PEARSON NEW INTERNATIONAL EDITION

Macroeconomics
Robert J. Gordon
Twelfth Edition

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What Is Macroeconomics?

Business will be better or worse.
— Calvin Coolidge, 1928

1   How Macroeconomics Affects Our Everyday Lives

Macroeconomics is concerned with the big economic issues that determine your own economic well-being as well as that of your family and everyone you know. Each of these issues involves the overall economic performance of the nation rather than whether one particular individual earns more or less than another.

The nation's overall macroeconomic performance matters, not only for its own sake but because many individuals experience its consequences. The **Global Economic Crisis** that began in late 2007 has created enormous losses of income and jobs for millions of American families. Not only were almost 15 million people unemployed in late 2010, but many more have given up looking for jobs, have been forced to work part-time instead of full-time, or have experienced pay cuts or furlough days when they have not been paid. By one estimate, more than half of American families since 2007 have experienced the job loss of a family member, a pay cut, or being forced to work part-time instead of full-time.

Macroeconomic performance can also determine whether inflation will erode the value of family savings, as occurred in the 1970s when the annual inflation rate reached 10 percent. Today's students also care about economic growth, which will determine whether in their future lives they will have a higher standard of living than their parents do today.

The "Big Three" Concepts of Macroeconomics

Each of these connections between the overall economy and the lives of individuals involves a central macroeconomic concept introduced in this chapter—unemployment, inflation, and economic growth. The basic task of macroeconomics is to study the causes of good or bad performance of these three concepts, why each matters to individuals, and what (if anything) the government can do to improve macroeconomic performance. While there are numerous other important macroeconomic concepts, we start by focusing just on these, which are the "Big Three" concepts of macroeconomics:

1. The **unemployment rate.** The higher the overall unemployment rate, the harder it is for each individual who wants a job to find work. College seniors who want permanent jobs after graduation are likely to have fewer job offers if the national unemployment rate is high, as in 2009–10, than low, as

Macroeconomics is the study of the major economic totals, or aggregates.

The **Global Economic Crisis** is the crisis that began in 2007 that simultaneously depressed economic activity in most of the world's economies.

The **unemployment rate** is the number of persons unemployed (jobless individuals who are actively looking for work or are on temporary layoff) divided by the total of those employed and unemployed.

in 2005–2007. All adults fear a high unemployment rate, which raises the chances that they will be laid off, be unable to pay their bills, have their cars repossessed, lose their health insurance, or even lose their homes through mortgage foreclosures. In "bad times," when the unemployment rate is high, crime, mental illness, and suicide also increase. The widespread consensus that unemployment is the most important macroeconomic issue has been further highlighted by the dismal labor market of 2009–10, when fully half of the unemployed were jobless for more than six months. And the recognized harm created by high unemployment is nothing new. Robert Burton, an English clergyman, wrote in 1621 that "employment is so essential to human happiness that indolence is justly considered the mother of misery."

The **inflation rate** is the percentage rate of increase in the economy's average level of prices.

2. The **inflation rate.** A high inflation rate means that prices, on average, are rising rapidly, while a low inflation rate means that prices, on average, are rising slowly. An inflation rate of zero means that prices remain essentially the same, month after month. In inflationary periods, retired people, or those about to retire, lose the most, since their hard-earned savings buy less as prices go up. Even college students lose as the rising prices of room, board, and textbooks erode what they have saved from previous summer and after-school jobs. While a high inflation rate harms those who have saved, it helps those who have borrowed. Great harm comes from this capricious aspect of inflation, taking from some and giving to others. People want their lives to be predictable, but inflation throws a monkey wrench into individual decision making, creating pervasive uncertainty.

Productivity is the aggregate output produced per hour.

3. **Productivity** growth. "Productivity" is the aggregate output per hour of work that a nation produces in total goods and services; it was about $61 per worker-hour in the United States in 2010. The faster aggregate productivity grows, the easier it is for each member of society to improve his or her standard of living. If productivity were to grow at 3 percent from 2010 to the year 2030, U.S. productivity would rise from $61 per worker-hour to $111 per worker-hour. When multiplied by all the hours worked by all the employees in the country, this extra $50 per worker-hour would make it possible for the nation to have more houses, cars, hospitals, roads, schools, and to combat greenhouse gas emissions that worsen global warming.

But if the growth rate of productivity were zero instead of 3 percent, U.S. productivity would remain at $61 in the year 2030. To have more houses and cars, we would have to sacrifice by building fewer hospitals and schools. Such an economy, with no productivity growth, has been called the "zero-sum society," because any extra good or service enjoyed by one person requires that something be taken away from someone else. Many have argued that the achievement of rapid productivity growth and the avoidance of a zero-sum society form the most important macroeconomic challenge of all.

The first two of the "Big Three" macroeconomic concepts, the unemployment and inflation rates, appear in the newspaper every day. When economic conditions are poor—as in 2009–10—daily headlines announce that one large company or another is laying off thousands of workers. In the past, sharp increases in the rate of inflation have also made headlines, as when the price of gasoline jumped during 2006–08. The third major concept, productivity growth, has received widespread attention since 1995 as a source of an improving American standard of living compared to that in Europe and Japan.

Macroeconomic concepts also play a big role in politics. Incumbent political parties benefit when unemployment and inflation are relatively low, as in the landslide victories of Lyndon Johnson in 1964 and Richard Nixon in 1972. Incumbent presidents who fail to gain reelection often are the victims of a sour economy, as in the cases of Herbert Hoover in 1932, Jimmy Carter in 1980, and more recently George W. Bush in 2008. The defeat of Al Gore by George W. Bush in 2000 was an exception since the strong economy of 2000 should have helped Gore's incumbent Democratic party win the presidency.

GLOBAL ECONOMIC CRISIS FOCUS

What Makes It Unique?

The Global Economic Crisis that started in 2008 is by most measures the most severe downturn since the Great Depression of the 1930s. Its severity is most apparent in the high level of the unemployment rate (10 percent) reached in 2009–10, in the relatively long duration of unemployment suffered by those who lost their jobs, and in the prediction that the unemployment rate would not return to its normal level of around 5 percent until perhaps 2015 or 2016. Thus, of our three big macro concepts, the Global Economic Crisis mainly affected the unemployment rate, while the inflation rate remained low and productivity growth was relatively robust.

2 Defining Macroeconomics

How Macroeconomics Differs from Microeconomics

Most topics in economics can be placed in one of two categories: macroeconomics or microeconomics. *Macro* comes from a Greek word meaning large; *micro* comes from a Greek word meaning small. Put another way, macroeconomics deals with the totals, or **aggregates,** of the economy, and microeconomics deals with the parts.

An **aggregate** is the total amount of an economic magnitude for the economy as a whole.

Microeconomics is devoted to the relationships among the different *parts* of the economy. For example, in micro we try to explain the wage or salary of one type of worker in relation to another. For example, why is a professor's salary more than that of a secretary but less than that of an investment banker? In contrast, macroeconomics asks why the total income of all citizens rises strongly in some periods but declines in others.

Economic Theory: A Process of Simplification

Economic theory helps us understand the economy by *simplifying complexity.* Theory throws a spotlight on just a few key relations. Macroeconomic theory examines the behavior of aggregates such as the unemployment rate and the inflation rate while ignoring differences among individual households. It studies the causes and possible cures of the Global Economic Crisis at the level of individual nations, instead of trying to explain why some individuals are more prone than others to losing their jobs.

It is this process of simplification that makes the study of economics so exciting. By learning a few basic macroeconomic relations, you can quickly

learn how to sift out the hundreds of irrelevant details in the news in order to focus on the few key items that foretell where the economy is going. You also will begin to understand which national and personal economic goals can be attained and which are "pie in the sky." You will learn when it is fair to credit a president for strong economic performance or blame a president for poor performance.

3   Actual and Natural Real GDP

We have learned that the "Big Three" macroeconomic concepts are the unemployment rate, the inflation rate, and the rate of productivity growth. Linked to each of these is the total level of output produced in the economy. The higher the level of output, the lower the unemployment rate. The higher the level of output, the faster tends to be the rate of inflation. Finally, for any given number of hours worked, a higher level of output automatically boosts output per hour, that is, productivity.

Gross domestic product is the value of all currently produced goods and services sold on the market during a particular time interval.

The official measure of the economy's total output is called **gross domestic product** and is abbreviated GDP. Real GDP includes all currently produced goods and services sold on the market within a given time period and excludes certain other types of economic activity. As you will also learn, the adjective "real" means that our measure of output reflects the quantity produced, corrected for any changes in prices.

Actual real GDP is the value of total output corrected for any changes in prices.

Actual real GDP is the amount an economy actually produces at any given time. But we need some criterion to judge the desirability of that level of actual real GDP. Perhaps actual real GDP is too low, causing high unemployment. Perhaps actual real GDP is too high, putting upward pressure on the inflation rate. Which level of real GDP is desirable, neither too low nor too high? This intermediate compromise level of real GDP is called "natural," a level of real GDP in which there is no tendency for the rate of inflation to rise or fall.

Figure 1 illustrates the relationship between actual real GDP, natural real GDP, and the rate of inflation. In the upper frame the red line is actual real GDP. The lower frame shows the inflation rate. The thin dashed vertical lines connect the two frames. The first dashed vertical line marks time period t_0. Notice in the bottom frame that the inflation rate is constant at t_0, neither speeding up nor slowing down.

Natural real GDP designates the level of real GDP at which the inflation rate is constant, with no tendency to accelerate or decelerate.

By definition, **natural real GDP** is equal to actual real GDP when the inflation rate is constant. Thus, in the upper frame, at t_0 the red actual real GDP line is crossed by the black natural real GDP line. To the right of t_0, actual real GDP falls below natural real GDP, and we see in the bottom frame that inflation slows down. This continues until time period t_1, when actual real GDP once again is equal to natural real GDP. Here the inflation rate stops falling and is constant for a moment before it begins to rise.

This cycle repeats itself again and again. *Only when actual real GDP is equal to natural real GDP is the inflation rate constant.* For this reason, natural real GDP is a compromise level to be singled out for special attention. During a period of low actual real GDP, designated by the blue area, the inflation rate slows down. During a period of high actual real GDP, designated by the shaded red area, the inflation rate speeds up.

Why Too Much Real GDP Is Undesirable

Figure 1 **The Relation Between Actual and Natural Real GDP and the Inflation Rate**

In the upper frame the solid black line shows the steady growth of natural real GDP—the amount the economy can produce at a constant inflation rate. The red line shows the path of actual real GDP. In the blue region in the top frame, actual real GDP is below natural real GDP, so the inflation rate, shown in the bottom frame, slows down. In the region designated by the red area, actual real GDP is above natural real GDP, so in the bottom frame inflation speeds up.

Unemployment: Actual and Natural

When actual real GDP is low, many people lose their jobs, and the unemployment rate is high, as shown in Figure 2. The top frame duplicates Figure 1 exactly, comparing actual real GDP with natural real GDP. The blue line in the bottom frame is the actual percentage unemployment rate, the first of the three central concepts of macroeconomics. The thin vertical dashed lines connecting the upper frame and lower frame show that whenever actual and natural real GDP are equal in the top frame, the actual unemployment rate is equal to the **natural rate of unemployment** in the bottom frame.

The definition of the natural rate of unemployment corresponds exactly to natural real GDP, describing a situation in which there is no tendency for the inflation rate to change. When the actual unemployment rate is high, actual real GDP is low (shown by blue shading in both frames), and the inflation rate slows down. In periods when actual real GDP is high and the economy prospers, the actual unemployment rate is low (shown by red shading in both frames) and the inflation rate speeds up. It is easy to remember the mirror-image behavior of real GDP and the unemployment rate. We use the shorthand

The **natural rate of unemployment** designates the level of unemployment at which the inflation rate is constant, with no tendency to accelerate or decelerate.

5

Figure 2 **The Behavior Over Time of Actual and Natural Real GDP and the Actual and Natural Rates of Unemployment**

When actual real GDP falls below natural real GDP, designated by the blue shaded areas in the top frame, the actual unemployment rate rises above the natural rate of unemployment as indicated in the bottom frame. The red shaded areas designate the opposite situation. When we compare the blue shaded areas of Figures 1 and 2, we see that the time intervals when unemployment is high (1–2) also represent time intervals when inflation is slowing down (1–1). Similarly, the red shaded areas represent time intervals when inflation is speeding up and unemployment is low.

Unemployment Cycles Are the Mirror Image of Real GDP Cycles
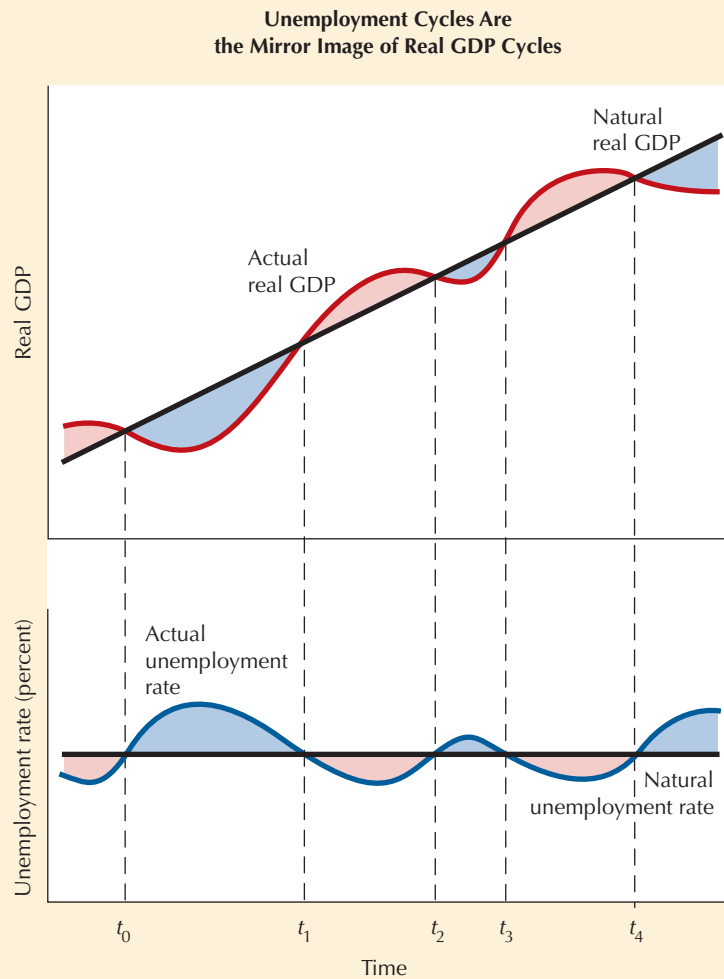
The **GDP gap** is the percentage difference between actual real GDP and natural real GDP. Another name for this concept is the "output gap."

The **unemployment gap** is the difference between the actual unemployment rate and the natural rate of unemployment.

label **GDP gap** for the percentage difference between actual real GDP and natural real GDP. We use the parallel shorthand label **unemployment gap** for the difference between the actual unemployment rate and the natural rate of unemployment. In recessions when the GDP gap is negative, the unemployment gap is positive, and both of the gaps are represented by the blue shaded areas in Figure 2. In highly prosperous periods like the late 1990s, the GDP gap is positive and the unemployment gap is negative, as indicated by the red shaded areas in Figure 2. Another name for the GDP gap is the "output gap."

Figures 1 and 2 summarize a basic dilemma faced by government policymakers who are attempting to achieve a low unemployment rate and a low inflation rate at the same time. If the inflation rate is high, lowering it requires a decline in actual real GDP and an increase in the actual unemployment rate. This happened in the early 1980s, when inflation was so high that the government deliberately pushed unemployment to its highest level since the 1930s. If, to the contrary, the policymaker attempts to provide jobs for everyone and keep the actual unemployment rate low then the inflation rate will speed up, as occurred in the 1960s and late 1980s.

Real GDP and the Three Macro Concepts

The total amount that the economy produces, actual real GDP, is closely related to the three central macroeconomic concepts introduced earlier in this chapter. First, as we see in Figure 2, the *difference* between actual and natural real GDP moves inversely with the *difference* between the actual and natural unemployment rates. When actual real GDP is high, unemployment is low, and vice versa.

The second link is with inflation, since inflation tends to speed up when actual real GDP is higher than natural real GDP (as in Figure 1). The third link is with productivity, which is defined as actual real GDP per hour; data on actual real GDP are required to calculate productivity.

Each of these links with the central macroeconomic concepts requires that actual real GDP be compared with *something else* in order to be meaningful. It must be compared to natural real GDP to provide a link with unemployment and inflation, or it must be divided by the number of hours worked to compute productivity. Actual real GDP by itself, without any such comparison, is not meaningful, which is why it is not included on the list of the three major macro concepts.

◆ SELF-TEST 1

1. When actual real GDP is above natural real GDP, is the actual unemployment rate above, below, or equal to the natural unemployment rate?

2. When actual real GDP is below natural real GDP, is the actual unemployment rate above, below, or equal to the natural unemployment rate?

3. When the actual unemployment rate is equal to the natural rate of unemployment, is the actual rate of inflation equal to the natural rate of inflation?

4   Macroeconomics in the Short Run and Long Run

Macroeconomic theories and debates can be divided into two main groups: (1) those that concern the "short-run" stability of the economy, and (2) those that concern its "long-run" growth rate. Much of macroeconomic analysis concerns the first group of topics involving the short run, usually defined as a period lasting from one year to five years, and focuses on the first two major macroeconomic concepts introduced in Section 1, the unemployment rate and the inflation rate. We ask why the unemployment rate and the inflation rate over periods of a few years are sometimes high and sometimes low, rather than always low as we would wish. These ups and downs are usually called "economic fluctuations" or **business cycles.** Much of this text concerns the causes of these cycles and the efficacy of alternative government policies to dampen or eliminate the cycles.

The other main topic in macroeconomics concerns the long run, which is a longer period ranging from one decade to several decades. It attempts to explain the rate of productivity growth, the third key concept introduced in Section 1, or more generally, **economic growth.** Learning the causes of growth helps us predict whether successive generations of Americans will be better off than their predecessors, and why some countries remain so poor in a world

Business cycles consist of expansions occurring at about the same time in many economic activities, followed by similarly general recessions and recoveries.

Economic growth is the topic area of macroeconomics that studies the causes of sustained growth in real GDP over periods of a decade or more.

where other countries by contrast are so rich. The remarkable achievement of China in achieving economic growth of 8 to 9 percent per year consistently over the past three decades raises a new question about economic growth—how long will it take the Chinese economy to catch up to the American level of real GDP per person?

The Short Run: Business Cycles

The main short-run concern of macroeconomists is to minimize fluctuations in the unemployment and inflation rates. This requires that fluctuations in real GDP be minimized.

Figure 3 contrasts two imaginary economies: "Volatilia" in the left frame and "Stabilia" in the right frame. The black "natural real GDP" lines in both frames are *absolutely identical.* The two economies differ only in the size of their business cycles, shown by the size of their GDP gap, which is simply the difference between actual and natural real GDP shown by blue and red shading.

In the left frame, Volatilia is a macroeconomic hell, with severe business cycles and large gaps between actual and natural real GDP. In the right frame, Stabilia is macroeconomic heaven, with mild business cycles and small gaps between actual and natural real GDP. All macroeconomists prefer the economy depicted by the right-hand frame to that depicted by the left-hand frame. But the debate between macro schools of thought starts in earnest when we ask how to achieve the economy of the right-hand frame. Active do-something policies? Do-nothing, hands-off policies? There are economists who support each of these alternatives, and more besides. But everyone agrees that Stabilia

Economic Failure and Success

(a) Volatilia

(b) Stabilia

Figure 3 **Business Cycles in Volatilia and Stabilia**
The left frame shows the huge business cycles in a hypothetical nation called Volatilia. Short-run macroeconomics tries to dampen business cycles so that the path of actual real GDP is as close as possible to natural real GDP, as shown in the right frame for a nation called Stabilia.

A Succession of Cycles

Figure 4 Basic Business-Cycle Concepts

The real output line exhibits a typical succession of business cycles. The highest point reached by real output in each cycle is called the *peak* and the lowest point the *trough.* The *recession* is the period between peak and trough; the *expansion* is the period between the trough and the next peak.

is a more successful economy than Volatilia. To achieve the success of Stabilia, Volatilia must find a way to eliminate its large real GDP gap.

