on the CPS show that, in December 2018, an average of 157 million people were employed, and 6.3 million people were unemployed, so the unemployment rate was $6.3 / (157 + 6.3) = 3.9\%$.

Note that only those *looking for a job* are counted as unemployed; those who do not have a job and are not looking for one are counted as **not in the labor force**. When unemployment is high, some of the unemployed give up looking for a job and therefore are no longer counted as unemployed. These people are known as **discouraged workers**. Take an extreme example: If all workers without a job gave up looking for one, the unemployment rate would go to zero. This would make the unemployment rate a poor indicator of what is actually happening in the labor market. This example is too extreme; in practice, when the economy slows down, we typically observe both an increase in unemployment and an increase in the number of people who drop out of the labor force. Equivalently, a higher unemployment rate is typically associated with a lower **participation rate**, defined as the ratio of the labor force to the total population of working age.

Figure 2-3 shows the unemployment rate in the United States since 1960. It has fluctuated between 3% and 11%, going up during recessions and down during expansions. Again, you can see the effect of the recent crisis, with the unemployment rate reaching a peak at nearly 10% in 2010, the highest since the 1980s, followed by a steady decline since then.

Why Do Economists Care about Unemployment?

Economists care about unemployment for two reasons. First, they care about unemployment because of its direct effect on the welfare of the unemployed. Although unemployment benefits are more generous today than they were during the Great Depression, unemployment is still associated with financial and psychological suffering. The extent of suffering depends on the nature of unemployment.

One image of unemployment is that of a stagnant pool, of people remaining unemployed for long periods of time. In normal times, in the United States, this image is not

The 60,000 households are chosen as a representative sample of the whole US population. Thus, the sample provides good estimates of what is happening for the population as a whole.

Suppose that, in a given month, both employment and unemployment go up. What do you conclude?

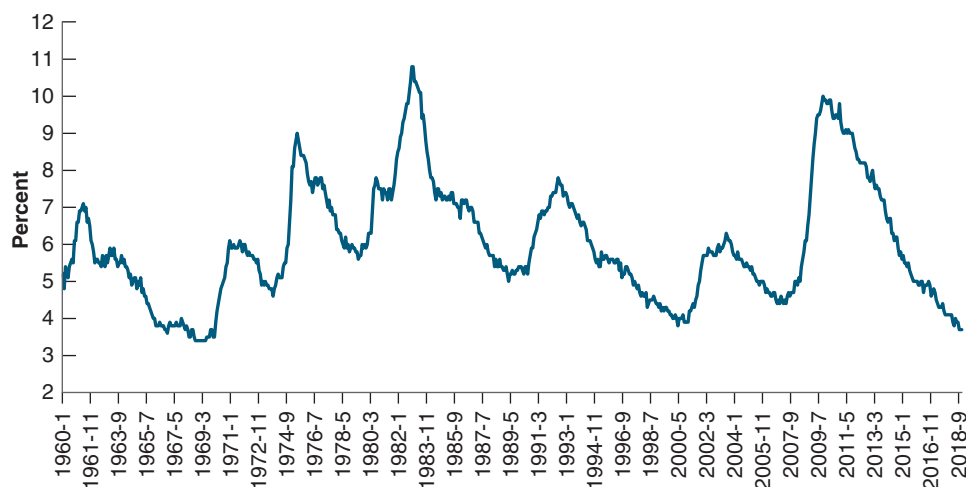


Figure 2-3

US Unemployment Rate, 1960–2018.

Since 1960, the US unemployment rate has fluctuated between about 3% and 11%.

Source: FRED Series: UNRATE.

right: Every month, many people become unemployed, and many of the unemployed find jobs. When unemployment is high, however, as it was during the crisis, another image becomes more relevant. Not only are more people unemployed, but also many of them are unemployed for a long time. For example, the mean duration of unemployment was 16 weeks on average during 2000–2007, but increased to 40 weeks in 2011. When unemployment increases, not only does unemployment become more widespread, it also becomes more painful for those who are unemployed.

Second, economists also care about the unemployment rate because it provides a signal that the economy is not using some of its resources. When unemployment is high, many workers who want to work do not find jobs; the economy is clearly not using its human resources efficiently. What about when unemployment is low? Can very low unemployment also be a problem? The answer is yes. Like an engine running at too high a speed, an economy in which unemployment is very low may be overusing its resources and run into labor shortages. How low is “too low”? This is a difficult question, and a question that, as of early 2019, is very relevant. The current rate of unemployment is below 4%, which is, as you can see from Figure 2-3, historically low. Whether it should be allowed to decrease further, or instead stabilized at the current level, is one of the main policy issues facing the Fed today.

◀ It is probably because of statements like this that economics is known as the “dismal science.”

2-3 THE INFLATION RATE

Inflation is a sustained rise in the general level of prices—the **price level**. The **inflation rate** is the rate at which the price level increases. (Symmetrically, **deflation** is a sustained decline in the price level. It corresponds to a negative inflation rate.)