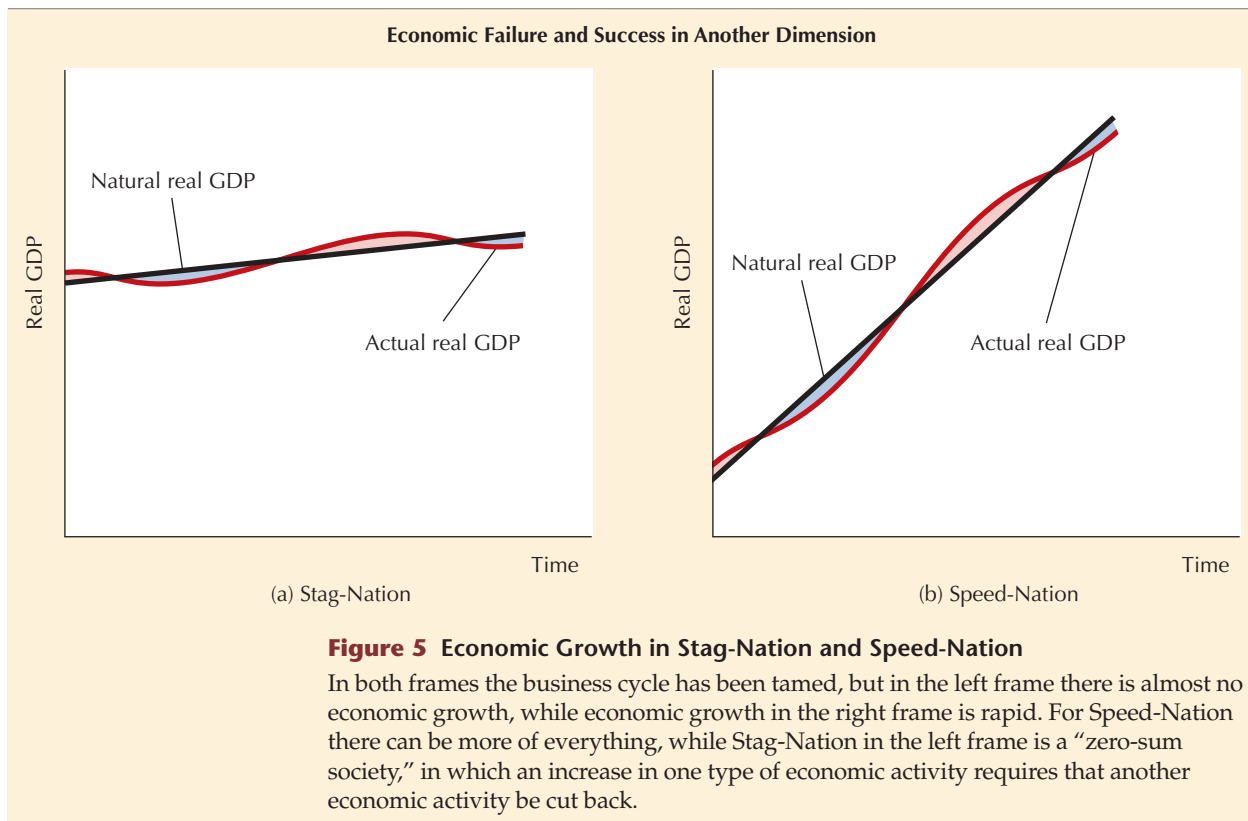The hallmark of business cycles is their pervasive character, which affects many different types of economic activity at the same time. This means that they occur again and again but not always at regular intervals, nor are they the same length. Business cycles in the past have ranged in length from one to twelve years.[1] Figure 4 illustrates two successive business cycles in real output. Although a simplification, Figure 4 contains two realistic elements that have been common to most real-world business cycles. First, the expansions last longer than the recessions. Second, the two business cycles illustrated in the figure differ in length.

The Long Run: Economic Growth

For a society to achieve an increasing standard of living, total output per person must grow, and such economic growth is the long-run concern of macroeconomists. Look at Figure 5, which contrasts two economies. Each has mild business cycles, like Stabilia in Figure 3. But in Figure 5, the left frame presents a country called "Stag-Nation," which experiences very slow growth in real GDP. In contrast, the right-hand frame depicts "Speed-Nation," a country with very fast growth in real GDP. If we assume that population growth in each country is the same, then growth in output per person is faster in Speed-Nation. In Speed-Nation everyone can purchase more consumer goods, and there is plenty of output left to provide better schools, parks, hospitals, and other public services. In Stag-Nation people must constantly face debates, since more money for schools or parks requires that people sacrifice consumer goods.

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[1] A comprehensive source for the chronology of and data on historical business cycles, as well as research papers by distinguished economists, is Robert J. Gordon, ed., *The American Business Cycle: Continuity and Change* (Chicago: University of Chicago Press, 1986). An up-to-date chronology and a discussion of the 2007–09 recession can be found at www.nber.org/cycles/cyclesmain.html.

Economic Failure and Success in Another Dimension

(a) Stag-Nation

(b) Speed-Nation

Figure 5 Economic Growth in Stag-Nation and Speed-Nation
In both frames the business cycle has been tamed, but in the left frame there is almost no economic growth, while economic growth in the right frame is rapid. For Speed-Nation there can be more of everything, while Stag-Nation in the left frame is a "zero-sum society," in which an increase in one type of economic activity requires that another economic activity be cut back.

Over the past decade, countries like Stag-Nation include Germany, Italy, and Japan. Countries like Speed-Nation include China and India. The United States has been between these extremes.

How do we achieve faster economic growth in output per person? We study the sources of economic growth and the role of government policy in helping to determine the growth in America's future standard of living, as well as the reasons why some countries remain so poor.

◆ **SELF-TEST 2**

Indicate whether each item in the following list is more closely related to short-run (business cycle) macro or to long-run (economic growth) macro:

1. The Federal Reserve reduces interest rates in a recession in an attempt to reduce the unemployment rate.

2. The federal government introduces national standards for high school students in an attempt to raise math and science test scores.

3. Consumers cut back spending because news of layoffs makes them fear for their jobs.

4. The federal government gives states and localities more money to repair roads, bridges, and schools.

5 CASE STUDY

How Does the Global Economic Crisis Compare to Previous Business Cycles?

This section examines U.S. macroeconomic history since the early twentieth century. You will see that unemployment in the past four decades did not come close to the extreme crisis levels of the 1930s.

Real GDP

Figure 6 is arranged just like Figure 2. But whereas Figure 2 shows hypothetical relationships, Figure 6 shows the actual historical record. In the top frame the solid black line is natural real GDP, an estimate of the amount the economy could have produced each year without causing acceleration or deceleration of inflation.

The red line in the top frame plots actual real GDP, the total production of goods and services each year measured in the constant prices of 2005. Can you pick out those years when actual and natural real GDP are roughly equal? Some of these years were 1900, 1910, 1924, 1964, 1987, 1997, and 2007.

In years marked by blue shading, actual real GDP fell below natural real GDP. A maximum deficiency occurred in 1933, when actual real GDP was only 64 percent of natural GDP; about 35 percent of natural real GDP was thus "wasted," that is, not produced. In some years actual real GDP exceeded natural real GDP, shown by the shaded red areas. The largest red area occurred during World War II in 1942–45.

Unemployment

In the middle frame of Figure 6, the blue line plots the actual unemployment rate. By far the most extreme episode was the Great Depression, when the actual unemployment rate remained above 10 percent for ten straight years, 1931–40. The black line in the middle frame of Figure 6 displays the natural rate of unemployment, the minimum attainable level of unemployment that is compatible with avoiding an acceleration of inflation. The red shaded areas mark years when actual unemployment fell below the natural rate, and the blue shaded areas mark years when unemployment exceeded the natural rate.

Notice now the relationship between the top and middle frames of Figure 6. The blue shaded areas in both frames designate periods of low production, low real GDP, and high unemployment, such as the Great Depression of the 1930s. The red shaded areas in both frames designate periods of high production and high actual real GDP, and low unemployment, such as World War II and other wartime periods. ◆
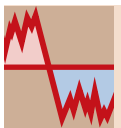
GLOBAL ECONOMIC CRISIS FOCUS

How It Differs from 1982–83

The bottom frame of Figure 6 magnifies the middle frame by starting the plot in 1970 instead of 1900. Over the past four decades there have been three big recessions with unemployment reaching its peak in 1975, then 1982–83, and most recently in 2009–10. The recent episode of high unemployment is more serious

(continued)

A Historical Report Card on Real GDP and Unemployment
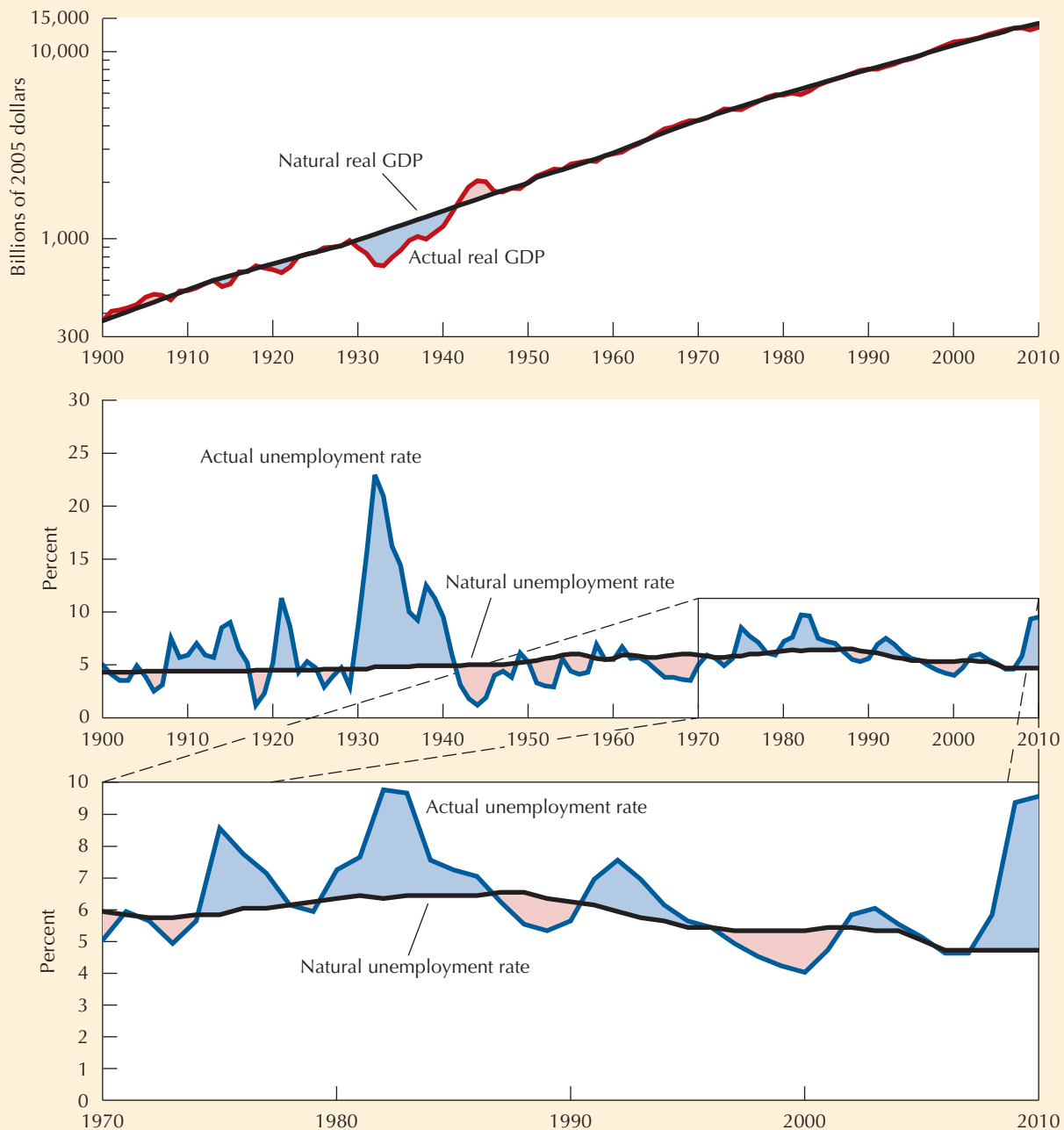
Figure 6 **Actual and Natural GDP and Unemployment, 1900–2010**

A historical report card for two important economic magnitudes. In the top frame the black line indicates natural real GDP. The red line shows actual real GDP, which was well below natural real GDP during the Great Depression of the 1930s and well above it during World War II. In the middle frame the black line indicates the natural rate of unemployment, and the blue line indicates the actual unemployment rate. Actual unemployment was much higher during the Great Depression of the 1930s than at any other time during the century. The bottom frame magnifies the middle frame to focus on unemployment since 1970. There we see that the 2009–10 levels of high unemployment were equivalent to 1982–83. However, the increase in unemployment was greater in 2007–10 than in 1980–82 since that economy started from a lower unemployment rate.

and harmful than in 1982–83 for several reasons. Notice that the unemployment rate dropped sharply from 1983 to 1984, while the decline in the unemployment rate in 2011–12 is forecast to be very slow. In the recent episode a larger share of the unemployed have been without jobs for six months or more, and a much larger share of the labor force than in 1982–83 has been forced to work on a part-time basis rather than their desired full-time status.

6 Macroeconomics at the Extremes

Most of macroeconomics treats relatively normal events. Business cycles occur, and unemployment goes up and down, as does inflation. Economic growth registers faster rates in some decades than in others. Yet there are times when the economy's behavior is anything but normal. The normal mechanisms of macroeconomics break down, and the consequences can be dire. Three examples of unusual macroeconomic behavior involving our "Big Three" concepts are the Great Depression of the 1930s, the German hyperinflation of the 1920s, and the stark difference in economic growth between two Asian nations over the past 50 years.
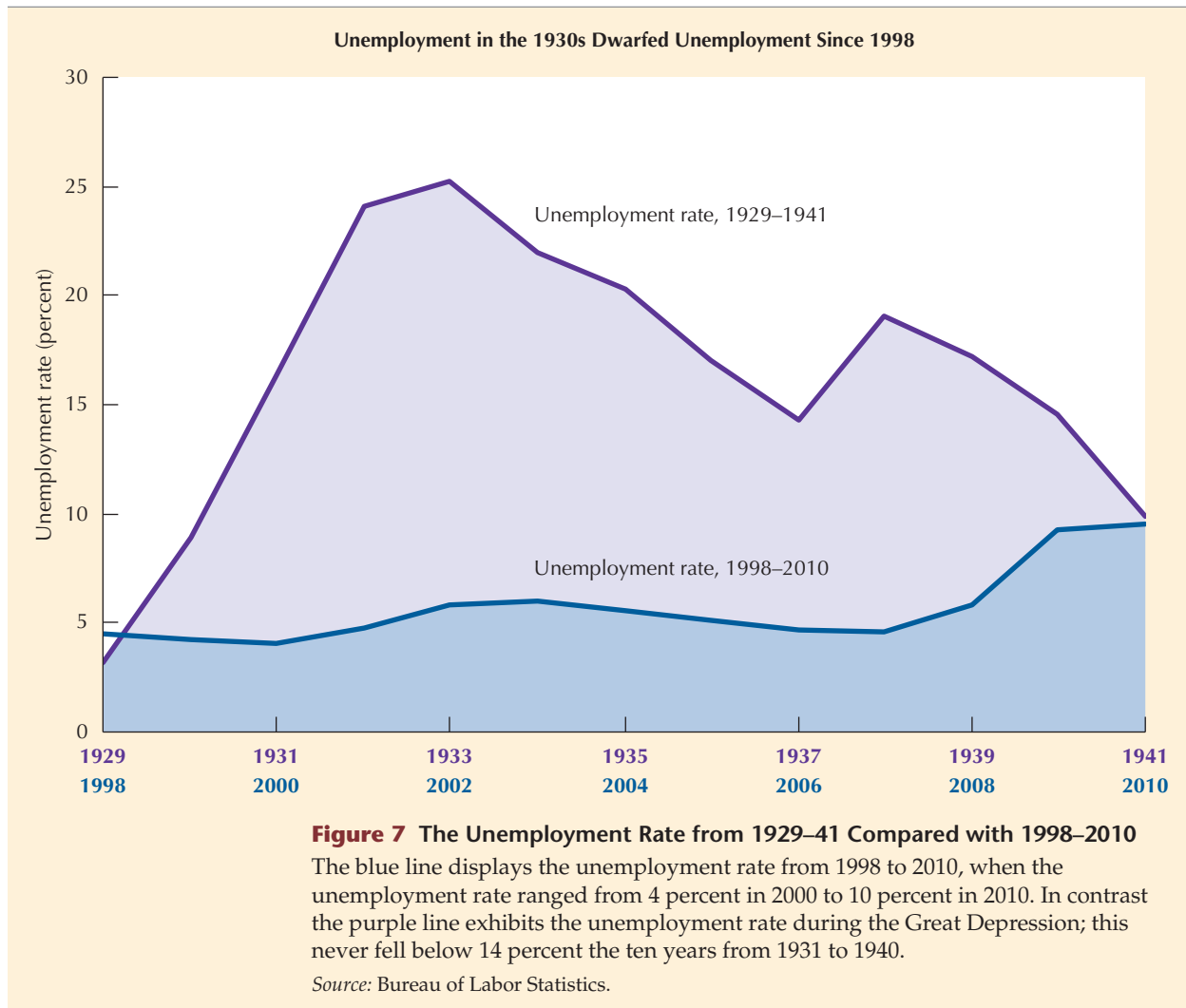
Unemployment in the Great Depression, 1929–40

The first of our "Big Three" macroeconomic concepts is the unemployment rate. The most extreme event involving unemployment in recorded history was the Great Depression of the 1930s. As is clearly visible in Figure 6 in the previous section, real GDP collapsed between 1929 and 1933, and the unemployment rate soared. A closer look at the decade of the 1930s is provided in Figure 7. For contrast with the 1930s, the blue line displays the unemployment rate from 1998 to 2010. The unemployment rate during the Great Depression behaved quite differently, as shown by the purple line, soaring from 3.2 percent in 1929 to 25.2 percent in 1933, and never falling below 10 percent until 1941. By 2010 the unemployment rate had reached 9.5 percent, almost as high as it was in 1941.

In the United States, the Great Depression caused many millions of jobs to disappear. College seniors could not find jobs. Stories of job hunting were unbelievable but true. For example, men waited all night outside Detroit employment offices so they would be first in line the next morning. An Arkansas man walked 900 miles looking for work. So discouraged were Americans of finding jobs that for the first (and last) time in American history, there were more emigrants than immigrants. In fact, there were 350 applications per day from Americans who wanted to settle in Russia. Since there was no unemployment insurance, how did people live when there were no jobs? Wedding rings were sold, furniture pawned, life insurance borrowed against, and money begged from relatives. Millions with no resources moved aimlessly from city to city, sometimes riding on freight cars; some cities tried to keep the wanderers out with barricades and shotguns.[2]

The Great Depression affected most of the industrialized world but was most serious in the United States and in Germany. The Great Depression in Germany led directly to Hitler's takeover of power in 1933 and indirectly

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[2] Details in this paragraph are from William Manchester, *The Glory and the Dream: A Narrative History of America,* 1932–72 (Boston: Little-Brown, 1973), pp. 33–35.

Unemployment in the 1930s Dwarfed Unemployment Since 1998

Figure 7 **The Unemployment Rate from 1929–41 Compared with 1998–2010**
The blue line displays the unemployment rate from 1998 to 2010, when the unemployment rate ranged from 4 percent in 2000 to 10 percent in 2010. In contrast the purple line exhibits the unemployment rate during the Great Depression; this never fell below 14 percent the ten years from 1931 to 1940.
Source: Bureau of Labor Statistics.

caused the 50 million deaths of World War II. What caused the disastrous depression and what could have been done to avoid it? We need to study basic macroeconomics first, and then we will examine the causes of the Great Depression.

The German Hyperinflation of 1922–23

A *hyperinflation* can be defined as an inflation raging at a rate of 50 percent or more *per month.* If a Big Mac cost $2 in January, a 50 percent monthly inflation would raise the price to $3 in February, $4.50 in March, $6.75 in April, and onward until it reached $173 in December! There were several examples of hyperinflation in the twentieth century, most of them involving the experience of European countries after World Wars I and II. The best known is the German hyperinflation, which proceeded at 322 percent per month between August 1922 and November 1923; in its final climactic days in October 1923, the inflation rate was 32,000 percent per month! Figure 8 displays the German price level from 1920 to 1923. The price

When Sausages Cost 100 Billion Marks

Figure 8 **The German Price Level, 1920–23**

The orange line shows the German price level, which increased from a little above 1 in 1920 and 1921 to 550 at the end of 1922 and to 100,000,000,000 in November 1923.
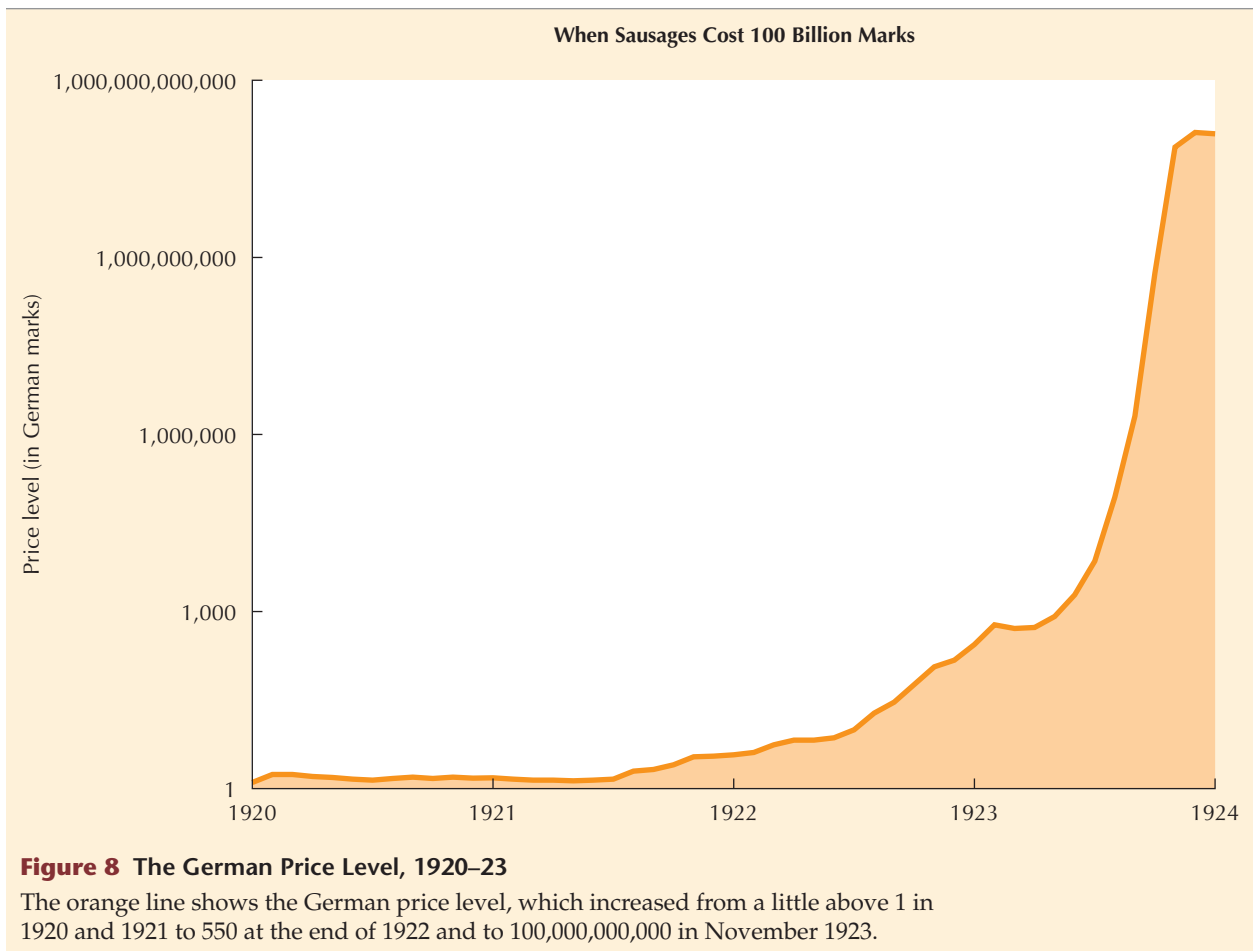
level goes from slightly above 1.0 in 1920 and early 1921 to 550 by the end of 1922 and about 100,000,000,000 at the end of 1923.

The basic cause of the German hyperinflation was the Versailles Peace Treaty, which ended World War I and required payment of massive reparations by Germany to Britain and France. The Germans were unwilling to obtain funds to pay the reparations by raising taxes, so instead they ran huge government budget deficits financed by printing paper money. When people realized the implications of these deficits, they became less willing to hold money; it was both the rapid increase in the supply of money and the ever-declining demand for money that combined to fuel the hyperinflation.[3]

The inflation decimated the savings of ordinary Germans. A farmer who sold a piece of land for 80,000 marks as a nest egg for his old age could barely buy a sandwich with the money a few years later. Elderly Germans can still recall the days in 1923 when:

> People were bringing money to the bank in cardboard boxes and laundry baskets. As we no longer could count it, we put the money on scales and weighed it. I can still see my brothers coming home Saturdays with heaps of paper money. When the

[3] Data from Philip Cagan, "The Monetary Dynamics of Hyperinflation," in Milton Friedman, ed., *Studies in the Quantity Theory of Money* (Chicago: University of Chicago Press, 1956), Table 1, p. 26.

shops reopened after the weekend they got no more than a breakfast roll for it. Many got drunk on their pay because it was worthless on Monday.[4]

Just as the Great Depression helped to create resentments about the existing government that turned voters to Hitler's Nazi party, so bitter memories of lost savings in the hyperinflation ten years earlier added to Hitler's growing support. Very rapid inflation is not an ancient artifact lacking relevance for today.

Throughout the 1980s and 1990s several Latin American countries suffered from inflation rates of 1,000 percent per year or more. Recently, a devastating inflation broke out in the southern African nation of Zimbabwe, where the inflation rate in October 2008 reached 210 billion percent per year! Because the government failed to raise the wages of teachers and hospital workers by even remotely the percentage by which prices had gone up, the nation in 2007–09 was in a state of collapse, with schools and hospitals closing down. So severe was the hyperinflation that in early 2009 the government cut 12 zeros off all types of currency and all prices, so that people would trade in a banknote marked 1,000,000,000,000 and receive a new banknote marked 1. In this chaotic environment more and more citizens turned to using currencies of other countries, particularly the South African Rand.
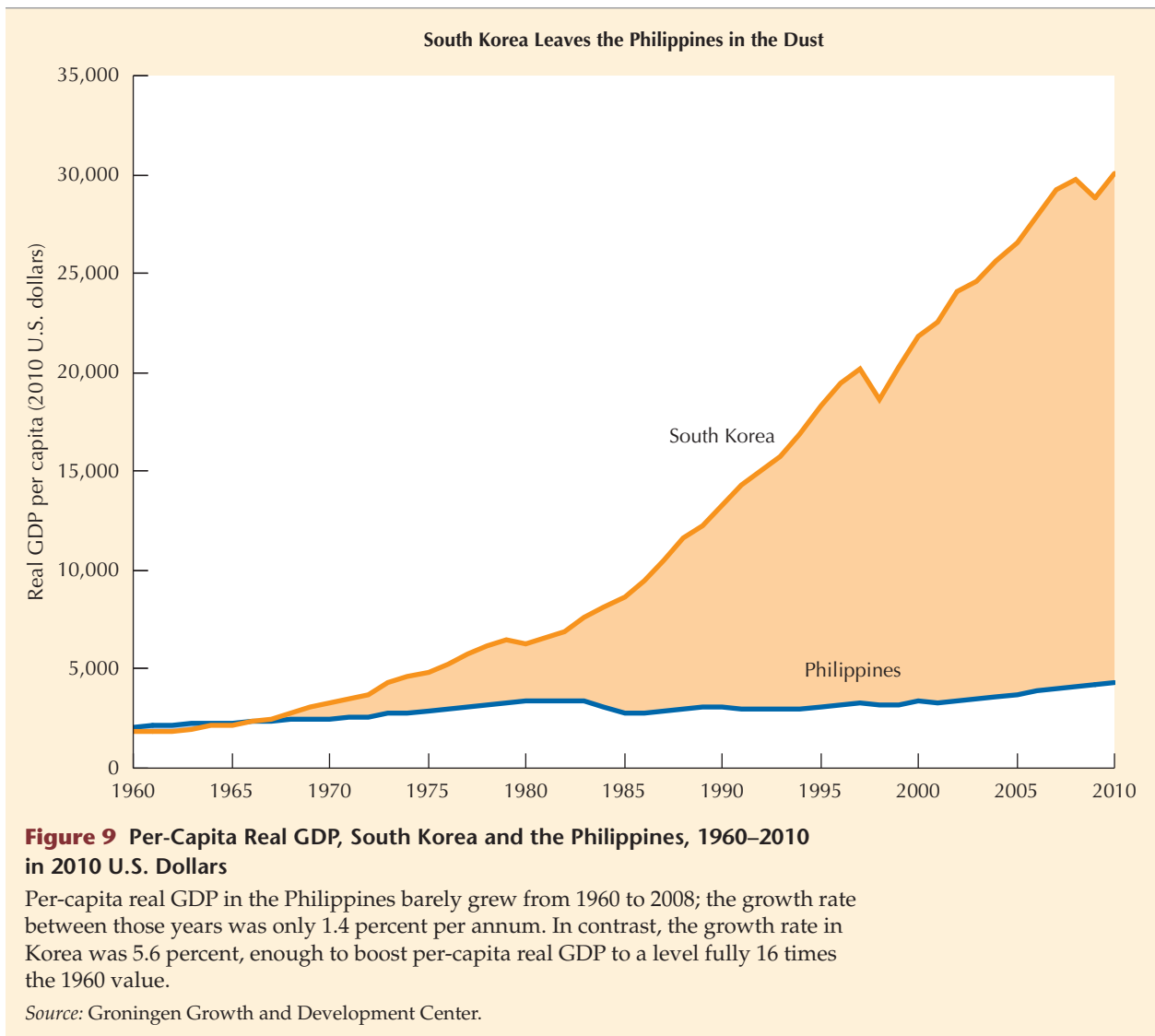
Fast and Slow Growth in Asia

Neither the Great Depression nor the German hyperinflation had any significant effect on the American or German standard of living a decade or two later. For effects that really matter over the decades, we need to look at the third of our "Big Three" macroeconomic concepts: productivity growth. Differences in growth rates that may appear small can compound over the decades and create enormous differences in the standard of living of any economic unit, from individuals to nations. A classic example of the importance of rapid growth is illustrated in Figure 9, which displays real GDP per capita in South Korea and the Philippines over the period 1960 to 2010.

In 1960, real GDP per capita in the Philippines was actually 20 percent higher than in South Korea. But between 1960 and 2010, real GDP per capita grew at 5.6 percent per year in South Korea compared to only 1.4 percent in the Philippines. Figure 9 shows the wide gap that opened up between the Korean and Philippine standards of living, with 2010 values of only $4,357 for the Philippines and $30,175 for South Korea. As a result of its superior economic growth record, the average Korean in 2010 could save or consume almost seven times as much as the average citizen of the Philippines. Stated another way, the Korean could consume everything enjoyed by the Philippine citizen and then have almost six times as much left over. This extra output in Korea is shown by the orange shading in Figure 9.

The outstanding achievement of South Korea has been duplicated in several other countries in East Asia, notably Hong Kong, Singapore, and Taiwan, and more recently by China. What secrets have the Koreans learned about economic growth that the Philippine government and population have not learned?

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[4] Alice Siegert, "When Inflation Ruined Germany," *Chicago Tribune,* November 30, 1974.

South Korea Leaves the Philippines in the Dust

Figure 9 Per-Capita Real GDP, South Korea and the Philippines, 1960–2010 in 2010 U.S. Dollars

Per-capita real GDP in the Philippines barely grew from 1960 to 2008; the growth rate between those years was only 1.4 percent per annum. In contrast, the growth rate in Korea was 5.6 percent, enough to boost per-capita real GDP to a level fully 16 times the 1960 value.

Source: Groningen Growth and Development Center.

7 Taming Business Cycles: Stabilization Policy

Macroeconomic analysts have two tasks: to analyze the causes of changes in important aggregates and to predict the consequences of alternative policy changes. In policy discussions the group of aggregates that society cares most about—inflation, unemployment, and the long-term growth rate of productivity—are called goals, or **target variables.** When the target variables deviate from desired values, alternative **policy instruments** can be used in an attempt to achieve needed changes. Instruments fall into three broad categories: **monetary policies**, which include control of the money supply and interest rates; **fiscal policies**, which include changes in government expenditures and tax rates; and a third, miscellaneous group, which includes policies to equip workers with skills they need to qualify for jobs.

How are target variables and policy instruments related to the three central macroeconomic concepts introduced at the beginning of this chapter? All three

Target variables are aggregates whose values society cares about.

Policy instruments are elements that government policymakers can manipulate directly to influence target variables.

Monetary policy tries to influence target variables by changing the money supply or interest rate or both.

Fiscal policy tries to influence target variables by manipulating government expenditures and tax rates.

INTERNATIONAL PERSPECTIVE

Differences Between the United States and Europe
Before and During the Global Economic Crisis

One result of the internationalization of macroeconomics is the increased attention to the relative economic performance of major countries or regions in the world, such as the United States versus Europe or Asia. We learn from these comparisons that performance differs over time. Compared to Europe, the United States did not perform well from 1960 to 1985 but then started to improve and performed much better than Europe after 1995, at least until the 2007 start of the Global Economic Crisis.

Good performance means the achievement of low unemployment, low inflation, and rapid productivity growth. The two charts in this box compare the United States and Europe on the unemployment rate and rate of productivity growth.[a] We do not include the third big concept, the inflation rate, because differences between the U.S. and European inflation rates are minor.

The chart below shows Europe's unemployment rate as lower than the U.S. rate throughout the 1970s, but higher after 1980. In fact, in 1999 the European unemployment rate was double that in the United States. The reasons for the big increase in the European unemployment rate constitute one of the most important and exciting research topics in macroeconomics—what policies could the European

How the United States Compares

UNEMPLOYMENT RATE, 1970–2010

United States

Europe
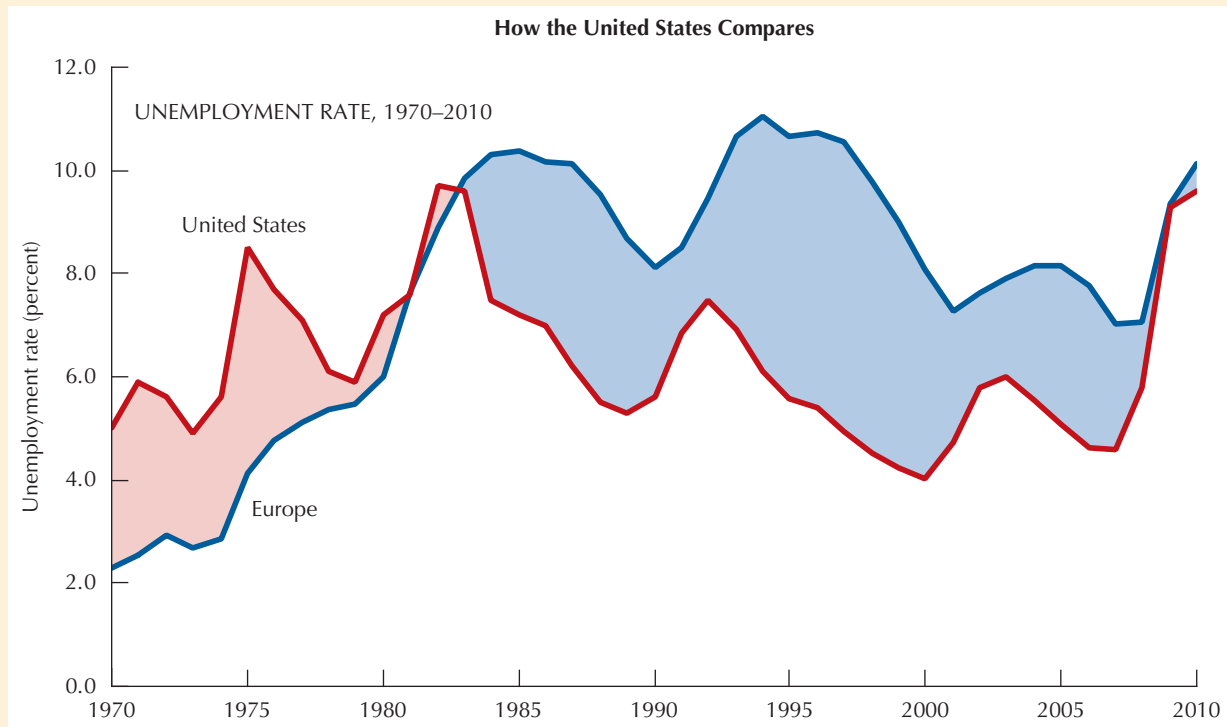
concepts—the unemployment rate, inflation rate, and productivity growth—are the key target variables of economic policy, the goals society cares most about.

The goal of policymakers regarding productivity growth is simple—just make productivity growth as fast as possible. There are no negatives to rapid productivity growth, and virtually every country in the world admires the growth achievement of South Korea (and some other East Asian countries) displayed in Figure 9 in the previous section. However, the goal of policymakers regarding the unemployment rate is not so simple. An attempt to reduce unemployment to zero would be likely to cause a significant acceleration of inflation,

countries adopt to reduce the European unemployment rate? Notice that in 2010, while Europe's unemployment rate was slightly higher than that in the United States, it had increased much less in the Global Economic Crisis period of 2008–10 than in the United States. Why? Some European nations including Germany and the Netherlands adopted a "work-sharing" policy in which people retained their jobs but worked shorter hours. Some European governments subsidized firms to retain workers. As a result, European unemployment did not rise nearly as much in 2008–10 as in the United States, but as European output slumped while workers were protected from layoffs, European productivity declined while that in the United States soared.

The chart below shows the growth rate of productivity in the United States and the same group of European countries. European productivity growth was more rapid than in the United States until 1996, after which the U.S. growth rate sped up and the European rate slowed down.

The U.S. speedup after 1995 is often attributed to its rapid adoption of computer and Internet technology, but this creates a big puzzle because there are plenty of computers and Internet use within Europe. Notice in 2008–09 that European productivity growth dropped below one percent while U.S. productivity growth revived. This occurred mainly because European firms and governments protected workers from mass layoffs to some extent, at least in comparison to the United States where American firms were panicked by the crisis and laid off millions of workers. It is not yet clear whether the impressive gains in U.S. productivity in 2008–10 will last and will augment the post-1998 advantage of the United States over Europe in its productivity growth performance.

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[a] All data on Europe refer to the fifteen members of the European Union prior to its enlargement to twenty-five nations on May 1, 2004.

PRODUCTIVITY GROWTH RATE, 1970–2010
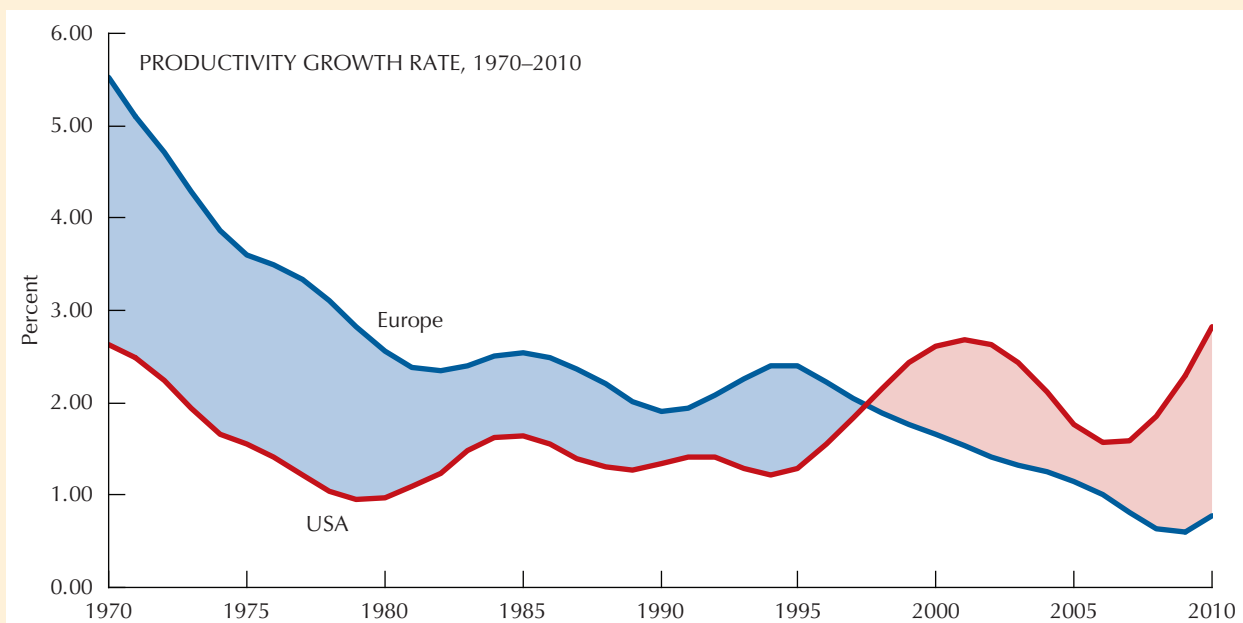
and moderation of inflation may be impossible if policymakers attempt to maintain the unemployment rate too low. A compromise goal for policymakers is to try to set the actual unemployment rate equal to the natural unemployment rate, since this would tend to maintain a constant inflation rate that neither accelerates nor decelerates.