The practical issue is how to define the price level so the inflation rate can be measured. Macroeconomists typically look at two measures of the price level, two *price indexes*: the GDP deflator and the Consumer Price Index.

The GDP Deflator

We saw how increases in nominal GDP can come either from an increase in real GDP, or from an increase in prices. Put another way, if we see nominal GDP increase faster than real GDP, the difference must come from an increase in prices.

Deflation is rare, but it happens. The United States experienced sustained deflation in the 1930s during the Great Depression (see the Focus Box in Chapter 9). Japan has had deflation, off and on, since the late 1990s. More recently, the euro area has had short spells of deflation.

Unemployment and Happiness

How painful is unemployment? To answer this question, one needs information about particular individuals and how their happiness varies as they become unemployed. This information is available from the German Socio-Economic Panel survey. The survey has followed about 11,000 households each year since 1984, asking each member of the household a number of questions about their employment status, their income, and their happiness. The specific question in the survey about happiness is the following: “How satisfied are you at present with your life as a whole?”, with the answer rated from 0 (“completely dissatisfied”) to 10 (“completely satisfied”).

The effect of unemployment on happiness defined in this way is shown in Figure 1. The figure plots the average life satisfaction for individuals who were unemployed during one year, and employed in the four years before and in the four years after. Year 0 is the year of unemployment. Years -4 to -1 are the years before unemployment, years 1 to 4 the years after.

The figure suggests three conclusions. The first and main one is indeed that becoming unemployed leads to a large decrease in happiness. To give you a sense of scale,

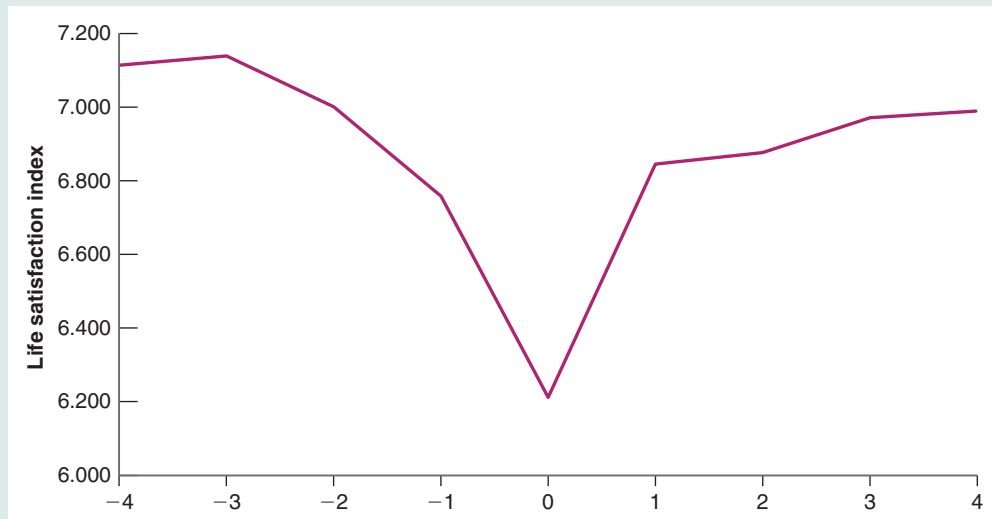
other studies suggest that this decrease in happiness is close to the decrease triggered by a divorce or a separation. The second is that happiness declines before the actual unemployment spell. This suggests that either workers know they are more likely to become unemployed, or that they like their job less and less. The third is that happiness does not fully recover even four years after the unemployment spell. This suggests that unemployment may do some long-lasting damage, either because of the experience of unemployment itself or because the new job is not as satisfying as the old one.

In thinking about how to deal with unemployment, it is essential to understand how unemployment decreases happiness. One important finding in this respect is that the decrease in happiness does not depend very much on the generosity of unemployment benefits. In other words, unemployment affects happiness not so much through financial channels as through psychological channels. To cite George Akerlof, a Nobel Prize-winning economist, “A person without a job loses not just his income but often the sense that he is fulfilling the duties expected of him as a human being.”¹

Figure 1

Effects of Unemployment on Happiness.

Source: Winkelmann 2014.



This remark motivates the definition of the GDP deflator. The **GDP deflator** in year t , P_t , is defined as the ratio of nominal GDP to real GDP in year t :

$$P_t = \frac{\text{Nominal GDP}_t}{\text{Real GDP}_t} = \frac{\$Y_t}{Y_t}$$

Note that, in the year in which, by construction, real GDP is equal to nominal GDP (2012 at this point in the United States), this definition implies that the price level is equal to 1. This is worth emphasizing: The GDP deflator is called an **index number**. Its level is

¹The material in this box, and in particular the figure, comes in part from “Unemployment and Happiness,” by Rainer Winkelmann, IZA World of Labor, 2014: 94, pp. 1–9.

chosen arbitrarily—here it is equal to 1 in 2012—and has no economic interpretation. But its rate of change, $(P_t - P_{t-1})/P_{t-1}$ (which we shall denote by π_t in the rest of the book), has a clear economic interpretation: It gives the rate at which the general level of prices increases over time—the rate of inflation.