The Role of Stabilization Policy

Macroeconomic analysis begins with a simple message: Either type of **stabilization policy,** monetary or fiscal, can be used to offset undesired changes

A **stabilization policy** is any policy that seeks to influence the level of aggregate demand.

in private spending.

There are many problems in applying stabilization policy. It may not be possible to control aggregate demand instantly and precisely. A policy stimulus intended to fight current unemployment might boost aggregate demand only after a long and uncertain delay, by which time the stimulus might not be needed. The impact of different policy changes may also be highly uncertain. An added problem has been faced by Japan in the 1990s and by the United States in the late 1930s and since 2009. The interest rate cannot be negative, and so once monetary policy has reduced the rate to zero it loses the ability further to stimulate the economy.
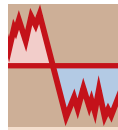
GLOBAL ECONOMIC CRISIS FOCUS

New Challenges for Monetary and Fiscal Policy

The sudden collapse of the U.S. economy in the fall of 2008 created unprecedented challenges for the makers of monetary and fiscal policy. The banking and financial system almost ground to a halt, and loans were nearly impossible to obtain. Housing prices declined rapidly and many households either lost their home to foreclosure or found that they owed more on their mortgages than their houses were worth. Monetary policy reacted promptly to reduce the short-term interest rate to zero but then was stymied by its inability to reduce interest rates below zero, since the interest rate cannot be negative. Fiscal policy was also constrained by the growing public debt that resulted from deficit spending to combat the recession.

◆ SELF-TEST 3

1. Is it the task of stabilization policy to set the unemployment rate to zero? Why or why not?

2. Is it the task of stabilization policy to set the inflation rate to zero? Why or why not?

3. What are the two big problems in applying stabilization policy to control aggregate demand?

8   The "Internationalization" of Macroeconomics

More than ever before, macroeconomics is an international subject. The days are gone when the effects of U.S. stabilization policy could be analyzed in isolation, without consideration for their repercussions abroad. This old view of the United States as a **closed economy** described reality in the first decade or so after World War II. In the 1940s and 1950s, trade accounted for only about 5 percent of the U.S. economy, exchange rates were fixed, and financial flows to and from other nations were restricted.

A **closed economy** has no trade in goods, services, or financial assets with any other nation.

The United States has increasingly become an **open economy.** Imports now equal 17 percent of U.S. GDP. The exchange rate of the dollar has been flexible since 1973 and has fluctuated far more widely than anyone had predicted prior to that time. International financial flows are massive and often instantaneous, with computers sending messages to buy or sell stocks, bonds, and foreign currencies at the speed of light among the major financial centers of Tokyo, London, New York, and Chicago.

An **open economy** exports (sells) goods and services to other nations, buys imports from them, and has financial flows to and from foreign nations.

The growing integration of the world economy was particularly evident in the emergence of the Global Economic Crisis in 2008–09. The Global Economic Crisis started in the United States, but it soon spread to the rest of the world as the meltdown of U.S. financial markets spread to banks and other financial institutions in Europe and Asia.

A primary example of global integration and interdependence had emerged long before the Global Economic Crisis. Back in 2005–07 (before the recession), the United States ran a large foreign trade deficit, importing far more than it exported. Many of these imports came from China, which was happy to lend money to the United States to continue to buy those American exports manufactured in China. Why would China so eagerly lend money to the United States to buy its goods? The simple answer, to which we return in Chapter 7, is that China pursues policies that keep its exports cheap, thus providing millions of jobs for Chinese workers, even though to achieve this China must lend billions of dollars to the United States.

Summary

1. The three central macroeconomic concepts are those that most affect everyday lives. They are the unemployment rate, inflation rate, and productivity growth.
2. Macroeconomics differs from microeconomics by focusing on aggregates that are summed up over all the economic activities in the economy. Theory in macroeconomics is a process of simplification that identifies the most important economic relationships.
3. Gross domestic product (GDP) is a measure of the overall size of the economy. While it does not affect everyday life directly, the behavior of GDP helps us to understand the behavior of the three central macroeconomic concepts that do influence everyday life.
4. Neither too much nor too little real GDP is desirable. The best compromise level is called natural real GDP and is consistent with a constant inflation rate. When the economy is operating at its natural level of real GDP, it is also by definition operating at its natural rate of unemployment.
5. The topic of "business cycles" studies short-run phenomena in macroeconomics over a period of one to five years. The topic of "economic growth" studies long-run phenomena over a period lasting a decade or more.
6. While most macroeconomic analysis concerns relatively normal events, a challenge for macroeconomists is to explain how extreme and unusual events can occur. Two of these were the Great Depression of the 1930s and the German hyperinflation of 1922–23. Another challenge is to understand how the rate of economic growth can be so different between two countries like South Korea and the Philippines that are located in the same region of the world.
7. In this century, periods of high unemployment have coincided with those of low real GDP. The Great Depression clearly scored worst on both counts.
8. The three central macroeconomic aggregates, (unemployment rate, inflation rate, and productivity growth) are the main targets of stabilization policy. Stabilization policy may not be effective in improving well-being if both unemployment and inflation are too high, and stabilization policy may operate with a long delay or have effects that are highly uncertain.
9. Macroeconomics is an international subject. International repercussions influence the way fiscal and monetary policy work and how the inflation process operates. Countries around the world face the same dilemmas as does the United States. How can low output and high unemployment be cured without massive increases in government deficits and government debt?

Concepts

macroeconomics	actual real GDP	target variables
Global Economic Crisis	natural real GDP	policy instruments
unemployment rate	natural rate of unemployment	monetary policy
inflation rate	GDP gap	fiscal policy
productivity	unemployment gap	stabilization policy
aggregate	business cycles	closed economy
gross domestic product	economic growth	open economy

Questions

1. Read either an entire week of the *Wall Street Journal* or a business-oriented weekly magazine such as *Business Week* or *The Economist.* Identify three stories that deal with topics related to microeconomics and another three stories that discuss topics related to macroeconomics. Explain why you have put each story in either the microeconomics or macroeconomics category.

2. Using the quarterly data for the period 1947–2010, attempt to identify the recession phases and the expansion phases of the basic business cycle depicted in Figure 4. (Note: The official start and end of each phase of a business cycle is determined by the National Bureau of Economic Research Business Cycle Dating Committee. The committee looks at more data than simply GDP in determining when each phase occurs and dates phases by months, not quarters. Therefore your answer will only approximate the official recession and expansion phases; for more details on the way the committee determines when each phase occurs and the official dates of business cycles, go to www.nber.org/cycles/main.html.)

3. Using your answer to question 2, compare the lengths of recessions and expansions for the period 1947–1982 with the years 1983–2007. Compare the length of the 2007–09 recession with the other recessions of the post–World War II era.

4. How are the natural real GDP and the natural real unemployment rates related to the rate of inflation?

5. Between June 2003 and June 2005, U.S. unemployment fell from 6.3 percent to 5.0 percent of the labor force. The Federal Reserve, the nation's monetary policy-making authority, took active measures beginning in June 2004 to raise short-term interest rates. What might have motivated policymakers to raise interest rates and what were they hoping to accomplish?

6. In April 2000, the seasonally adjusted unemployment rate was 3.8 percent. By June 2001, the unemployment rate had increased to 4.5 percent. Yet the measures by the Federal Reserve to reduce short-term interest rates were taken in stages, and in fact the unemployment rate continued to rise. What might have motivated the policymakers' cautious behavior?

7. (a) The "big three" concepts of macroeconomics are the unemployment rate, the inflation rate, and productivity growth. Discuss which of these concepts primarily relate to the behavior of the economy (i) in the short run and (ii) in the long run.

   (b) Using Figures 3 and 5 as guides, discuss how natural real GDP is used to evaluate the behavior of the economy in both the short run and the long run.

8. Explain why productivity growth not only allows a society to have higher living standards in the form of more goods and services, but also allows it to increase the percentage of an average person's life that is spent in school, on vacation, in retirement, or in other non-work related activities.

9. Explain how the value of real GDP relative to natural real GDP can be used by policymakers to decide how to change the values of the target variables.

10. How does the performance of the U.S. economy contrast with the performance of the European economy for the periods 1960–2007 and since the start of the Global Economic Crisis?

Problems

1. (a) Suppose that real GDP is currently $97 billion per year and natural real GDP is currently $100 billion. Measured as a percentage, what is the GDP gap?

(b) Suppose natural real GDP is growing by $4 billion per year. By how much must real GDP have risen after two years to close the GDP gap?

2. The sum of exports and imports as a percent of gross domestic product is sometimes used as a measure of how open an economy is. In particular, the greater the percent, the more open the economy is considered.

Use the following data to compute this measure of the openness of the United States economy in 1960, 1970, 1980, 1990, 2000, and 2009. Discuss what the data show in terms of the "internationalization" of the United States economy since 1960.

	1960	1970	1980	1990	2000	2009
GDP	2,830.9	4,269.9	5,839.0	8,033.9	11,226.0	12,880.6
Exports	98.5	175.5	351.7	600.2	1,188.3	1,490.7
Imports	114.5	236.6	344.7	673.0	1,639.9	1,853.8

◆ SELF-TEST ANSWERS

1. (1) When actual real GDP is above natural real GDP, the actual unemployment rate is below the natural unemployment rate. (2) In this opposite case, the actual unemployment rate is above the natural unemployment rate. (3) There is no such thing as the natural rate of inflation. When the economy is operating at its natural rate of unemployment, the inflation rate does not change. But it does not change from whatever level is inherited from the past, and this could be zero, 10 percent per year, or 100 percent per year.

2. (1) short-run, (2) long-run, (3) short-run, (4) both (the money can create jobs during a recession but also will stimulate long-run productivity growth).

3. (1) Stabilization policy cannot set the unemployment rate to zero or any other rate below the natural rate of unemployment without causing accelerating inflation. (2) Stabilization policy can set the inflation rate to zero only at the cost of a recession and a substantial cost in terms of lost output. (3) The two big problems are lags and uncertainty. A policy change may affect aggregate demand only after a long and uncertain delay, and the impact of different policy changes may also be highly uncertain.

Data Sources and Methods

Sources and Methods for Figures

Some sources are abbreviated as follows:

FRB: The Board of Governors of the Federal Reserve System

BEA: U.S. Department of Commerce *Bureau of Economic Analysis*

NIPA Tables: *National Income and Products Accounts Tables* obtained from www.bea.gov

BLS: U.S. Department of Labor *Bureau of Labor Statistics*

GGDC: The Conference Board and Groningen Growth and Development Centre

Historical Statistics: *The Historical Statistics of the United States: Millennial Edition Online*

IMF: International Monetary Fund

OECD: The Organization for Economic Cooperation and Development

1. Figure 6:
   1900–2010: Real GDP (*Y*):
   Same as Nominal GDP (*X*), except Table 1.1.6 for 1929–2010.
   Natural Real GDP (*Y^N*):
   1875–1955: *Y^N* is the geometric interpolation between real GDP for the benchmark years 1869, 1873, 1884, 1891, 1900, 1910, 1924, and 1949 and

the value of natural real GDP in 1955 (see below).

1955–2010: Average annual values of the natural real GDP series described in Appendix C-2.

Unemployment Rate (*U*):

1890–1899: Lebergott's series copied from Christina Romer, "Spurious Volatility in Historical Unemployment Data," *Journal of Political Economy*, vol. 94 (February 1986).

1900–1946: Series B1 in Long-Term Economic Growth, 1860–1970 (Washington, D.C.: U.S. Department of Commerce, 1973).

1947–2010: Series LNS14000000 from http://stats.bls.gov, Bureau of Labor Statistics, Department of Labor. Average of quarterly values.

Natural Unemployment Rate (U^N):

1890–1901: Assumed to be the same level as in 1902, 4.1 percent.

1902–1954: U^N is the linear interpolation between the U^N values of the benchmark years of 1902, 1907, 1913, 1929, and 1949 and is calculated as $U^N = B^* (U/UA)$ where *UA* is the published unemployment rate that adjusts for self-employment. *UA* equals the number of unemployed divided by the civilian labor force net of self-employed persons. The long-run equilibrium rate for *UA* ("*B*") reflects the value of *UA* observed in late 1954 when the economy was operating at its natural rate of unemployment. Changes in U^N before 1954 reflect only changes in the *U/UA* ratio.

1955–2010: Time-varying NAIRU for chain-weighted GDP price index-based deflator with standard deviation = 0.2 from Robert J. Gordon, "Time-Varying NAIRU," *Journal of Economic Perspective*, vol. 11, pp. 11–34, extended to 2010 using unpublished research. For recent unpublished research papers on time-varying NAIRU, see http://faculty-web.at.northwestern.edu/economics/gordon/researchhome.html

2. Figure 7:

1929–41 and 1995–2010: Unemployment Rate (*U*):

1890–1899: Lebergott's series copied from Christina Romer, "Spurious Volatility in Historical Unemployment Data," *Journal of Political Economy*, vol. 94 (February 1986).

1900–1946: Series B1 in Long-Term Economic Growth, 1860–1970 (Washington, D.C.: U.S. Department of Commerce, 1973).

1947–2010: Series LNS14000000 from http://stats.bls.gov, Bureau of Labor Statistics, Department of Labor. Average of quarterly values.

3. Figure 8:

Thomas J. Sargent, "The Ends of Four Big Inflations," in Robert E. Hall, ed., *Inflation: Causes and Effects*, University of Chicago for NBER, 1982, Table G1, pp. 74–75

4. Figure 9:

GDP per capita is a linear average of GK and EKS PPP GDP measures

1960–2010: GGDC, Total Economy Database, January 2010, www.ggdc.net

U.S. implicit GDP deflator estimates

BEA NIPA Table 1.1.9

5. International Perspective box:

Labor Productivity

1960–2010: GGDC, Total Economy Database, January 2010

EU-15 Unemployment

1960–2010: OECD Labour Force Statistics—Summary tables Vol. 2010 release 03. SourceOECD Employment and Labour Market Statistics

EU-15 Civilian Labor Force

1960–2010: OECD Labour Force Statistics—Summary tables Vol. 2010 release 03. SourceOECD Employment and Labour Market Statistics

U.S. Unemployment

1960–2010: Unemployment Rate (*U*):

1890–1899: Lebergott's series copied from Christina Romer, "Spurious Volatility in Historical Unemployment Data," *Journal of Political Economy*, vol. 94 (February 1986).

1900–1946: Series B1 in Long-Term Economic Growth, 1860–1970 (Washington, D.C.: U.S. Department of Commerce, 1973).

1947–2010: Series LNS14000000 from http://stats.bls.gov, Bureau of Labor Statistics, Department of Labor. Average of quarterly values.

The Measurement of Income, Prices, and Unemployment

The Measurement of Income, Prices, and Unemployment

It has been said that figures rule the world; maybe. I am quite sure that it is figures which show us whether it is being ruled well or badly.
—Johann Wolfgang Goethe, 1830

Our first task is to develop a simple theoretical model to explain real output (gross domestic product, or GDP) and the price level. Before we can turn to theory, however, we must stop for a few definitions. What are GDP and the price level? How are they measured? What goods and services are included in or excluded from GDP? How are private saving, private investment, the government deficit, and the current account deficit related to one another? How are the inflation rate and unemployment rate measured?
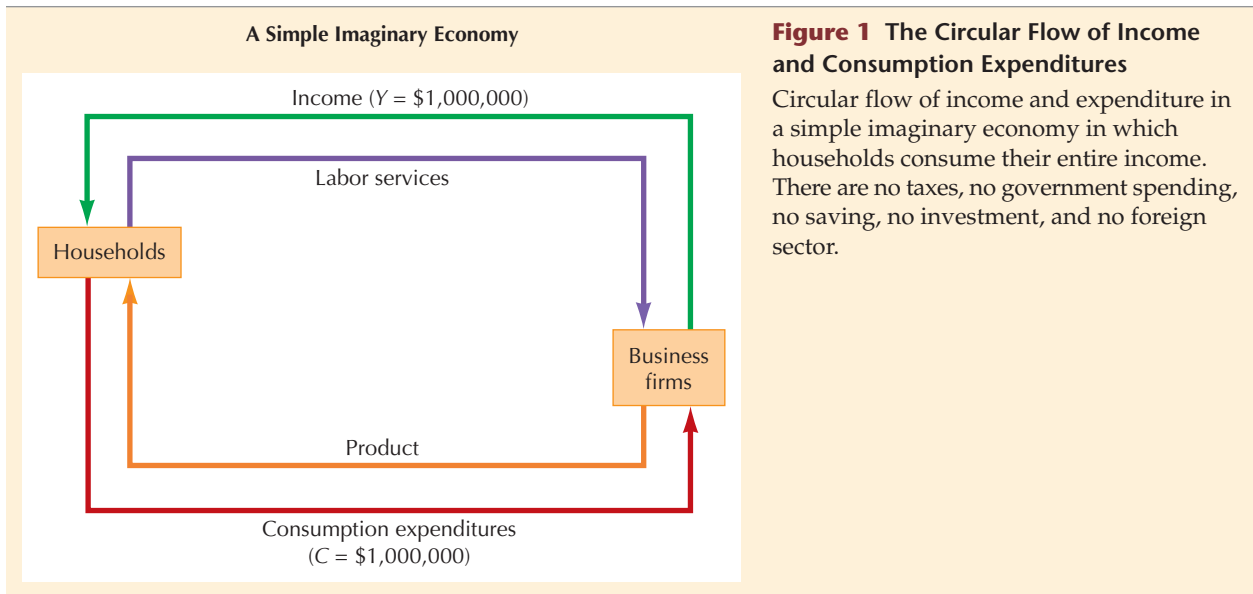
1   Why We Care About Income

We identified two key links between real GDP and the three central concepts of macroeconomics. First, we noted that movements in the unemployment gap are inversely related to the parallel movements of the GDP gap. Thus the key to understanding changes in unemployment (the first central concept) is the change in actual real GDP.

Second, the level and growth rate of our standard of living are measured by productivity (the third central concept), defined as the ratio of output to the number of hours worked. Output is the same as real GDP. Thus any discussion of U.S. productivity performance in comparison with the country's history or with other nations requires an understanding of the data on real GDP.

This chapter begins by asking what is included in GDP and why. We then learn about the different sectors of the economy that purchase portions of the total GDP and how that GDP is the source of different types of income. We learn how the price level and rate of inflation are measured. Finally, we learn how the unemployment rate is measured and how important components of distress caused to families by the Global Economic Crisis are not included in the official measure of the unemployment rate.

2   The Circular Flow of Income and Expenditure

We begin with a very simple economy, consisting of households and business firms. We will assume that households spend their entire income, saving nothing,

A Simple Imaginary Economy

Income (Y = $1,000,000)

Labor services

Households

Business firms

Product

Consumption expenditures
(C = $1,000,000)

Figure 1 **The Circular Flow of Income and Consumption Expenditures**
Circular flow of income and expenditure in a simple imaginary economy in which households consume their entire income. There are no taxes, no government spending, no saving, no investment, and no foreign sector.

and that there is no government.[1] Figure 1 depicts the operation of our simple economy, with households represented by the box on the left and business firms by the box on the right. There are two kinds of transactions between the households and the firms.

First, the firms sell goods and services (product)—for instance, bread and shoes—to the households represented in Figure 1 by the lower orange line, labeled product. The bread and shoes are not a gift, but are paid for by a flow of money (C), say $1,000,000 per year, represented by the solid red line, labeled **consumption expenditures.**

Second, households must work to earn the income to pay for the consumption goods. They work for the firms, selling their skills as represented by the upper purple line, labeled labor services. Household members are willing to work only if they receive a flow of money, usually called wages, from the firms for each hour of work. Wages are the main component of income (Y), shown by the upper green line.