One advantage to defining the price level as the GDP deflator is that it implies a simple relation between *nominal GDP*, *real GDP*, and the *GDP deflator*. To see this, reorganize the previous equation to get:

$$\$Y_t = P_t Y_t$$

Nominal GDP is equal to the GDP deflator times real GDP. Or, putting it in terms of rates of change: The rate of growth of nominal GDP is equal to the rate of inflation plus the rate of growth of real GDP.

The Consumer Price Index

The GDP deflator gives the average price of output—the final goods *produced* in the economy. But consumers care about the average price of consumption—the goods they *consume*. The two prices need not be the same: The set of goods produced in the economy is not the same as the set of goods purchased by consumers, for two reasons:

- Some of the goods in GDP are sold not to consumers but to firms (machine tools, for example), to the government, or to foreigners.
- Some of the goods bought by consumers are not produced domestically but are imported from abroad.

To measure the average price of consumption, or, equivalently, the **cost of living**, macroeconomists look at another index, the **Consumer Price Index, or CPI**. The CPI has been in existence in the United States since 1917 and is published monthly (in contrast, numbers for GDP and the GDP deflator are constructed and published only quarterly).

The CPI gives the cost in dollars of a specific list of goods and services over time. The list, which is based on a detailed study of consumer spending, attempts to represent the consumption basket of a typical urban consumer and is updated every two years.

Each month, Bureau of Labor Statistics (BLS) employees visit stores to find out what has happened to the price of the goods on the list; prices are collected for 211 items in 38 cities. These prices are then used to construct the CPI.

Like the GDP deflator (the price level associated with aggregate output, GDP), the CPI is an index. It is set equal to 100 in the period chosen as the base period and so its level has no particular significance. The current base period is 1982 to 1984, so the average for that period is equal to 100. In 2018, the CPI was 250; thus, it cost two and a half times as much in dollars to purchase the same consumption basket than in 1982–1984.

You may wonder how the rate of inflation differs depending on whether the GDP deflator or the CPI is used to measure it. The answer is given in Figure 2-4, which plots the two inflation rates since 1960 for the United States. The figure yields two conclusions:

- The CPI and the GDP deflator move together most of the time. In most years, the two inflation rates differ by less than 1%.
- But there are clear exceptions. In 1979 and 1980, the increase in the CPI was significantly larger than the increase in the GDP deflator. The reason is not hard to find. Recall that the GDP deflator is the price of goods *produced* in the United States, whereas the CPI is the price of goods *consumed* in the United States. That

Index numbers are often set equal to 100 (in the base year) rather than to 1. If you look at the series for the GDP deflator in FRED (GDPDEF), it is equal to 100 for 2012 (the base year), 101.7 in 2013, and so on.

Compute the GDP deflator and the associated rate of inflation from 2011 to 2012 and from 2012 to 2013 in our car example in Section 2-1, when real GDP is constructed using the 2012 price of cars as the common price. (For a refresher on going from levels to rates of change, see Appendix 2 at the end of the book, Proposition 7.)

Do not confuse the CPI with the PPI, or *producer price index*, which is an index of prices of domestically produced goods in manufacturing, mining, agriculture, fishing, forestry, and electric utility industries.

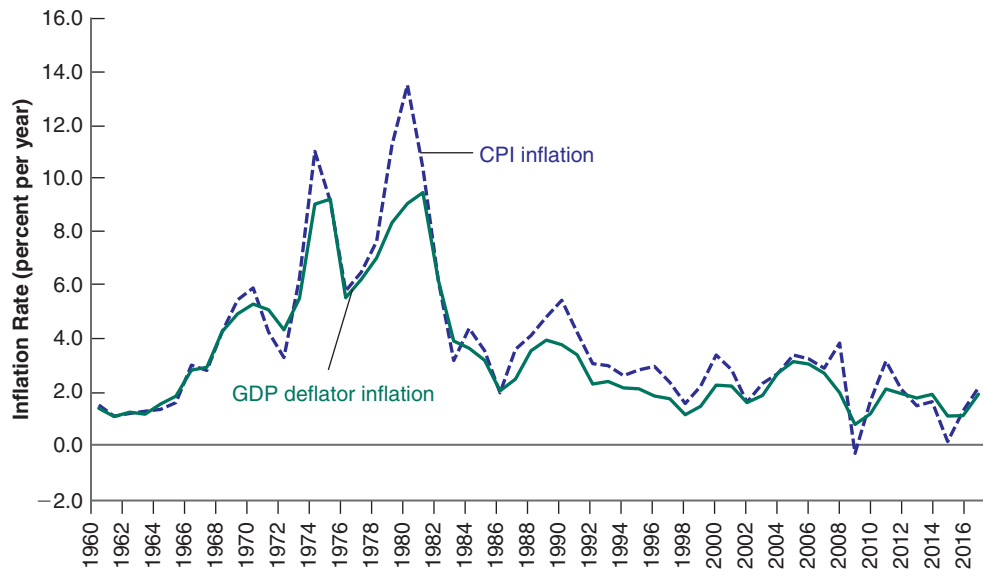
Do not ask why such a strange base period was chosen. Nobody seems to remember.