Since households are assumed to consume all of their income, and since firms are assumed to pay out all of their sales in the form of income to households, it follows that income (Y) and consumption expenditures (C) are equal. For the same reason, the labor services provided in return for income are equal to the goods and services (product) sold by the firms to households in return for the money flow of consumption expenditures:

$$
\begin{aligned}
\text{income}(Y) &= \text{labor services} \\
&= \text{consumption expenditures}(C) \\
&= \text{product}
\end{aligned}
$$

Each of the four elements in the preceding equation is a **flow magnitude,** any economic magnitude that is measured per unit of time, like U.S. GDP *per*

Consumption expenditures are purchases of goods and services by households for their own use.

A **flow magnitude** is an economic magnitude that moves from one economic unit to another at a specified rate per unit of time.

---

[1] Because households do no saving, there is no capital or wealth, and all household income is in the form of wages for labor services.

A **stock** is an economic magnitude in the possession of a given economic unit at a particular point in time.

year. A flow is distinguished from a **stock,** which is measured at a particular point in time, such as the amount of paper money in your wallet or purse at noon on September 11, 2011.

◆ SELF-TEST 1

1. Imagine that a student named Eric purchases a haircut, priced at $10, with a $10 bill. Describe in words how the student's haircut will be included in each of the four flows of Figure 1.

2. Imagine that a student named Alison obtains a job as a lifeguard at a summer camp paying $8 per hour for July and August, and that the camp obtains the money to pay Alison from fees paid by parents for their children to go to the camp. Describe in words how the fees and the lifeguard job will be included in each of the four flows of Figure 1.

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3   What GDP Is, and What GDP Is Not

National Income and Product Accounts is the official U.S. government economic accounting system that keeps track of GDP and its subcomponents.

The **National Income and Product Accounts** (also called NIPA, or national accounts, for short) is the official U.S. government accounting of all the flows of income and expenditure in the United States. A guide to government data sources is provided in the box on the next page.

Defining GDP: What's In and What's Out

Final product includes all currently produced goods and services that are sold through the market but are not resold. It is the same as gross domestic product (GDP).

In our free market economy, the fact that a good or service is sold is a sign that it satisfies certain human wants and needs; otherwise, people would not be willing to pay a price for it. So by including in the GDP only things that are sold through the market for a price, we can be fairly sure that most of the components of GDP contribute to human satisfaction. There are three major requirements in the rule for including items in the total **final product,** or GDP: *Final product consists of all currently produced goods and services that are sold through the market but not resold during the current time period.*

Currently produced.   The first part of the rule—*to be included in final product, a good must be currently produced*—helps us to define what GDP is not. GDP excludes sales of any used items such as houses and cars, since they are not currently produced. Similarly, it excludes financial transactions such as sales or purchases of bonds and stocks. Because neither the purchase nor the sale of a financial asset is included, GDP by definition excludes capital gains on assets that occur when they are sold for more than they cost to buy. GDP also excludes any transaction in which money is transferred without any accompanying good or service in return. Among the **transfer payments** excluded from national income in the United States are payments from the government to persons, such as Social Security, Medicare, and unemployment benefits.

Transfer payments are those for which no goods or services are produced in return.

Sold on the market.   The second part of the rule—*goods included in the final product must be sold on the market and are valued at market prices*—means that we

Where to Find the Numbers: A Guide to the Data

Time Passes and Revisions Occur: How to Cope

You will need to know where to find macroeconomic data that are not included in the text or data for more recent periods that were released after the text was printed. For these head to the Internet. There you can find the most recent and comprehensive sources of economic data.

The "Big Three" Agencies

Using the Internet is by far the easiest way to gather economic data; whether it be rather simple data, such as real GDP or the most recent Consumer Price Index, or more detailed data, such as the unemployment rate for males aged 20–24 or how much U.S. consumers spend on funerals. For these and many other series, turn to one of the Web sites of the government agencies that actually produce the data. The three most important are the Bureau of Economic Analysis (BEA, a branch of the Commerce Department), the Bureau of Labor Statistics (BLS, a branch of the Labor Department), and the Federal Reserve Board (usually called by its nickname, the Fed).

BEA: National Income Data   All the data on GDP, and related income and product series, are produced by the BEA in an organized system of tables called the National Income and Product Accounts (NIPA). These extend back to 1929 for annual data and to 1947 for quarterly data and are updated regularly on the BEA Web site **www.bea.gov**. Here you can find not only NIPA tables, but recent news releases, industry data, and international and regional series.

BLS: Labor Market, Price, and Wage Data   The BLS is a primary producer of data on employment, unemployment, consumer and producer prices, and wage rates. The BLS runs several large surveys, contacting thousands of families each month to learn about their employment and unemployment experience and contacting thousands of retail outlets to track price changes. All of the BLS data series are available at **www.bls.gov**.

The opening screen of the Bureau of Economic Analysis Web site. U.S. Department of Commerce

The Fed: Financial Market Data   The Federal Reserve compiles data on interest rates, the money supply, and other figures describing the banking and financial system. One of the regional Feds, the Federal Reserve Bank of St. Louis, supports an online database known as FRED (**research.stlouisfed.org/fred2**). This database provides historical U.S. economic and financial data, including daily interest rates, monetary and business indicators, exchange rates, balance of payments, and select regional economic data. The Federal Reserve Board of Governors Web site (**www.federalreserve.gov**) is also useful.

The preceding list does not even include the grandfather of all statistics agencies, the Bureau of the Census, which conducts the decennial Census of Population and, every five years, economic censuses of business establishments. The Census data form the raw material for much of the BEA's work in creating the national accounts, not to mention much research by economists on both macro and micro topics. See **www.census.gov**.

International Web Sites to Know:
Org. for Economic Cooperation and Development
　　www.oecdwash.org/DATA/online.htm
World Bank
　　www.worldbank.org/data
International Monetary Fund
　　www.imf.org/external/data.htm
Groningen Growth and Development Center
　　www.ggdc.net/databases/index.htm

Many more sites are available through such search engines as google.com, yahoo.com, and ask.com.

measure the value of final product by the market prices that people are willing to pay for goods and services. We assume that a Mercedes gives 10,000 times as much satisfaction as a package of razor blades because it costs about 10,000 times as much. Excluded from GDP by this criterion is the value of personal time spent engaged in activities that are not sold on the market (often called "home production," this includes time spent cooking, mowing lawns, painting, and maintenance). Also excluded is any allowance for the costs of air pollution, water pollution, acid rain, or other by-products of the production process for which no explicit charge is made. A final exclusion in this category is illegal activity, such as sales of illegal drugs that are typically bought and sold for cash. Some other activities paid for in cash may be excluded because they are hard to measure, including household helpers who are paid in cash and whose employers do not pay social security taxes on their behalf.

But not resold.   The third part of the rule—*to be included in final product, a good must not be resold in the current time period*—further limits the inclusion of items. The many different goods and services produced in the economy are used in two different ways. Some goods, like wheat, are mainly used as ingredients in the making of other goods, in this case, bread. Any good resold by its purchaser is an **intermediate good** and is not included in GDP. Any good that is not resold is called a final good because it is sold to a final user, such as a household or the government.

An **intermediate good** is resold by its purchaser either in its present form or in an altered form.

Intermediate Goods, Final Goods, and Value Added

A **final good** is part of final product because it is sold to a final user rather than being resold.

The opposite of an intermediate good is a **final good,** one that is not resold. Bread sold at the grocery is a final good, used by consumers, as are the many other products that consumers buy. Take a simple example of a loaf of bread that sells for $2.00. We assume that the only ingredient in the bread is wheat, which the bakery buys from the wheat farmer for $0.50 per loaf. The remaining $1.50 represents the wages of the bakery employees, the rent on the bakery building, and the profits of the owner. Only the $2.00 spent for the final good, a loaf of bread, is included in GDP.

We cannot include intermediate goods in GDP, because that would be double counting. The value of the wheat is already included in the price of bread, so we don't want GDP to include *both* the $0.50 value of the wheat and the $2.00 value of the bread, since the resulting sum of $2.50 would be more than consumers pay for the bread.

Value added is the value of a firm's output minus the value of the intermediate goods that the firm produces. It includes wages paid to the firm's employees, rental of buildings and equipment, and the firm's profit. By definition, total value added is equal to final product.

Another way to compute GDP is to add up the **value added** at each stage of production, defined as the value of a firm's output minus the amount paid for intermediate goods. Assuming there are no intermediate goods involved in growing wheat, in this example the wheat farmer has a value added of $0.50 and the bread bakery has a value added of $1.50 (consisting of wages, rent, and profit). Total GDP is the sum of the value added of each firm, $0.50 for the farmer and $1.50 for the bread bakery. By definition, the final product of $2.00 is equal to value added of $2.00. GDP is equal to *both* total final product and total value added.

Table 1 summarizes what's in and out of GDP. Notice that sales of used assets like cars and houses do have an effect on GDP if they generate current income for used car dealers and real estate agents. Similarly, fees and commissions earned by financial institutions are included in GDP.

Table 1 **What's In and What's Out of GDP**

Category	What's In	What's Out
Currently Produced	Goods and Services	Sales of Used Assets*
		Sales of Financial Assets**
		Transfer Payments
Sold on the Market	Market Production	Home Production
		Environmental Pollution
		Illegal Activity
		Some Unrecorded Payments Made with Cash
Not Resold	Final Goods and Services	Intermediate Goods and Services

Notes: * Fees and commissions earned by used-car dealers and real estate agents are included in GDP

** Fees and commissions earned by financial institutions are included in GDP

What's the "Domestic" in Gross Domestic Product (GDP)?

GDP includes all final goods and services produced within the 50 states of the United States regardless of whether they are sold within the 50 states or exported. Imported goods produced in other countries are excluded from GDP. If we want to know how much income is being earned by Americans, we need an alternative concept called **gross national product (GNP).** Once we know GDP, we can calculate GNP by adding receipts of factor income (wages, rent, and profits) by Americans from the rest of the world and subtracting payments of factor income to the rest of the world:

$$GNP = GDP + \text{Factor Payments from Rest of World} - \text{Factor Payments to Rest of World} \quad (1)$$

Gross national product (GNP) is GDP plus factor payments received from the rest of the world minus factor payments sent to the rest of the world.

For instance, Procter & Gamble makes Tide detergent and Crest toothpaste in factories around the world. The value of the detergent and toothpaste is included in the GDP of the countries where the foreign plants are located, from Japan to Britain, and is not part of U.S. GDP. But Procter & Gamble brings some of the profits from these plants back to the United States, and these are included in "Factor Payments from Rest of World" and raise U.S. GNP relative to GDP. Conversely, Japanese factories produce millions of cars inside the United States, and the value of these cars is included in U.S. GDP. But these factories are profitable, and some of their profits are sent back to Japan. These profits are treated as a factor payment to the rest of the world, which is subtracted from GNP and makes it smaller than GDP.

Overall, the factor payments received by the United States, such as profits earned abroad by McDonald's and Procter & Gamble, and those sent from the United States, such as profits earned by Honda and Toyota, are roughly equal in size, and so GNP is very similar in size to GDP (GNP was 0.7 percent larger than GDP in 2009). But in some other countries, such as Ireland, GNP is much smaller than GDP because many of the factories are owned by foreign-owned companies. In other countries, such as Kuwait, GNP is much larger than GDP because Kuwaiti residents own large amounts of bank deposits and other assets in other countries and receive large flows of interest and dividend income on those assets.

What's the "Gross" in Gross Domestic Product (GDP)?

Depreciation (consumption of fixed capital) represents the part of the capital stock used up due to obsolescence and physical wear.

GDP includes **depreciation,** which is the amount that business firms set aside to replace structures and equipment that wear out or become obsolete, like old computers that still work but do not have the speed or memory to handle today's complex software. In the national accounts (NIPA), depreciation is called "consumption of fixed capital." Since it is a cost of doing business, it must be deducted out in order to measure the net result of economic activity, which is called **net domestic product (NDP).**

Net domestic product (NDP) is equal to GDP minus depreciation.

In economics, **gross** refers to the inclusion of depreciation; **net** refers to the exclusion of depreciation.

The terms **gross** and **net** usually refer to the inclusion or exclusion of depreciation. Thus the difference between "gross investment" and "net investment," or between "gross saving" and "net saving," is exactly the same as the difference between GDP and NDP.

4 Components of Expenditure

Types of Investment

The goods and services produced by business firms, which are not resold as intermediate goods to other firms or consumers during the current period, qualify by our rule as final product. But the business firm does not consume them. Final goods that business firms keep for themselves are called **private investment** or private capital formation. These goods add to the nation's stock of income-yielding assets. Private investment consists of *inventory investment* and *fixed investment.*

Private investment is the portion of final product that adds to the nation's stock of income-yielding physical assets or that replaces old, worn-out physical assets.

Inventory investment includes all changes in the stock of raw materials, parts, and finished goods held by business.

Inventory investment.   Bread produced by the baker but not resold to consumers in the current period stays on the bakery's shelves, raising the level of the bakery's inventories. Since all the bread that is produced is included in GDP, we must define expenditure so as to include the bread, whether it is sold to consumers or whether it remains unsold on the shelf. *By including the change in inventories as part of expenditure, we guarantee that GDP (that is, total product) by definition equals total expenditure.* When inventories increase, the inventory investment component of GDP is positive. When inventories decrease, the inventory investment component of GDP is negative.

◆ SELF-TEST 2

Imagine that a bakery has 10 loaves of bread at the close of business on December 31, 2010. Valued at the baker's price of $2.00, the value of the bakery's inventory is $20.00. At the close of business on March 31, 2011, the baker has 15 loaves or $30.00 of bread on the shelves.

1. What is the level of the baker's inventory on December 31, 2010, and on March 31, 2011?

2. What is the change in the baker's inventories in the first quarter of 2011?

3. What is the implication of these numbers for the contribution of the baker's inventories to GDP in the first quarter of 2011?
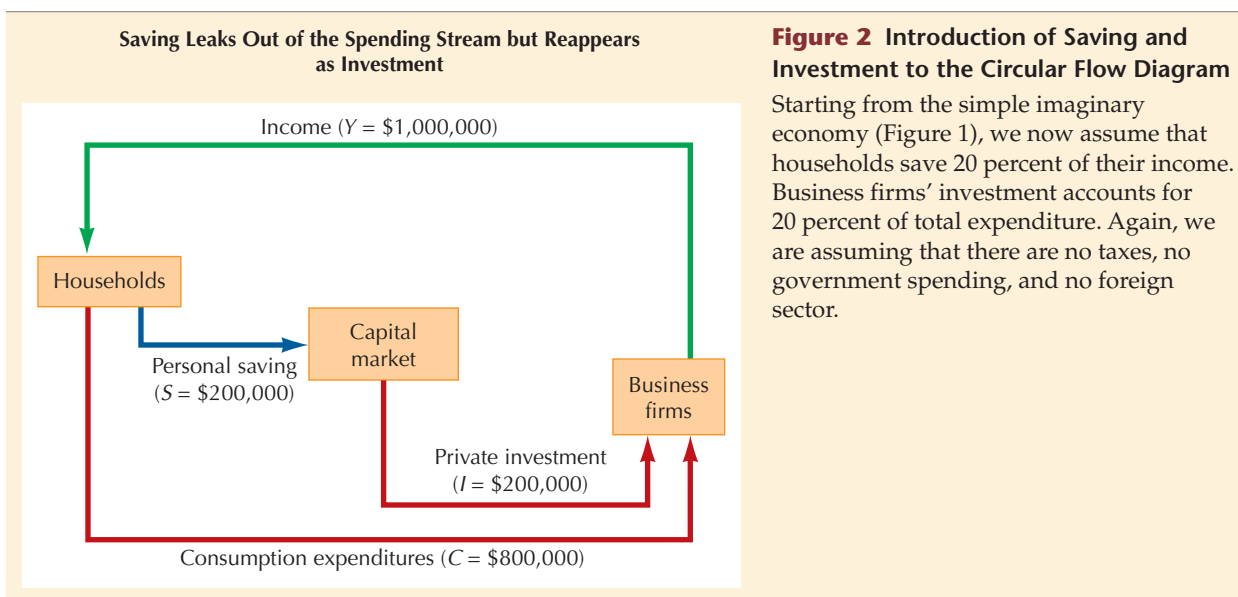
Figure 2 Introduction of Saving and Investment to the Circular Flow Diagram

Starting from the simple imaginary economy (Figure 1), we now assume that households save 20 percent of their income. Business firms' investment accounts for 20 percent of total expenditure. Again, we are assuming that there are no taxes, no government spending, and no foreign sector.

Saving Leaks Out of the Spending Stream but Reappears as Investment

Income (Y = $1,000,000)

Households

Personal saving (S = $200,000)

Capital market

Business firms

Private investment (I = $200,000)

Consumption expenditures (C = $800,000)

Fixed investment.   **Fixed investment** includes all final goods purchased by business, other than additions to inventory. The main types of fixed investment are structures (factories, office buildings, shopping centers, apartments, houses) and equipment (refrigerated display cases, computers, trucks). Newly produced houses and condominiums sold to individuals are also counted as fixed investment—a household is treated in the national accounts as a business firm that owns the house as an asset and rents the house to itself.[2]

Fixed investment includes all final goods purchased by business that are not intended for resale.

Relation of Investment and Saving

Figure 1 described a simple imaginary economy in which households consumed all of their total income. Figure 2 introduces investment into that economy. Total expenditures on final product are the same as before, but now they are divided into consumption expenditures by households (C) and business purchases of investment goods (I). Households spend part of their income on purchases of consumption goods and save the rest.

The portion of household income that is not consumed is called **personal saving.** What happens to income that is saved? The funds are channeled to business firms in two basic ways:

Personal saving is that part of personal income that is neither consumed nor paid out in taxes.

1. Households buy bonds and stocks issued by the firms, and the firms then use the money to buy investment goods.

2. Households leave the unused income (savings) in banks and other financial institutions. The banks then lend the money to the firms, which use it to buy investment goods.

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[2] An individual who owns a house is treated as a split personality in the national accounts: as a business firm and as a consuming household. My left side is a businessperson who owns my house and receives imaginary rent payments from my right side, the consumer who lives in my house. The NIPA identifies these imaginary rent payments as "Imputed rent on owner-occupied dwellings," which makes rent payments the most important exception to the rule that a good must be sold on the market to be counted in GDP.

In either case, business firms obtain funds to purchase investment goods. The box labeled "capital market" in Figure 2 symbolizes the transfer of personal saving to business firms for the purpose of investment.

In other words, saving is a "leakage" from the income used for consumption expenditures. This leakage from the spending stream must be balanced by an "injection" of nonconsumption spending in the form of private investment.

Net Exports and Net Foreign Investment

Exports in the margin: **Exports** are goods and services produced within one country and sold to another.

Imports in the margin: **Imports** are goods consumed within one country but produced in another country.

Exports are expenditures for goods and services produced in the United States and sent to other countries. Such expenditure creates income in the United States but is not part of the consumption or investment spending of U.S. residents. **Imports** are expenditures by U.S. residents for goods and services produced elsewhere and thus do *not* create domestic income. For instance, an American-made Chevrolet exported to Canada is part of U.S. production and income but is Canadian consumption. A German-made Mercedes imported to the United States is part of German production and income but is U.S. consumption. If income created from exports is greater than income spent on imported goods, the net effect is a higher level of domestic production and income. Thus the difference between exports and imports, **net exports,** is a component of final product and GDP.

Net exports and **net foreign investment** in the margin: **Net exports** and **net foreign investment** are both equal to exports minus imports. The term "net foreign borrowing" is used when net exports are negative.

Another name for net exports is **net foreign investment,** which can be given the same economic interpretation as domestic investment. Why? Both domestic and foreign investment are components of domestic production and income creation. Domestic investment creates domestic capital assets; net foreign investment creates U.S. claims on foreigners that yield us future flows of income. An American export to Japan is paid for with Japanese yen, which can be deposited in a Japanese bank account or used to buy part of a Japanese factory. The opposite occurs as well. When the United States imports more than it exports, as it has in every year since 1981, net foreign investment is negative. U.S. payments for imports provide dollars that foreign investors use to buy American factories, hotels, and other assets including bank accounts in the United States.

The Government Sector

Up to this point we have been examining an economy consisting only of private households and business firms. Now we add the government, which collects taxes from the private sector and makes two kinds of expenditures. Government purchases of goods and services (tanks, fighter planes, school-books) generate production and create income. The government can also make payments directly to households. Social Security, Medicare, and unemployment compensation are examples of these transfer payments, given the name *transfer* because they are payments from the government to the recipient without any obligation for the recipient to provide any services in return. As you learned in Section 3, transfer payments are not included in GDP.

Figure 3 adds the government (federal, state, and local) to our imaginary economy of Figures 1 and 2. A flow of tax revenue (R) passes from the households to the government.[3] The government buys goods and services (G).

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[3] In the real world, both households and business firms pay taxes. Here we keep things simple by limiting tax payments to personal income taxes.
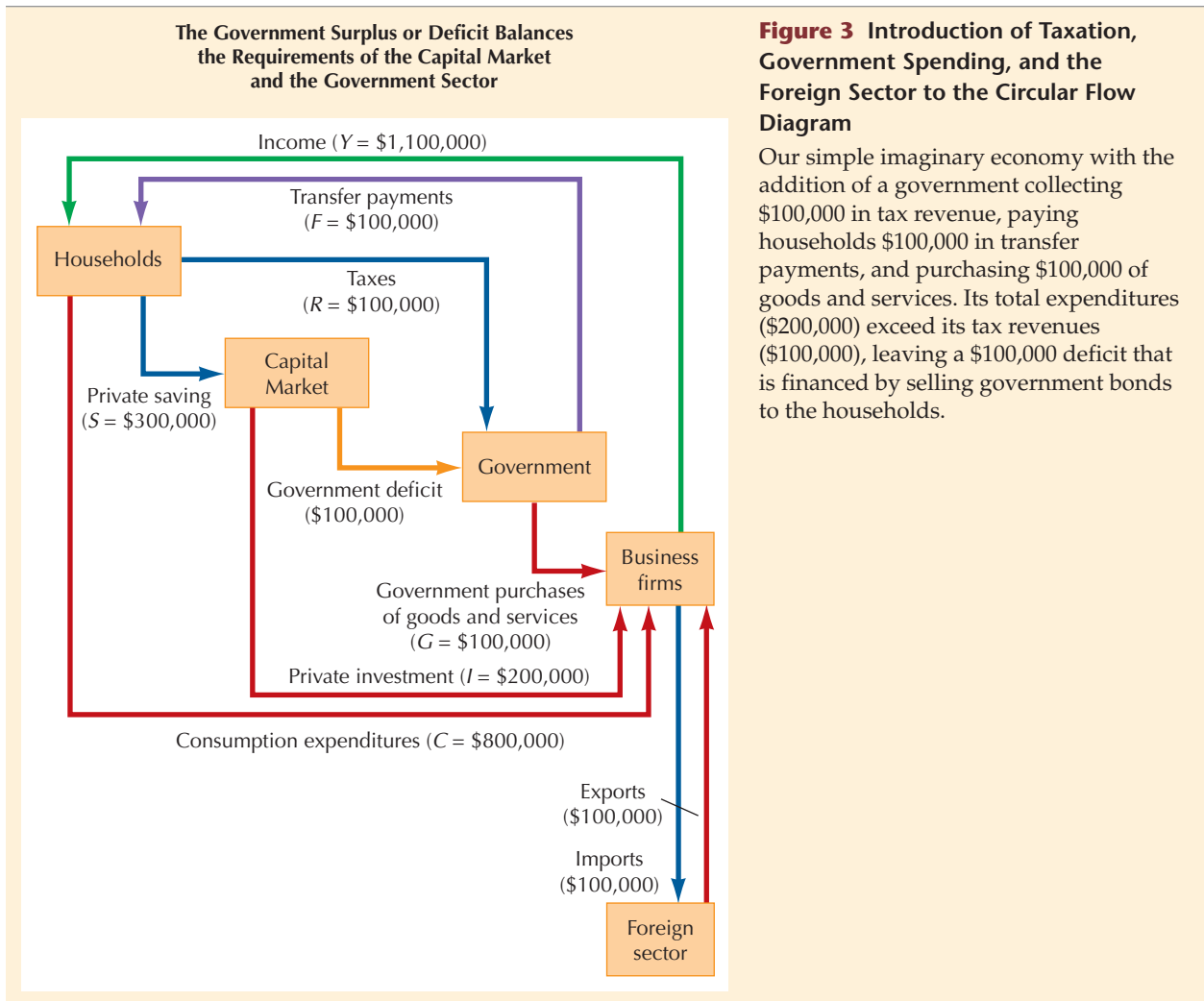
**The Government Surplus or Deficit Balances
the Requirements of the Capital Market
and the Government Sector**

Figure 3 **Introduction of Taxation, Government Spending, and the Foreign Sector to the Circular Flow Diagram**

Our simple imaginary economy with the addition of a government collecting $100,000 in tax revenue, paying households $100,000 in transfer payments, and purchasing $100,000 of goods and services. Its total expenditures ($200,000) exceed its tax revenues ($100,000), leaving a $100,000 deficit that is financed by selling government bonds to the households.

In addition the government sends transfer payments (F), such as welfare payments, to households, leaving a deficit that must be financed. To do this, the government sells bonds to private households through the capital market, just as business firms sell bonds and stock to households to finance their investment projects.

Also shown in Figure 3, in the bottom right corner, is the foreign sector. Imports are already included in consumption and investment spending, so imports are shown as a leakage by the blue arrow pointing down toward the foreign sector box. Exports are spending on domestic production, as shown by the red arrow going from the foreign sector to the business firms. To keep the diagram simple, exports equal imports.[4]

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[4] If imports exceed exports, there is a flow equal to the difference going from the foreign sector box to the capital market box. This is the inflow of foreign capital available to finance private investment or the government deficit.
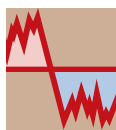
GLOBAL ECONOMIC CRISIS FOCUS
Which Component of GDP Declined the Most in the Global Economic Crisis?

The economy in the most recent business cycle reached its peak in the fourth quarter of 2007 (abbreviated 2007:Q4) and reached its trough (minimum level of real GDP) in 2009:Q2. The different components of GDP behaved very differently over those six quarters. Real consumption spending declined over those six quarters by only 0.8 percent. Real government spending grew by 6.6 percent. Net exports were negative throughout but declined to a much smaller negative value, which stimulated the economy. So what was the problem? It was the collapse of investment, which *fell by an amazing 31.7 percent!* As we learn more about the Global Economic Crisis, we will come back to this collapse of investment, the relative stability of consumption, and the role of financial market problems in causing the recession.

5 The "Magic" Equation and the Twin Deficits

The relationships displayed in Figure 3 can be summarized in a simple relationship that we call the "magic" equation because of its versatility in explaining central macroeconomic concepts. The **magic equation** helps us understand the relationships among investment, private saving, the government surplus or deficit, and the surplus or deficit of exports versus imports.

> The **magic equation** states that private saving plus net tax revenue must by definition equal the sum of private domestic investment, government spending on goods and services, and net exports.

A central phenomenon of the current U.S. economy is that the government is running a large deficit, with government expenditures far in excess of tax revenue. At the same time, the U.S. economy imports far more than it exports, implying a large international deficit (negative net exports). How are these "twin deficits" financed? What difference would it make if the government ran a surplus while the international deficit remained the same? What would happen if the international deficit were zero while the government deficit remained large? The magic equation can help us to answer these questions.

Implications of the Equality Between Income and Expenditures

By definition, total income created (Y) is equal to total expenditure on final product (E). Why is this true by definition? Because income is created from total production, and expenditures include both the production that is sold to final users, as well as the production that is not sold (i.e., the change in inventories). We can indicate that this relationship is true by definition by using the three-bar equals sign, otherwise known as the "identity sign":

$$Y \equiv E$$

There are four types of expenditure on final product: consumption expenditures (C); private domestic investment (I); government purchases of goods and services (G); and net exports (NX):

$$E \equiv C + I + G + NX \tag{2}$$

The total personal income that households receive consists of the income created from production (Y) and transfer payments from the government (F). This total ($Y + F$) is available for the purchase of consumption goods (C), private saving (S), and the payment of taxes (R):

$$Y + F \equiv C + S + R$$

An equivalent expression is obtained if we subtract F from both sides:

$$Y \equiv C + S + R - F \tag{3}$$

Transfer payments (F) can be treated as negative taxes. Accordingly, we define net tax revenue (T) as taxes (R) minus transfers (F), converting equation (3) into the simpler expression:

$$Y \equiv C + S + T \tag{4}$$

Leakages and Injections

Since $Y \equiv E$, the right side of equation (4) is equal to the right side of equation (2), and we obtain:

$$
\begin{aligned}
C + S + T &\equiv \quad C + I + G + NX \\
-C & \qquad\quad -C \qquad\qquad \text{subtracting } C \text{ from both sides} \\
\hline
S + T &\equiv \quad I + G + NX
\end{aligned}
\tag{5}
$$

The bottom line of (5) can be translated to a general rule:

> Since income is equal to expenditure, the portion of income not consumed (saving plus net taxes) must be equal to the nonconsumption portion of expenditure on final product (investment plus government spending plus net exports).

In other words, **leakages** out of the income available for consumption goods ($S + T$) must be exactly balanced by **injections** of nonconsumption spending ($I + G + NX$).

Equation 5 is one of the most important relationships in macroeconomics and reappears often in the next few chapters. We call it the magic equation; its more technical name is the leakages–injections identity. The importance of this relationship is that it shows how some of the most basic concepts in macroeconomics—private saving, government spending and taxes, domestic investment, and net exports—are connected *by definition.*

Leakages describe the portion of total income that flows to taxes or saving rather than into purchases of consumer goods.

Injections is a term for nonconsumption expenditures.

The Government Budget and the Twin Deficits

The magic equation shows how the funds resulting from a government budget surplus are used, and it is equally useful in showing how the government finances a budget deficit. We can arrange equation (5) to show the uses of a government budget surplus:

$$T - G \equiv (I + NX) - S \tag{6}$$

On the left side of this definition is the government budget surplus. If the left side is negative, the government is running a budget deficit. Shown on the right side is the excess of total investment, both domestic (I) and foreign (NX), over private savings (S).

If government spending is greater than net tax revenue, as has occurred in most years over the past three decades, the government is running a deficit, and equation (6) shows that there are three possible implications. First, the

government budget deficit could make domestic investment (I) smaller than otherwise. Second, the government budget deficit requires that private saving must rise to avoid any downward pressure on the sum of domestic and foreign investment ($I + NX$). Third, if there is no increase in private saving, then to avoid a decline in domestic investment there must be more borrowing from foreigners (larger negative NX) or a decline in lending to foreigners.

We can use a numerical example from recent years to illustrate how the right-hand side of equation (6) changed as the government shifted from its 1993 deficit to its surplus in 2000 and then to an even larger deficit in 2010.

$$T - G \equiv (I + NX) - S$$

1993	$-1.9 \equiv (17.6 - 1.2) - 18.4$
2000	$4.3 \equiv (20.9 - 4.1) - 12.5$
2010	$-6.8 \equiv (15.5 - 3.6) - 18.8$

In the year 2000, there was a government budget surplus equal to 4.3 percent of GDP, which together with foreign borrowing of 4.1 percent, allows domestic investment to be 8.4 percent of GDP larger than saving. In contrast there was a government budget deficit in both 1993 and 2010. Since saving was roughly the same in the two years (18.4 vs. 18.8 percent of GDP), the much larger government deficit in 2010 compared to 1993 was financed by reduced investment (down from 17.6 to 15.5 percent of GDP) and triple the foreign borrowing (up from 1.2 to 3.6 percent of GDP).

Because the magic equation (5 or 6) is true by definition, it does not identify the direction of causation among the interrelated variables. For instance, in the year 2000 did the government run a budget surplus because domestic investment was so strong, or was investment so strong because the government ran a surplus? Did the sharp decline in investment between 2000 and 2010 cause the government to run a deficit, or did the government deficit occur for other reasons?

During most of the period since 1980, the United States has experienced "twin deficits," with a government budget deficit accompanied by foreign borrowing (negative NX). The year 2000, with its budget surplus accompanied by foreign borrowing, was the exception rather than the rule, but the year 2000 shows that the deficits are not guaranteed to be "twins."

GLOBAL ECONOMIC CRISIS FOCUS

Chicken or Egg in Recessions?

The numbers for the magic equation at the top of this page show an enormous contrast between the prosperous conditions of the year 2000 and the depressed conditions of 2010. The only similar element was net exports at around -4 percent of GDP. The most dramatic change was in the government budget, from a surplus of 4.3 percent of GDP to a deficit of -6.8 percent, a shift into deficit of 11.1 percent of GDP. The numbers show that of this epochal shift, 5.4 percent of GDP represented a decline of investment and 6.3 percent an increase in saving. Which was the chicken and which was the egg? We will learn that, while changes in government tax and expenditure policy obviously influence the budget, there is a big impact of the economy on the budget. So weak investment and strong saving both held down GDP, and hence government tax revenues.

6 Where Does Household Income Come From?

Income, Leakages, and the Circular Flow

An important lesson of circular flow diagrams like Figure 3 is that the expenditures on GDP (consumption, investment, government spending, and net exports) create income, and this income is available to be spent on another round of expenditure. Households receive only part of the GDP generated by business firms; the rest leaks out of the circular flow in the form of tax revenue for government and saving that provides funds to the capital market. Recall from equation (5) that total leakages (taxes and saving) must by definition equal total nonconsumption spending, also called *injections.*

Table 2 provides a concise summary of the steps by which income travels from business firms to households. Down the left-hand side are the various

Table 2   Households Get What Remains After All the Leakages

Concept	Leakage into saving	Leakage into taxes	Transfers from government
1. Gross domestic product (14,745.1)			
2. Less:		Depreciation (consumption of fixed capital, 1,871.9)	
3. Equals: Net domestic product (12,873.2)			
4. Less:		Indirect business taxes (1002.2)	
5. Equals: Domestic income (11,871.0)			
6. Less:	Undistributed profits (474.4)		
		Social Security and corporate taxes (1439.2)	
7. Plus:			Transfer payments and interest (2,635.2)
8. Equals: Personal income (12,592.8)			
9. Less:		Personal income taxes (1,177.7)	
10. Equals: Personal disposable income (11,415.1)			
Divided among:	Personal saving (678.8)		
11. Personal consumption expenditure (10,366.3)			
12. Interest and personal transfer payments (370.0)			

Note: 2010:Q3 amounts in $ billions are shown in parentheses. Several minor items are included with larger items.

Source: www.bea.gov, NIPA tables 1.7.5, 1.12, and 2.1.

concepts of total income; these differ depending on which tax and saving leakages are included. The three remaining columns identify the major types of saving and tax leakages, as well as transfer payments (which work like taxes in reverse).

Line 1 starts with GDP, the total amount of income created by domestic production. The first leakage, on line 2, is for depreciation, defined on p. 30, the amount business firms set aside for the replacement of worn-out and obsolete investment goods.

What remains after depreciation deductions is net domestic product (NDP), shown on line 3.

Next, line 4 in Table 2 deducts indirect business taxes, which include state and local sales and property taxes. These tax payments are not available as income to households or business firms. Only what is left over, called **domestic income** (line 5), is available to provide net income to the domestic factors of production (labor and capital) that produce current output.

Domestic income is the earnings of domestic factors of production, computed as net domestic product, minus indirect business taxes, which are taxes levied on business sales.

By far the most important portion of domestic income is compensation paid to employees (which includes wages, salaries, and fringe benefits). Next in order of importance are net interest income, proprietors' income (from small businesses like farms and shops), corporate profits, and rental income.

From Domestic Income to Personal Income

Not all of domestic income is paid out to households as personal income, and personal income also includes some receipts by households that are not counted in GDP or domestic income. Lines 6 and 7 in Table 2 explain these differences. First, part of domestic income is kept by corporations in the form of undistributed profits—that is, the part of corporate profits that is not paid as dividends to stockholders or as corporate taxes to the government. Undistributed profits are a type of saving leakage, providing funding for the capital market to finance investment spending.

Next, large amounts flow to the government in the form of corporate and Social Security tax payments, then back from the government to households in the form of transfer payments like Social Security and unemployment benefits. Government funds also are paid out for interest on the national debt. Adjusting domestic income for these deductions and additions yields **personal income,** the sum of income payments to households (line 8). Personal income represents the current flow of purchasing power to households coming from *both* the productive activities of business firms *and* transfers from the government sector.

Personal income is the income received by households from all sources, including earnings and transfer payments.

All personal income is not available to households to spend, first because they must pay personal income taxes to the government (line 9). What remains is one of the most important concepts in national income accounting, **personal disposable income** (line 10). This is available for households to use in the three ways shown at the bottom of Table 2: consumption expenditure, personal interest and transfer payments, and personal saving (lines 11 and 12).

Personal disposable income is personal income minus personal income tax payments.

The total saving and tax leakages (with transfers treated as a negative tax) are symbolized as $S + T$ in equation (5) on p. 35, which shows that, by definition, they must be equal to nonconsumption spending (injections), symbolized by $I + G + NX$. This is the leakages–injections identity, for which we use the easy-to-remember name, the magic equation.

7   Nominal GDP, Real GDP, and the GDP Deflator

Thus far, all the terms and relationships of national income accounting apply to a particular time period (a quarter or a year) and are measured at the prices actually paid by households and firms. Any economic magnitude measured at the prices actually paid is described by the adjective **nominal.** For instance, **nominal GDP** is the total amount of current product valued at the prices actually paid on the market.

Real and Nominal Magnitudes

Nominal amounts are not very useful for economic analysis because they can increase either when people buy more physical goods and services—more cars, steaks, and haircuts—or when prices rise. An increase in my nominal spending on consumption goods from $40,000 in 2010 to $50,000 in 2011 might indicate that I became able to buy more items, or it could simply mean that I had to pay higher prices in 2011 for the same items purchased in 2010. Changes in nominal magnitudes hide more than they reveal. So economists focus on changes in real magnitudes, which eliminate the influence of year-to-year changes in prices and reflect true changes in the number, size, and quality of items purchased.

Real GDP and Real Output

We need a measure of real gross domestic product, or real GDP. Like any real magnitude, real GDP is expressed in the prices of an arbitrarily chosen base year. The official measures of GDP in the United States currently use 2005 as the base year. Real GDP for every year, whether 1929 or 2011, is measured by taking the production of that particular year expressed at the constant prices of 2005. For instance, 2011 real GDP measured in 2005 prices represents the amount that the actual 2011 production of goods and services would have cost if each item *had been sold at its 2005 price.*

Since prices usually increase each year, nominal GDP is higher than real GDP for years after 2005. Similarly, nominal GDP is lower than real GDP for years before 2005. You can see this regular pattern in Figure 4, which displays nominal and real GDP for each year since 1900. Only in 2005 are nominal and real GDP the same.

The percentage ratio of nominal GDP to real GDP is a price index called the **GDP deflator,** and this is displayed as the orange line in Figure 4. The GDP deflator measures the ratio of the prices actually paid in a particular year to the prices paid in the base year 2005. For instance, in 1959 nominal GDP was about 18 percent of real GDP, indicating that prices actually paid in 1959 were about 18 percent of the prices that would have been paid in 2005 for the same goods and services.

Later on we will consider other real magnitudes, such as real consumption and the real money supply. An alternative label for real magnitudes is constant-dollar; in contrast, nominal magnitudes are usually called current-dollar. To summarize:

Nominal is an adjective that modifies any economic magnitude measured in current prices.

Nominal GDP is the value of gross domestic product in current (actual) prices.

The **GDP deflator** is the economy's aggregate price index and is defined as 100 times the ratio of nominal GDP to chain-weighted real GDP.