Figure 2-4

Inflation Rate, Using the CPI and the GDP Deflator, 1960–2018.

The inflation rates, computed using either the CPI or the GDP deflator, are largely similar.

Source: FRED: CPIAUCSL and GDPDEF.



means when the price of imported goods increases relative to the price of goods produced in the United States, the CPI increases faster than the GDP deflator. This is precisely what happened in 1979 and 1980. The price of oil doubled. And although the United States was a producer of oil, it produced less than it consumed: It was an oil importer. The result was a large increase in the CPI compared to the GDP deflator.

In what follows, we shall typically assume that the two indexes move together so we do not need to distinguish between them. We shall simply talk about *the price level* and denote it by P_t , without indicating whether we have the CPI or the GDP deflator in mind.

Why Do Economists Care about Inflation?

If a higher inflation rate meant just a faster but proportional increase in all prices and wages—a case called *pure inflation*—inflation would be only a minor inconvenience because relative prices would be unaffected.

Take, for example, the workers' *real wage*—the wage measured in terms of goods rather than dollars. Suppose that price inflation was 2%, and wage inflation 4%, so real wages increased by 2% a year, reflecting productivity growth. Now suppose that price inflation was instead 4% and wage inflation 6%. Real wages would still increase at $6\% - 4\% = 2\%$, the same as before. In other words, higher inflation would not affect real wages (or other relative prices). Inflation would not be entirely irrelevant; people would have to keep track of the increase in prices and wages when making decisions. But this would be a small burden, hardly justifying making control of the inflation rate one of the major goals of macroeconomic policy.

So why do economists care about inflation? Precisely because there is no such thing as pure inflation:

- During periods of inflation, not all prices and wages rise proportionately. Because they don't, inflation affects income distribution. For example, retirees in some countries receive payments that do not keep up with the price level, so they lose in relation

to other groups when inflation is high. This is not the case in the United States, where Social Security benefits automatically rise with the CPI, protecting retirees from inflation. But during the very high inflation that took place in Russia in the 1990s, retirement pensions did not keep up with inflation, and many retirees were pushed to near starvation.

- Inflation leads to other distortions. Variations in relative prices also lead to more uncertainty, making it harder for firms to make decisions about the future, such as investment decisions. Some prices, which are fixed by law or by regulation, lag behind the others, leading to changes in relative prices. Taxation interacts with inflation to create more distortions. If tax brackets are not adjusted for inflation, for example, people move into higher and higher tax brackets as their nominal income increases, even if their real income remains the same.

If inflation is so bad, does this imply that deflation (negative inflation) is good?

The answer is no. First, high deflation (a large negative rate of inflation) would create many of the same problems as high inflation, from distortions to increased uncertainty. Second, as we shall see in Chapter 4, even a low rate of deflation limits the ability of monetary policy to affect output. So what is the “best” rate of inflation? Most macroeconomists believe that the best rate of inflation is low and stable, somewhere between 1% and 4%.

This is known as *bracket creep*. In the United States, the tax brackets are adjusted automatically for inflation: If inflation is 5%, all tax brackets also go up by 5%—in other words, there is no bracket creep. By contrast, in Italy, where inflation averaged 17% a year in the second half of the 1970s, bracket creep led to a rise of almost 9 percentage points in the rate of income taxation.

Newspapers sometimes confuse deflation and recession. They may happen at the same time but they are not the same. Deflation is a decrease in the price level. A recession is a decrease in real output.

◀ We shall look at the pros and cons of different rates of inflation in Chapter 23.

2-4 OUTPUT, UNEMPLOYMENT, AND THE INFLATION RATE: OKUN'S LAW AND THE PHILLIPS CURVE

We have looked separately at the three main dimensions of aggregate economic activity: output growth, the unemployment rate, and the inflation rate. Clearly, they are not independent, and much of this book will be spent looking at the relations among them in detail. But it is useful to have a first pass now.

Okun's Law

Intuition suggests that if output growth is high, unemployment will decrease, and this is indeed true. This relation was first examined by US economist Arthur Okun and for this reason has become known as **Okun's law**. Figure 2-5 plots quarterly changes in the unemployment rate on the vertical axis against the quarterly rate of growth of output on the horizontal axis for the United States since the first quarter of 2000. It also draws the line that best fits the cloud of points. Looking at the figure and the line suggests two conclusions:

Arthur Okun was an adviser to President John F. Kennedy in the 1960s. Okun's law is, of course, not a law but an empirical regularity.