Alternative labels for magnitudes			
Items measured in prices of a single year like 2005	Constant-dollar	or	Real
Items measured in actual prices paid in each separate year	Current-dollar	or	Nominal

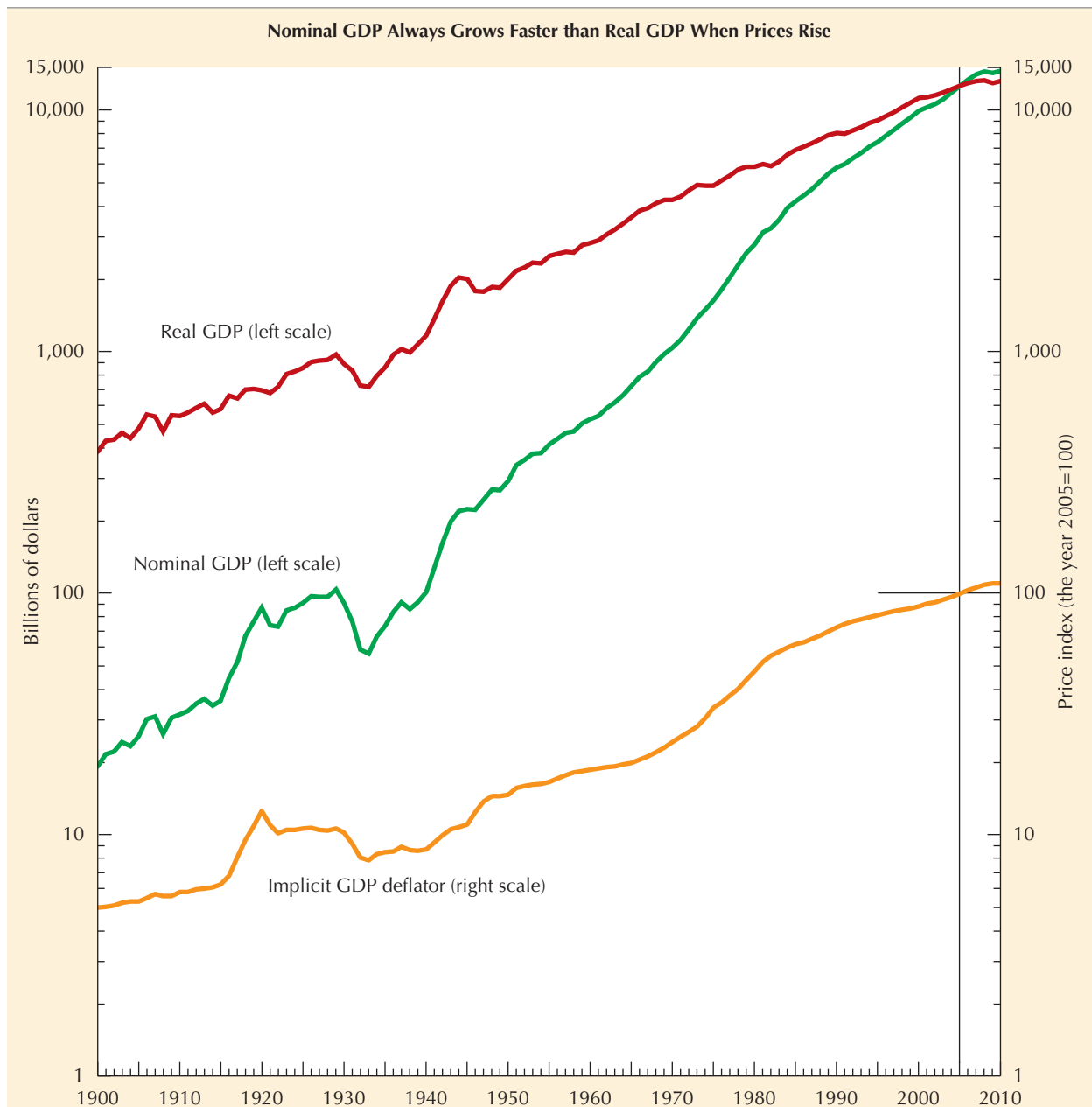**Nominal GDP Always Grows Faster than Real GDP When Prices Rise**

Figure 4 **Nominal GDP, Real GDP, and the GDP Deflator, 1900–2010**

Notice how the nominal GDP line lies below the real GDP line before 2005 but lies above the real GDP line after 2005. This reflects the fact that before 2005 the current prices used to measure nominal GDP were lower than the 2005 prices used to measure real GDP. After 2005, the current prices used to measure nominal GDP were higher than the 2005 prices used to measure real GDP. Notice how the nominal GDP line crosses the real GDP line in 2005, the same year that the GDP deflator attains the value of 100.

How to Calculate Inflation, Real GDP Growth, or Any Other Growth Rate

Often, you will want to calculate a percentage growth rate, whether the U.S. rate of inflation, real GDP, or even your own income over a period of years. In this section we will learn a very simple formula that will allow you to calculate the growth rate of *anything* over any period, no matter how long or short, and convert it to an annual rate.

In this text we will use lowercase letters, say *x*, to designate the growth rate of a variable, the level of which is called the same uppercase letter *X*. Let's say that we have been given the value of the GDP deflator for 2008 as 108.5 and for 2009 as 109.8, and we have been asked to calculate the inflation rate for 2009.

The general formula to calculate the percentage annual growth rate of any variable *X* at a time period *t* from another period *s* years earlier (call this *t-s*) is as follows:

General Form
$$X_t = 100 \, LN(X_t/X_{t-s})/s$$
Numerical Example
$$1.19 = 100 \, LN(109.8/108.5)/1.0$$

Here *LN* means "natural logarithm" and is a function key found on any scientific calculator. The answer to the example is found simply by taking the ratio $109.8/108.5 = 1.0120$ and then pushing the "LN" button, which yields 0.0119, and finally multiplying that result by 100.

Exactly the same formula can be used to calculate the annual rate of inflation between two adjacent quarters. Let us take the level of the GDP deflator for the fourth quarter of 2009, abbreviated "2009:Q4" from Appendix

Table A-2, which is 109.92. The value for the next quarter, 2010:Q1, is 110.23. What is the annual rate of inflation between those two quarters?

General Form
$$X_t = 100 \, LN(X_t/X_{t-s})/s$$
Numerical Example
$$1.09 = 100 \, LN(110.23/109.92)/0.25$$

The method is exactly the same. The only difference is that now we are comparing two adjacent quarters rather than two adjacent years, and so $s = 0.25$ (one-quarter of a year) instead of $s = 1$ as before.

Our final exercise is to calculate the average annual growth rate of U.S. real GDP from 1875 to 2010:

General Form
$$X_t = 100 \, LN(X_t/X_{t-s})/s$$
Numerical Example
$$3.32 = 100 \, LN(13238.6/138.9)/135$$

Again, this is exactly the same formula, now with $s = 135$ since there are 135 years between 1875 and 2009. Despite the fact that real GDP in 2009 was 88 times larger than in 1875, such a long period elapsed between those two years that the annual growth rate was a mere 3.32 percent.

The extremely useful formula discussed in this box can be used for any calculation involving growth rates, not just for such macroeconomic concepts as the price level or real GDP, but to calculate the annual rate of return of an investment over any period of time, even for a single day.

Why We Care About Real GDP and the GDP Deflator

We care about real GDP because its movements create a mirror image movement in the opposite direction in the unemployment rate. Further, we care about accurate measurements of real GDP, since they are essential to measuring productivity, or output per hour, the third of our central macro concepts.

We care about the GDP deflator because it is the basis for measuring the inflation rate. The inflation rate is the percentage rate of increase in the economywide average price level, which we measure by the GDP deflator. To convert the GDP deflator into the inflation rate, we use the universal formula for calculating growth rates shown in the box higher up on this page.

Further, we care about the GDP deflator because very fast inflation can destroy a society, as in the German hyperinflation. Fast inflation is bad because of the direct harm it causes, and because of the indirect harm done by measures taken to stop it. And to measure the inflation rate, we need to start with the GDP deflator.

The Appendix to this chapter provides the details that you need to understand how to calculate real GDP and the GDP deflator from specific prices and quantities of individual products.

◆ SELF-TEST 3

Without looking at Figure 4, you should now be able to answer the following:

1. Is the implicit GDP deflator greater or less than 100 percent in every year before 2005? In every year after 2005?

2. In what year is the implicit GDP deflator equal to exactly 100 percent?

8   Measuring Unemployment

The unemployment rate is the first of the central macro concepts. Families dread the financial and emotional disruption caused by layoffs, so news of an increase in the unemployment rate creates public concern and plummeting popularity ratings for incumbent politicians. Because of widespread public awareness, the unemployment rate is generally considered the most important of the central macro concepts. In this section we learn how the unemployment rate is measured.

The Unemployment Survey

Many people wonder how the government determines facts such as "the teenage unemployment rate in October 2010 was 27.1 percent," because they themselves have never spoken to a government agent about their own experiences of employment, unemployment, and time in school. It would be too costly to contact everyone in the country every month; the government attempts to reach each household to collect information only once each decade when it takes the decennial Census of Population.

As a compromise, each month 1,500 Census Bureau workers interview about 60,000 households, or about 1 in every 1,400 households in the country. Each month one-fourth of the households in the sample are replaced, so that no family is interviewed more than four months in a row. The laws of statistics imply that an average from a survey of a sample of households of this size comes very close to the true figure that would be revealed by a costly complete census.

Questions asked in the survey.   The interviewer first asks about each separate household member aged 16 or older, "What were you doing most of last week—working, keeping house, going to school, or something else?" Anyone who has done any work at all for pay during the past week, whether part-time (even one hour per week), full-time, or temporary work, is counted as employed.

For those who say they did no work, the next question is, "Did you have a job from which you were temporarily absent or on layoff last week?" If the person is awaiting recall from a layoff or has obtained a new job but is waiting for it to begin, he or she is counted as unemployed.

If the person has neither worked nor been absent from a job, the next question is, "Have you been looking for work in the last four weeks, and if so, what have you been doing in the last four weeks to find work?" A person who has not been ill and has searched for a job by applying to an employer, registering with an employment agency, checking with friends, or other specified job-search activities is counted as unemployed. The remaining people who are neither employed nor unemployed, mainly homemakers who do not seek paid work, students, disabled people, and retired people, fall in the category of "not in the labor force."

Definitions based on the interview.   Despite the intricacy of questions asked by the interviewer, the concept is simple: People with jobs are employed; people who do not have jobs and are looking for jobs are **unemployed;** people who meet neither labor-market test are not in the labor force. The **total labor force** is the total of the civilian employed, the armed forces, and the unemployed. Thus the entire population aged 16 and over falls into one of four categories:

The **unemployed** are those without jobs who either are on temporary layoff or have taken specific actions to look for work.

The **total labor force** is the total of the civilian employed, the armed forces, and the unemployed.

1. Total labor force
    a. Civilian employed
    b. Armed forces
    c. Unemployed
2. Not in the labor force

The actual **unemployment rate** is defined as the ratio

The **unemployment rate** is the ratio of the number unemployed to the number in the labor force, expressed as a percentage.

$$U = \frac{\text{number of unemployed}}{\text{civilian employed} + \text{unemployed}}$$

Example: In October 2010, the BLS reported an unemployment rate of 9.6 percent. This was calculated as the percentage ratio

$$U = 100 \times \left(\frac{\text{number of unemployed}}{\text{civilian employed} + \text{unemployed}} \right)$$

$$= 100 \times \left(\frac{14{,}843{,}000}{139{,}061{,}000 + 14{,}843{,}000} \right)$$

or

$$U = 9.6 \text{ percent}$$

The labor force participation rate is the ratio of the total labor force (civilian employed, armed forces, and the unemployed) to the population aged 16 or over. Those who do not participate in the labor force include those above age 15 who are in school, retired individuals, people who do not work because they are raising children or otherwise choose to stay at home, and those who cannot work because they are ill, disabled, or have given up on finding jobs. In June 2010 the labor force participation rate was 64.5 percent.

Flaws in the definition.   The government's unemployment measure sounds relatively straightforward, but unfortunately it disguises almost as much as it reveals. The adjacent Global Economic Crisis box explains some of the flaws in the official definition of unemployment, and the dimensions of harm done by the 2007–09 recession to workers who are not officially counted as unemployed.

UNDERSTANDING THE GLOBAL ECONOMIC CRISIS

The Ranks of the Hidden Unemployed

Flaws in the Definition

The official definition of unemployment unfortunately disguises as much as it reveals. The first problem is that the unemployment rate overstates the social harm done by unemployment. But a much more serious second problem is that the unemployment greatly understates the number of people whose lives are negatively impacted by recessions and their aftermath.

1. *The unemployment rate by itself is not a measure of the social distress caused by the loss of a job.* Each person who lacks a job and is looking for one is counted as "1.0 unemployed people." But the social impact of unemployment is very serious for the head of a household responsible for feeding numerous dependents, while it is much less serious for a 16-year-old looking only for a 10-hour-per-week part-time job to provide pocket money. Further, many of the unemployed in normal times are looking for jobs not because they have been laid off but because they are young people entering the labor force for the summer between school years, women reentering the labor force after maternity leave, and people who quit their jobs voluntarily and are counted as unemployed while looking for a new job. In prosperous periods like 2007, only a minority of the unemployed had lost their jobs involuntarily.

2. *The official unemployment concept misses millions of people who are still working but nevertheless are hurt by a recession.* Millions of those still employed may be forced to work part-time when they really want to work full-time. The number of "forced part-time workers" was particularly high in 2009 and 2010.

3. *A person lacking a job must actively look for a job within the most recent four weeks.* What about people who have looked and looked for a job and are convinced that nothing is available? If they stop looking, they are not counted as unemployed. They simply disappear from the labor force, entering the category of "not in the labor force." This group of people who have given up looking for jobs has been called "discouraged workers" and the "disguised unemployed." The government now keeps track of them as a separate category called "marginally attached workers."

Hidden Victims in the Global Economic Crisis and Its Aftermath

The chart tracks two categories of people officially defined as unemployed, and two categories of people who are not so defined. The yellow area at the bottom represents the people officially counted as unemployed who do not represent a major social problem, including new-entrant youth, reentrant mothers, and people who choose to quit their jobs to look for a better job. Variations in the yellow area are fairly minor, although the relatively high levels in 1975–85 and in 2009–10 reflect a weak labor market that made it harder for entrants, reentrants, and job leavers to find a job.

The light blue area represents those people who have lost their jobs or have just completed temporary jobs, and everyone in the blue area is officially counted as unemployed. These are the most obvious victims of recessions, and you can see sharp upswings in the size of the blue area in the recessions of 1975, 1981–82, and 2008–09, and to a lesser extent in the milder recessions of 1990–91 and 2001. A common feature of the blue area is that it tends to remain relatively high even after the recession is over. Also note that the blue area never disappears.

Unemployment has always been a *lagging indicator* and stays high sometimes for many months after output stops declining. Notice that the blue area declined rapidly in 1984–85 but slowly in 1991–94 and 2002–04. Current forecasts suggest that unemployment will remain at near-record high levels not just in 2009–10 but for at least two or three years after that.

The two types of hidden distress caused by recessions are shown by the red and brown areas. The red area represents those forced to work part-time who desire to work full-time; it grows during recessions and shrinks only slowly during business expansions. The large number of forced part-time workers in 2009–10 leads to a pessimistic prediction for the unemployment rate after 2010. Firms can add hours of labor most easily by shifting the employees already on the job from part-time to full-time status, and the large overhang of these part-time workers will allow employers to delay any need to hire new workers

Millions Impacted by Recessions but Not Counted As Unemployed
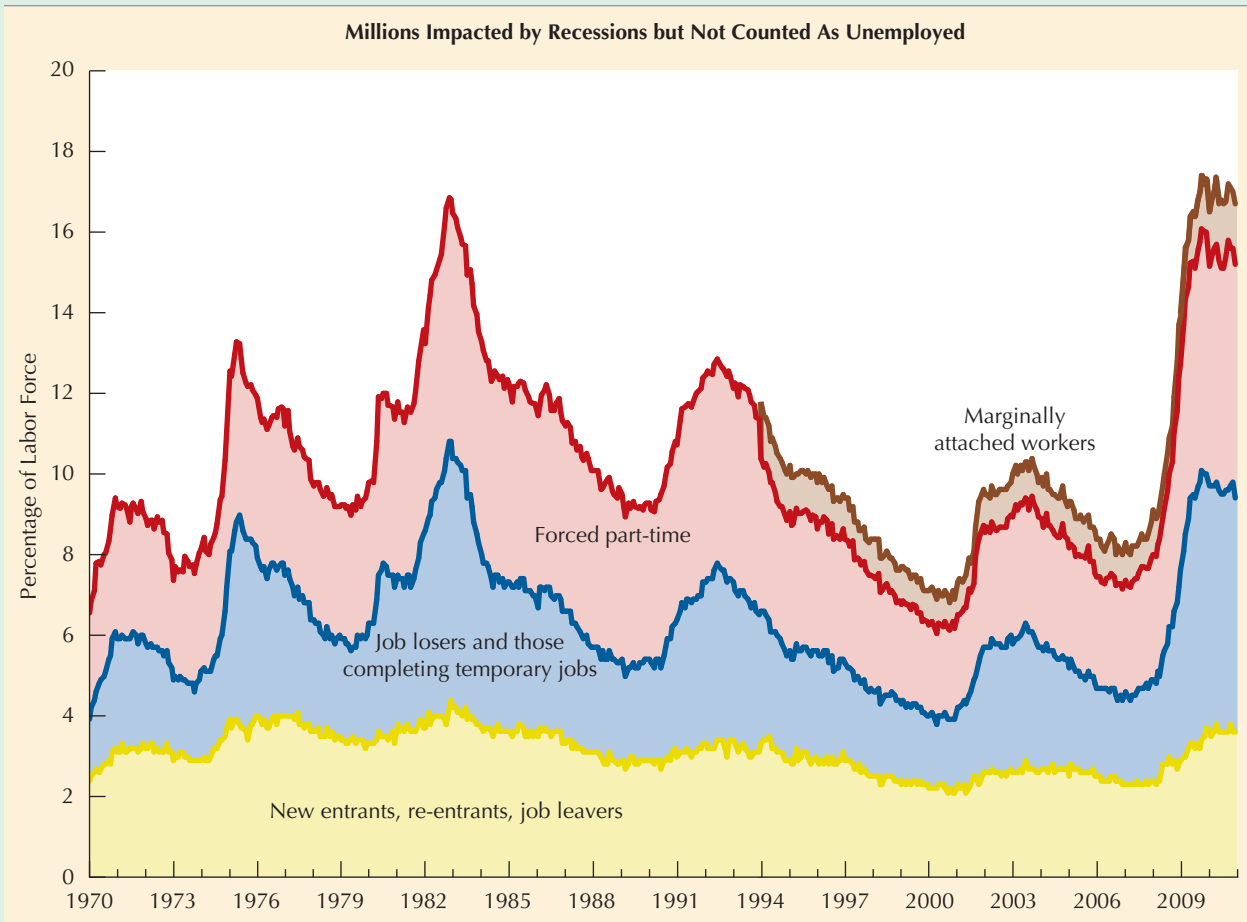
from the ranks of the unemployed or marginally attached workers.

The brown area is based on data that only begin in 1994 (this is why there is no brown area in the left portion of the chart). The marginally attached workers, including those who have given up looking for jobs, grow in number during recessions but appear to be a fairly constant percentage of the labor force during recoveries and expansions. The people in the red and brown areas are victims of recessions just as surely as those in the blue area.

When people are unemployed, they lose their incomes. If they are unemployed long enough, they use up their life savings and reach borrowing limits on credit cards and other debt. What do they live on then? A great political debate emerged in 2010 over proposals to extend unemployment benefits (transfer payments to the unemployed) any further. Some who opposed extending the benefits argued that the harm done by the large federal budget deficit and growing debt outweighed the need of the unemployed for continued help. The protracted symptoms of long-term unemployment began to show some similarity to the Great Depression.

Summary

1. This chapter is concerned with the definition and measurement of expenditures and income—what is included and excluded, and why, as well as with the measurement of real GDP, inflation, and the unemployment rate.
2. A flow magnitude is any money payment, physical good, or service that flows from one economic unit to another per unit of time. A flow is distinguished from a stock, which is an economic magnitude in the possession of an individual or firm at a moment of time.
3. Final product (GDP) consists of all currently produced goods and services sold through the market but not resold during the current time period. By counting intermediate goods only once, and by including only final purchases, we avoid double-counting and ensure that the value of final product and total income created (value added) are equal.
4. GNP equals GDP plus factor payments received from the rest of the world minus factor payments sent to the rest of the world.
5. GDP includes depreciation. Once depreciation is deducted from GDP, we have net domestic product or NDP.
6. Leakages out of income available for consumption spending are, by definition, exactly balanced by injections of nonconsumption spending. This equality of leakages and injections is guaranteed, by definition, to be true.
7. In the same way, by definition, total income (consumption plus leakages) equals total expenditure (consumption plus injections). Injections of nonconsumption spending fall into three categories: private domestic investment (on business equipment and structures, residential housing, and inventory accumulation); foreign investment or net exports; and government spending on goods and services. The definitions require private saving to exceed private investment (domestic and foreign) by the amount of the government deficit.
8. Net domestic product (NDP) is obtained by deducting depreciation from GDP. Deduction of indirect business taxes from NDP yields domestic income, the sum of all net incomes earned by domestic factors of production in producing current output. If we deduct corporate undistributed profits, corporate income taxes, and Social Security taxes, and add in transfer payments, we arrive at personal income, the sum of all income payments to individuals. Personal disposable income is personal income after the deduction of personal income taxes.
9. The GDP deflator is defined as nominal GDP in actual current prices divided by real GDP.
10. Those aged 16 and over are counted as unemployed if they are temporarily laid off or want a job, and take specified actions to find a job. The unemployment rate is the number of unemployed expressed as a percent of the total number of persons employed and unemployed.