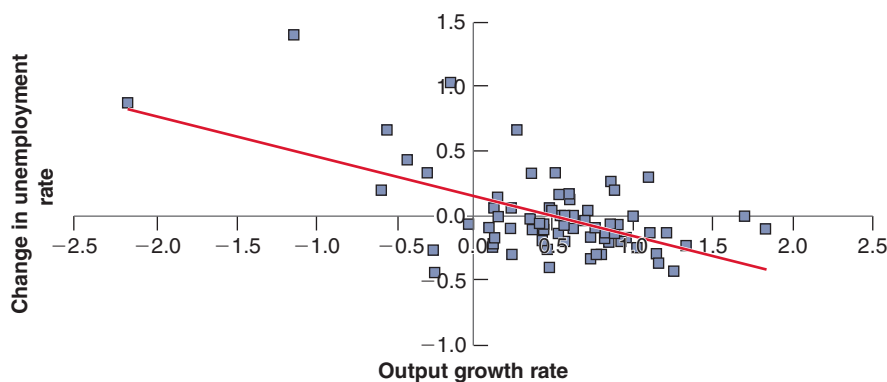
- The line is downward sloping and fits the cloud of points quite well. Put in economic terms: There is a strong relation between the two variables: Higher output growth leads to a decrease in unemployment. The slope of the line is -0.3 . This implies that, on average, an increase in the growth rate of 1% decreases the unemployment rate by roughly -0.3% . This is why unemployment goes up in recessions and down in expansions. This relation has a simple but important implication: The key to decreasing unemployment is a high enough rate of growth.
- This line crosses the horizontal axis at the point where quarterly output growth is roughly equal to 0.5% , equivalently when annual output growth is equal to 2% . In economic terms: It takes an annual growth rate of about 2% to keep unemployment

Such a graph, plotting one variable against another, is called a *scatterplot*. The line is called a *regression line*. For more on regressions, see Appendix 3 at the end of the book.

Figure 2-5

Changes in the Unemployment Rate versus Growth in the United States, 2000 Q1 to 2018 Q4.

Output growth that is higher than usual is associated with a reduction in the unemployment rate; output growth that is lower than usual is associated with an increase in the unemployment rate.



Source: FRED: Series GDPC, UNRATE.

constant. This is for two reasons. The first is that population, and thus the labor force, increases over time, so employment must grow over time just to keep the unemployment rate constant. The second is that output per worker is also increasing with time, which implies that output growth is higher than employment growth. Suppose, for example, that the labor force grows at 1% and that output per worker grows at 1%. Then output growth must be equal to $1\% + 1\% = 2\%$ just to keep the unemployment rate constant.

The Phillips Curve

Okun's law implies that, with strong enough growth, one can decrease the unemployment rate to very low levels. But intuition suggests that, when unemployment becomes very low, the economy is likely to overheat, and that this will lead to upward pressure on inflation. And, to a large extent, this is true. This relation was first explored in 1958 by a New Zealand economist, A. W. Phillips, and has become known as the **Phillips curve**. Phillips plotted the rate of inflation against the unemployment rate. Figure 2-6 does the same by plotting, on the vertical axis, the quarterly **core inflation rate**, which is the inflation rate constructed by leaving out volatile prices, such as food and energy, against the unemployment rate on the horizontal axis, together with the line that fits the cloud of points best, for the United States, quarterly since the first quarter of 2000. Looking at the figure again suggests two conclusions:

- The line is downward sloping, although the fit is definitely not as good as it was for Okun's law: Higher unemployment is associated, on average, with lower inflation; lower unemployment is associated with higher inflation. But this is only true on average. As we shall see later in Chapter 8, not only is the Phillips curve relation not as tight as Okun's law, but it has evolved over time, complicating in important ways the job of central banks, which have to care about both inflation and unemployment.
- Using the regression line, we can compute the rate of unemployment associated with a given rate of inflation. If, for example, we want the inflation rate to be 2%, which is the current target of the Fed and many other central banks, the line implies that the unemployment rate has to be roughly equal to 5%. In economic terms, since 2000, when unemployment has been below 5%, inflation has typically been above 2%. When unemployment has been above 5%, inflation has typically been below 2%. But again, the relation is not tight enough that the required unemployment rate can be pinned down precisely. Indeed, at the time of writing, unemployment is lower than 4% and core inflation is 2.2%, barely above 2%.

It should probably be known as the Phillips relation, but it is too late to change the name. ►

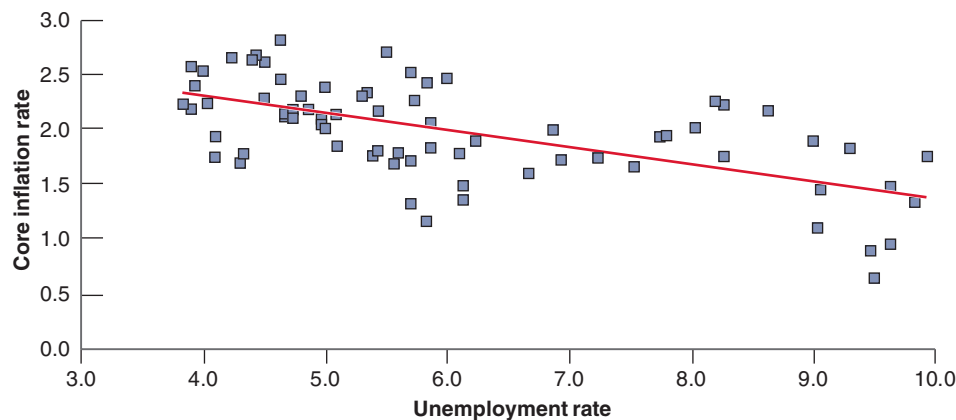


Figure 2-6

Changes in the Inflation Rate versus the Unemployment Rate in the United States, 2000 Q1 To 2018 Q4.

Lower unemployment rate is associated with a higher inflation rate, higher unemployment rate with a lower inflation rate.

Source: FRED. Series GDPC, CPILFESL.

Clearly, a successful economy is an economy that combines high output growth, low unemployment, and low inflation. Can all these objectives be achieved simultaneously? Is low unemployment compatible with low and stable inflation? Do policymakers have the tools to sustain growth, to achieve low unemployment while maintaining low inflation? These are the questions we shall take up as we go through the book. The next two sections give you the road map.

2-5 THE SHORT RUN, THE MEDIUM RUN, AND THE LONG RUN

What determines the level of aggregate output in an economy? Consider three answers:

- Newspaper articles suggest a first answer: Movements in output come from movements in the demand for goods. You probably have read news stories that begin like this: “Production and sales of automobiles were higher last month due to a surge in consumer confidence, which drove consumers to showrooms in record numbers.” Stories like these highlight the role demand plays in determining aggregate output; they point to factors that affect demand, ranging from consumer confidence to government spending to interest rates.
- But, surely, no amount of Indian consumers rushing to Indian showrooms can raise India’s output to the level of output in the United States. This suggests a second answer: What matters when it comes to aggregate output is the supply side—how much the economy can produce. How much can be produced depends on how advanced the technology of the country is, how much capital it is using, and the size and the skills of its labor force. These factors—not consumer confidence—are the fundamental determinants of a country’s level of output.
- The previous argument can be taken one step further: Neither technology, nor capital, nor skills are given. The technological sophistication of a country depends on its ability to innovate and introduce new technologies. The size of its capital stock depends on how much people have saved. The skills of workers depend on the quality of the country’s education system. Other factors are also important: If firms are to operate efficiently, for example, they need a clear system of laws under which to operate and an honest government to enforce those laws. This suggests a third answer: The true determinants of output are factors

like a country's education system, its saving rate, and the quality of its government. If we want to understand what determines the level of output, we must look at these factors.

The next three bullet points may be the most important lesson of the book. ▶

You might be wondering at this point, which of the three answers is right? The fact is that all three are right. But each applies over a different time frame:

- In the **short run**, say, a few years, the first answer is the right one. Year-to-year movements in output are primarily driven by movements in demand. Changes in demand, perhaps as a result of changes in consumer confidence or other factors, can lead to a decrease in output (a recession) or an increase in output (an expansion).
- In the **medium run**, say, a decade, the second answer is the right one. Over the medium run, the economy tends to return to the level of output determined by supply factors: the capital stock, the level of technology, and the size of the labor force. And, over a decade or so, these factors move sufficiently slowly that we can take them as given.
- In the **long run**, say, a few decades or more, the third answer is the right one. To understand why China has been able to achieve such a high growth rate since 1980, we must understand why both the capital stock and the level of technology in China are increasing so fast. To do so, we must look at factors like the education system, the saving rate, and the role of the government.

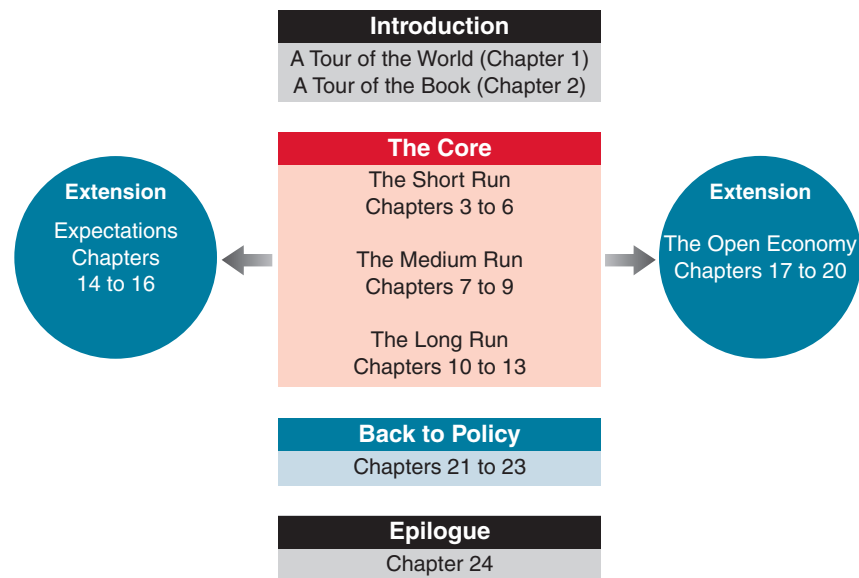
This way of thinking about the determinants of output underlies macroeconomics, and it underlies the organization of this book.

2-6 A TOUR OF THE BOOK

The book is organized in three parts: A core; two extensions; and, finally, a comprehensive look at the role of macroeconomic policy. This organization is shown in Figure 2-7. We now describe it in more detail.

Figure 2-7

The Organization of the Book.



The Core

The core is composed of three parts—the short run, the medium run, and the long run.

- Chapters 3 to 6 look at how output is determined in the short run. To focus on the role of demand, we assume that firms are willing to supply any quantity at a given price. In other words, we ignore supply constraints. Chapter 3 shows how the demand for goods determines output. Chapter 4 shows how monetary policy determines the interest rate. Chapter 5 puts the two together, by allowing demand to depend on the interest rate, and then showing the role of monetary and fiscal policy in determining output. Chapter 6 extends the model by introducing a richer financial system and using it to explain what happened during the financial crisis.
- Chapters 7 to 9 develop the supply side and look at how output is determined in the medium run. Chapter 7 introduces the labor market. Chapter 8 builds on it to derive the relation between inflation and unemployment. Chapter 9 puts all the parts together, and shows the determination of output, unemployment, and inflation in both the short and the medium run.
- Chapters 10 to 13 focus on the long run. Chapter 10 introduces the relevant facts by looking at the growth of output both across countries and over long periods of time. Chapters 11 and 12 discuss how both capital accumulation and technological progress determine growth. Chapter 13 looks at the challenges to growth, from inequality to global warming.

Extensions

The core chapters give you a way of thinking about how output (and unemployment, and inflation) is determined over the short, medium, and long run. However, they leave out several elements, which are explored in two extensions:

- Expectations play an essential role in macroeconomics. Nearly all the economic decisions people and firms make depend on their expectations about future income, future profits, future interest rates, and so on. Fiscal and monetary policies affect economic activity not only through their direct effects, but also through their effects on people's and firms' expectations. Although we touch on these issues in the core, Chapters 14 to 16 offer a more detailed treatment and draw the implications for fiscal and monetary policy.
- The core chapters treat the economy as *closed*, ignoring its interactions with the rest of the world. But the fact is, economies are increasingly *open*, trading goods and services and financial assets with one another. As a result, countries are becoming more and more interdependent. The nature of this interdependence and the implications for fiscal and monetary policy are the topics of Chapters 17 to 20.

Back to Policy

Monetary and fiscal policies are discussed in nearly every chapter of this book. But once the core and the extensions have been covered, it is useful to go back and put things together.

Chapter 21 focuses on general issues of policy, whether macroeconomists know enough about how the economy works to use policy as a stabilization tool at all, and whether policymakers can be trusted to do what is right.

Chapters 22 and 23 return to the role of fiscal and monetary policies.

Epilogue

Macroeconomics is not a fixed body of knowledge. It evolves over time. The final chapter, Chapter 24, looks at the history of macroeconomics and how macroeconomists have come to believe what they believe today. From the outside, macroeconomics sometimes looks like a field divided among schools of economists—“Keynesians,” “monetarists,” “new classicals,” “supply-siders,” and so on—hurling arguments at each other. The actual process of research is more orderly and more productive than this image suggests. I identify what I see as the main differences among macroeconomists, and the set of propositions that define the core of macroeconomics today.

SUMMARY

- We can think of GDP, the measure of aggregate output, in three equivalent ways: (1) GDP is the value of the final goods and services produced in the economy during a given period; (2) GDP is the sum of value added in the economy during a given period; and (3) GDP is the sum of incomes in the economy during a given period.
- Nominal GDP is the sum of the quantities of final goods produced times their current prices. This implies that changes in nominal GDP reflect both changes in quantities and changes in prices. Real GDP is a measure of output. Changes in real GDP reflect changes in quantities only.
- A person is classified as unemployed if he or she does not have a job and is looking for one. The unemployment rate is the ratio of the number of people unemployed to the number of people in the labor force. The labor force is the sum of those employed and those unemployed.
- Economists care about unemployment because of the human cost it represents. They also look at unemployment because it sends a signal about how efficiently the economy is using its resources. High unemployment indicates that the country is not using its resources efficiently.
- Inflation is a rise in the general level of prices—the price level. The inflation rate is the rate at which the price level increases. Macroeconomists look at two measures of the price level. The first is the GDP deflator, which is the average price of the goods produced in the economy. The second is the Consumer Price Index (CPI), which is the average price of goods consumed in the economy.
- Inflation leads to changes in income distribution, to distortions, and to increased uncertainty.
- There are two important relations among output, unemployment, and inflation. The first, called Okun’s law, is a relation between output growth and the change in unemployment: High output growth typically leads to a decrease in the unemployment rate. The second, called the Phillips curve, is a relation between unemployment and inflation: A lower unemployment rate typically leads to a higher inflation rate.
- Macroeconomists distinguish between the short run (a few years), the medium run (a decade), and the long run (a few decades or more). They think of output as being determined by demand in the short run. They think of output as being determined by the level of technology, the capital stock, and the labor force in the medium run. Finally, they think of output as being determined by factors like education, research, saving, and the quality of government in the long run.

KEY TERMS

national income and product accounts, 40
aggregate output, 40
gross domestic product (GDP), 40
gross national product (GNP), 40
intermediate good, 40
final good, 41
value added, 41
nominal GDP, 42
real GDP, 42
real GDP in chained (2009) dollars, 43
dollar GDP, GDP in current dollars, 44

GDP in terms of goods, GDP in constant dollars, GDP adjusted for inflation, GDP in chained 2012 dollars, GDP in 2012 dollars, 44
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QUESTIONS AND PROBLEMS

QUICK CHECK

1. Using the information in this chapter, label each of the following statements true, false, or uncertain. Explain briefly.

- US GDP was 38 times higher in 2018 than it was in 1960.
- When the unemployment rate is high, the participation rate is also likely to be high.
- The rate of unemployment tends to fall during expansions and rise during recessions.
- If the Japanese CPI is currently at 108 and the US CPI is at 104, then the Japanese rate of inflation is higher than the US rate of inflation.
- The rate of inflation computed using the CPI is a better index of inflation than the rate of inflation computed using the GDP deflator.
- Okun's law shows that when output growth is lower than normal, the unemployment rate tends to rise.
- Periods of negative GDP growth are called *recessions*.
- When the economy is functioning normally, the unemployment rate is zero.
- The Phillips curve is a relation between the level of prices and the level of unemployment.

2. Suppose you are measuring annual GDP of a country by adding up the final value of all goods and services produced in the economy. Determine the effect on the country's GDP for each of the following transactions.

- A seafood restaurant buys €100 worth of fish from a fisherman.
- A family spends €100 on a dinner at a restaurant.
- China Eastern Airlines buys a C919 jet, manufactured in China, for ¥58 billion (\$9.5 billion) instead of a Boeing or an Airbus.
- The national airline of your country buys a new jet from Boeing for \$200 million.
- A European airline sells one of its Airbus to a private company for €100 million.

3. During a given year, suppose the following activities occur in an economy.

- An automobile manufacturing company pays its workers €10 million to assemble 5,000 cars. The cars are then sold to an automobile store for €12 million.
- That year, the store pays €1 million in wages to its salespeople, who sell the cars directly to consumers for €15 million.

- Using the production-of-final-goods approach, what is GDP in this economy?
- What is the value added at each stage of production? Using the value-added approach, what is GDP?
- What are the costs incurred in terms of wage payment and the profits earned? Using the income approach, what is GDP?

4. An economy produces three goods: cars, computers, and oranges. Quantities and prices per unit for years 2012 and 2013 are as follows:

	2012		2013	
	Quantity	Price	Quantity	Price
Cars	10	\$2000	12	\$3000
Computers	4	\$1000	6	\$500
Oranges	1,000	\$1	1000	\$1

- What is nominal GDP in 2012 and in 2013? By what percentage does nominal GDP change from 2012 to 2013?
- Using the prices for 2012 as the set of common prices, what is real GDP in 2012 and in 2013? By what percentage does real GDP change from 2012 to 2013?
- Using the prices for 2013 as the set of common prices, what is real GDP in 2012 and in 2013? By what percentage does real GDP change from 2012 to 2013?
- Why are the two output growth rates constructed in parts b and c different? Which one is correct? Explain your answer.

5. Consider the economy described in Problem 4.

- Use the prices for 2012 as the set of common prices to compute real GDP in 2012 and in 2013. Compute the GDP deflator for 2012 and for 2013, and compute the rate of inflation from 2012 to 2013.
- Use the prices for 2013 as the set of common prices to compute real GDP in 2012 and in 2013. Compute the GDP deflator for 2012 and for 2013 and compute the rate of inflation from 2012 to 2013.
- Why are the two rates of inflation different? Which one is correct? Explain your answer.