Concepts

consumption expenditures
flow magnitude
stock
National Income and Product
   Accounts
final product
transfer payments
intermediate good
final good
value added
gross national product (GNP)
depreciation (consumption of fixed
   capital)

net domestic product (NDP)
gross
net
private investment
inventory investment
fixed investment
personal saving
exports
imports
net exports
net foreign investment
magic equation
leakages

injections
domestic income
personal income
personal disposable income
nominal
nominal GDP
GDP deflator
unemployed
total labor force
unemployment rate

Questions

1. Explain the difference between a stock magnitude and a flow magnitude. Label each of the following as either a stock or a flow:
   (a) depreciation
   (b) saving
   (c) wealth
   (d) government debt
   (e) government deficit
   (f) current account deficit
   (g) savings
   (h) money supply
   (i) labor force
   (j) labor services
   (k) net exports
   (l) net taxes

2. Decide whether each of the following transactions is included in GDP. If the transaction is included, determine which component of final spending it represents. If the transaction is excluded from GDP, explain why.
   (a) Your local ice cream maker buys peaches to make peach ice cream.
   (b) Your local ice cream maker buys a new and improved ice cream maker.
   (c) You buy peach ice cream from your local ice cream maker.
   (d) Your local ice cream maker sells peach ice cream to a restaurant that serves peach smoothies.
   (e) Your cousin in Canada buys peach ice cream from your local ice cream maker.
   (f) You buy a used book to learn how to make peach ice cream.
   (g) You buy peaches to make peach ice cream for yourself.
   (h) You buy a new ice cream maker to make peach ice cream for yourself.
   (i) You give some of your peach ice cream to your cousin when she visits from Canada.

3. Explain whether each of the following would be included in GDP, GNP, or both of the United States.
   (a) The salary of an American who is working in Japan for Honda (a Japanese company).
   (b) The profits that Honda earns from its production of cars in Ohio.
   (c) The value of the software that Microsoft sells to Honda for use in its corporate headquarters in Japan.

4. Explain why the value of goods and services purchased by Europeans vacationing in the United States would be considered U.S. exports and the money that Americans spend traveling overseas is considered part of U.S. imports.

5. Assume that the GDP of the United States is twice as large as the GDP of China. Can you conclude, based on this information, that the average individual in the United States is two times as well off as the average individual in China? Why or why not?

6. The term "underground economy" encompasses economic activity that people do not report because it is illegal or because they hope to avoid paying taxes. Though the size of the underground economy is unknown, it may be a sizable fraction of the nation's GDP. How does the underground economy affect the accuracy of official measures of GDP, unemployment, and productivity, and complicate the tasks of policymakers?

7. Using the information contained in the box entitled "Where to Find the Numbers: A Guide to the Data" concerning where to find data on the economy, go to the correct Web site to get the following data for the most recent month or quarter:
   (a) interest rates on two-year Treasury notes and ten-year Treasury bonds;
   (b) the GDP deflator;
   (c) the number of people unemployed, the number of civilians employed, the number of people in the labor force, the unemployment rate, and the nonfarm payroll;
   (d) nominal and real GDP and nominal and real personal consumption expenditures.

8. (a) Savings and taxes are called leakages. From what do they leak? Where do they go? Imports are also a leakage. From what do they leak? Where do they go?
   (b) Private domestic investment and government purchases of goods and services are called injections. What are they injections into? From where do they come? Exports are an injection. What are they injections into? From where do they come?

9. When the government runs a budget deficit, funds flow from capital markets to the government as the government borrows from capital markets by selling bonds. Explain how funds flow from the government to the capital markets when the government runs a budget surplus.

10. In the national income and product accounts, personal income is calculated by subtracting from national income any income earned but not received

and adding back in any income received but not earned. Explain.

11. Four hundred tires are produced by a tire manufacturer and sold for $75 each to General Motors in December 2010. In February 2011, General Motors puts the tires on 100 newly produced cars and sells each car for $30,000. What is the contribution made to GDP in 2010 and 2011 by the transaction described? (Assume all other components of the cars are produced in 2011.)

12. Starting from the situation depicted in Figure 3, assume that business firms produce an additional $500,000 worth of goods, of which only $450,000 are bought during the current year. What are the new values for the following categories?
    (a) income
    (b) consumption expenditure
    (c) personal saving
    (d) investment

13. Suppose that the amount of private saving declines. Explain why at least one of the following must occur: Government saving must increase, private domestic investment must decrease, or net foreign investment must decrease.

14. If you learn that nominal GDP for 2011 is greater than nominal GDP for 2010, what do you know about changes in the level of output during this period? Changes in prices during this period? Would your answer change if real GDP had increased in 2011?

15. In late 2003 and early 2004, the Federal Reserve was concerned about the possibility of deflation, which is a general fall in prices. If deflation occurs, explain which grows faster, nominal GDP or real GDP.

16. Explain how a person who falls into the ranks of the "hidden unemployed" differs from someone who is officially counted as unemployed. Compare the Global Economic Crisis with earlier recessions in terms of the severity of "hidden unemployment" and how long people were unemployed.

17. If the government suddenly decided to include the noncivilian employed, that is, the armed forces, together with the civilian employed in the denominator of the unemployment rate, what would happen to the unemployment rate?

18. Due to a recession, ABC Enterprises' sales decline. In order to reduce losses, ABC lays off 10 percent of its labor force, including Don, Ellen, and Frank. ABC indicates that it will hire all its workers back within two months. In each of the following cases, explain if the person is employed, unemployed, or not in the labor force.
    (a) Don decides he is going to use the two months to go fishing in Montana.
    (b) Ellen questions whether ABC will really hire her back. She quickly finds another job.
    (c) Frank's wife decides she wants to go back to work, but urges him to go back to school. He agrees and resigns his position at ABC. He also decides to devote all of his efforts to school. His wife starts looking for a job to support them.

Problems

*Indicates that the problem requires the Appendix to this chapter.

1. Use the following data to answer the following questions (all figures are in billions of dollars):

Item	Amount
Government purchases of goods and services	$1,721.6
Exports	1,096.3
Receipts of factor income from the rest of the world	382.7
Depreciation (consumption of fixed capital)	990.8
Net fixed investment	688.2
Corporate income taxes	265.2
Consumption expenditures	6,739.4
Indirect business taxes	664.6
Imports	1,475.8
Payments of factor income to the rest of the world	343.7
Inventory change	56.5
Social Security contributions	702.7
Undistributed corporate profits (retained earnings)	130.3
Government transfer and interest payments	1,366.3
Personal interest payments	286.2
Personal taxes	1,235.7

(a) What is gross domestic product?
(b) What is gross national product?
(c) What is net domestic product?
(d) What is domestic income?
(e) What is personal income? (*Hint:* Personal interest payments are part of the category "interest and personal transfer payments" on line 12 of Table 2.)
(f) What is disposable personal income?
(g) What is personal saving?

2. Assume that gross private domestic investment is $800 billion and the government (state, local, and federal combined) is currently running a $400 billion deficit. If households and businesses are saving $1,000 billion, what is the value of net exports? Use equation (6) to explain your answer.

3. Orange growers sell $15 billion of their crop to orange juice processors and $6 billion of their crop to supermarkets. The orange juice processors sell their orange juice to supermarkets for $18 billion. The supermarkets sell oranges to consumers for $8 billion, orange juice to consumers for $18 billion, and orange juice to

restaurants for $4 billion. The restaurants sell the orange juice to consumers for $8 billion.
(a) Calculate the amounts oranges and orange juice contribute to GDP.
(b) Calculate the value added by orange growers, orange juice processors, supermarkets, and restaurants.

*4. Assume that a country produces only two goods, automobiles and fast PCs. In year 1, automobiles cost $20,000 each and the PCs cost $3,000 each; 1,000 automobiles and 10,000 PCs are produced. In year 2, the price of automobiles has increased to $22,000; because a new, even faster type of PC is about to be introduced, the price of fast PCs has fallen to $700. In year 2, 1,000 automobiles and 15,000 PCs are produced.
(a) Fill in the following table.

	Year 1	Year 2
Nominal GDP (Total of current-dollar expenditures)		
Real GDP		
(i) at fixed year 1 prices		
(ii) at fixed year 2 prices		

(b) Using the technique of chain-weighting, calculate the percentage change in real GDP between year 1 and year 2.
(c) Calculate the GDP deflator for year 2.

5. If nominal GDP is $10,608 and real GDP is $10,400, what is the value of the GDP deflator?

6. Suppose that the GDP deflator equals 100 and real GDP equals 10,000. Calculate the value of nominal GDP.

7. Suppose that the GDP deflator equals 102.5 and nominal GDP equals 11,200. Calculate the value of real GDP.

8. Calculate percentage annual growth rates using the data that follow.
(a) Productivity growth measures increase in output per hour of work. Output per hour was 54.0 in the first quarter of 1973, 75.4 in the first quarter of 1996, and 111.0 in the first quarter of 2010 (2005 = 100). Calculate the average annual rates of productivity growth between 1973 and 1996 and between 1996 and 2010. Using your answers, explain during which of these two periods living standards rose more quickly.
(b) The GDP deflator was 30.7 in 1974, 43.8 in 1979, 59.8 in 1984, 69.5 in 1989, 79.9 in 1994, 86.8 in 1999, 96.8 in 2004, and 109.6 in 2009. During which five-year interval was the annual inflation rate the

highest? During which interval was the average annual inflation rate the lowest? What was the trend in inflation over the last quarter of the twentieth century? (*Hint:* The inflation rate is the annual percentage change in the GDP deflator.)

(c) In the second quarter of 2005, real GDP was 12,587.5. In the second quarter of 2006, real GDP was 12,962.5; in the third quarter of 2006, it was 12,965.9. Calculate the percentage annual growth rates between the second quarters of 2005 and 2006, and the second and third quarters of 2006. Interpret your results.

9. How long will it take real GDP to double if it grows at the following rates?
   (a) 4 percent per year
   (b) 6 percent per year
   (c) 8 percent per year

10. In 2009, civilian employment was 139,877,000 and unemployment was 14,265,000. What was the unemployment rate?

◆ SELF-TEST ANSWERS

1. (1) The payment of the $10 bill to the barber is a flow of money shown by the red line labeled consumption expenditure. The provision of the haircut by the barber for the student is shown by the orange line labeled product. The barber's income of $10 is shown by the green line labeled income, and the barber's provision of labor services to perform the haircut is shown by the purple line labeled labor services. (2) Alison provides labor services, shown by the purple line, to the summer camp, in return for which she receives income ($8 per hour for each hour she works) from the summer camp, shown by the green line. The camp fees paid by parents are part of consumer expenditures, shown by the red line, and the camp services are part of product, shown by the orange line.

2. (1)(2) Included in GDP for the first quarter of 2011 is the change in the value of the bakery's inventories between December 31, 2010, and March 31, 2011. This is $30.00 minus $20.00, or $10.00. If the level of inventories had fallen, instead of rising as in the example, inventory investment would have been negative. (3) The baker's inventory change contributes $10.00 to GDP in the first quarter of 2011.

3. (1) Less than 100 percent in every year before 2005; greater than 100 percent in every year after 2005. (2) Equal to 100 percent in 2005.

Appendix

How We Measure Real GDP and the Inflation Rate

Clearly, nominal GDP is of no interest by itself. We must find some way of separating its movements into those caused by changes in real GDP and those caused by inflation. Only if we succeed in making this "split" of nominal GDP changes will we be able to identify separately the growth rate of total output, or real GDP, and the inflation rate.

How We Calculate Changes in Real GDP

Real GDP cannot be observed directly. No one can see, feel, or touch it. There's an old saying that "you can't add apples and oranges." Real GDP carries that saying to its limit, since real GDP consists not just of apples and oranges, but also computers, electricity, haircuts, restaurant meals, and thousands of other goods and services that can't be added directly. The only way to combine the different products is to place a value on each component of GDP, and that requires using the prices of the goods and services produced. However, since prices are constantly changing, our measure of real GDP and its changes will depend on which time period we choose to take the prices for this essential valuation of the components of GDP.

The table shows how the change in real GDP between year 1 and year 2 differs, depending on the prices that are used. Lines 1 and 2 show the hypothetical prices and quantities of oranges and apples used in this imaginary two-good economy. Notice that the price of oranges doubles between year 1 and year 2, while the price of apples goes up only 25 percent. As a result, the consumption of oranges drops in year 2 while the consumption of apples doubles. As you will see, the change in measured real GDP between years 1 and 2 depends on the importance we assign to the big decline in orange consumption and the big increase in apple consumption.

One approach, which was used previously to calculate real GDP in the United States, was to hold the value of all products fixed over all years at the prices of a single

Calculation of Real GDP and GDP Deflators in an Imaginary Economy Producing Only Oranges and Apples

	Year 1	Year 2
1. Prices		
a. Oranges	$0.10	$0.20
b. Apples	0.20	0.25
2. Quantities		
a. Oranges	30	20
b. Apples	10	20
3. Current-dollar expenditures		
a. Oranges (1.a times 2.a)	$3.00	$4.00
b. Apples (1.b times 2.b)	2.00	5.00
c. Total: Nominal GDP	5.00	9.00
4. Constant-dollar expenditures each year		
a. At fixed year 1 prices	$5.00	$6.00
b. At fixed year 2 prices	8.50	9.00

(continued)

	Year 1	Year 2
5. Real GDP (index, year 1 = 1.00)		
a. At fixed year 1 prices	1.00	1.20
b. At fixed year 2 prices	1.00	1.06
c. Chain-weighted (geometric mean, 5.a and 5.b)	1.00	1.13
6. Additional indexes, year 1 = 1.00		
a. Nominal GDP (3.c)	1.00	1.80
b. GDP deflator (6.a/5.c)	1.00	1.59

Sources, by line:
4.a. Year 1 same as 3c. Year 2 (.10 × 20 + .20 × 20 = 6.00)
4.b. Year 2 same as 3c. Year 1 (.20 × 30 + .25 × 10 = 8.50)
5.a. Year 2 divided by year 1 from line 4a, 6.00/5.00 = 1.20
5.b. Year 2 divided by year 1 from line 4b, 9.00/8.50 = 1.06
5.c. Year 2 is geometric mean of year 2 from the two lines above, $\sqrt{1.20 \times 1.06}$

year. The actual dollars spent on oranges, apples, and total fruit are shown on line 3 of the table. The expenditures, measured in fixed year 1 prices, are shown on line 4.a. This yields an increase in real GDP in year 2 (measured in the constant prices of year 1) of 20 percent, since the ratio of year 2 expenditures to year 1 expenditures ($6.00/$5.00) is 1.20. This gives us line 5.a, showing that real GDP, using year 1 prices, increases from 1.00 in year 1 to 1.20 in year 2.

But we get a different answer if we measure constant-dollar expenditures in each year using fixed year 2 prices. As shown on line 4.b, expenditures in year 2 increase from $8.50 to $9.00. This yields an increase in real GDP in year 2 (measured in the constant prices of year 2) of 6 percent, since the ratio of year 2 expenditures to year 1 expenditures ($9.00/$8.50) is 1.059. Why does this second method give us a lower estimate of the increase in real GDP? This occurs because year 2 prices are relatively lower for apples compared to oranges, and using year 2 prices places a lower importance on the big jump in apple consumption.

This example shows a general tendency—that choosing the prices of a later year tends to give us a lower increase in real GDP, since the later year places a lower valuation on the quantities that have increased most rapidly. This is particularly important in recent years in actual calculations of real GDP, since the prices of some goods, such as personal computers, TV sets, and telephone equipment, have been declining rapidly in contrast to continuous increases in the prices of many other goods and services.

The Chain-Weighted Calculation of Real GDP

Which is the correct measure of the increase in real GDP in this example? Is 20 percent correct or is 6 percent? The startling fact is that *there is no single answer to this question,* because the prices of each year are equally valid as alternative ways to value the quantities actually produced. A reasonable compromise is to average the two answers together. To do this, economists have long known that the best type of average is a geometric average, which is obtained by multiplying the two answers together and then taking the square root, that is:

$$\sqrt{1.20 \times 1.06} = 1.13.[1]$$

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[1] Take a scientific calculator and check the answer for yourself. Multiplying 1.20 by 1.06 and then taking the square root yields an answer of 1.128. An alternative method to arrive at exactly the same answer is to take the natural logarithms of 1.20 and 1.06, which are 0.1823 and 0.0583, respectively, add them together (0.2406), divide by 2 (0.1203), and then take the antilogarithm (e^x) of the answer, yielding 1.128.

The United States now calculates real GDP using this technique of geometric averaging across hundreds of different types of products. The outcome is called chain-weighted real GDP, because the weights move forward from year to year. For instance, the percentage change in real GDP between 2007 and 2008 uses a geometric average of 2007 and 2008 price weights. Then the percentage change in real GDP between 2008 and 2009 shifts to a geometric average of 2008 and 2009 price weights. The resulting percentage changes are chained together into an index of real GDP, moving forward and backward from the base year of 2000.

The Implicit GDP Deflator

The method illustrated in line 5.c. of the table yields the chain-weighted measure of real GDP. The implicit GDP deflator is simply the ratio of nominal GDP to chain-weighted real GDP.

The implicit deflator, which is plotted in Figure 4, tells us the percentage ratio of prices actually charged in any single year (say, 1959) to the prices charged in the base year 2005. For instance, the implicit GDP deflator in 1959 was 18.3, the percentage ratio of actual nominal GDP ($506.6 billion) to real GDP, which is spending for the same year measured in 2000 prices (2,762.5 billion):

$$\text{implicit GDP deflator for 1959} = 18.3 = 100 \times \left(\frac{506.6 \text{ billion}}{2,762.5 \text{ billion}} \right)$$

$$= 100 \times \left(\frac{\text{nominal GDP}}{\text{real GDP}} \right)$$

In words, this equation states that the implicit GDP deflator in 1959 was 18.3 because 1959 nominal GDP was 18.3 percent of the value of the 1959 real GDP. This percentage in turn reflects the fact that the average level of prices in 1959 was about one-fifth of the level of the base year 2005.

The rate of inflation is simply the percentage growth rate of the chain-weighted GDP deflator.

Data Sources and Methods

Sources and Methods for Figures

Some sources are abbreviated as follows:

FRB: The Board of Governors of the Federal Reserve System

BEA: U.S. Department of Commerce *Bureau of Economic Analysis*

NIPA Tables: *National Income and Products Accounts Tables* obtained from www.bea.gov

BLS: U.S. Department of Labor *Bureau of Labor Statistics*

GGDC: The Conference Board and Groningen Growth and Development Centre

Historical Statistics: *The Historical Statistics of the United States: Millennial Edition Online*

IMF: International Monetary Fund

OECD: The Organization for Economic Cooperation and Development

1. Figure 4:

    1900–2010: Nominal GDP (*X*):

    1875–1928: Data from Nathan S. Balke and Robert J. Gordon, "The Estimation of Prewar GNP: Methodology and New Results," *Journal of Political Economy*, vol. 97 (February 1989), pp. 38–92, Table 10. Linked in 1929 to:

    1929–2010: Data from U.S. Department of Commerce, Bureau of Economic Analysis. National Income and Product Accounts: Table 1.5 on the BEA Web site: www.bea.doc.gov

    Implicit GDP Deflator (*P*):

    Same as Nominal GDP (*X*), except Table 1.9 for 1929–2010.

    Real GDP (*Y*):

    Same as Nominal GDP (*X*), except Table 1.6 for 1929–2010.

2. Figure 5:

    Current Population and Employment Statistics Surveys

    1990–2010: BLS Series Ids: LNS12000000 and CES0000000001

    For accurate comparison, requires: Employment in Agriculture, Forestry, and Fishing

    1990–2010: BEA *NIPA* Table 6.8

Income and Interest Rates: The Keynesian Cross Model and the *IS* Curve

Income and Interest Rates: The Keynesian Cross Model and the *IS* Curve

An honest man is one who knows that he can't consume more than he has produced.
   —Ayn Rand, 1966

Our introduction to macroeconomics distinguished two main groups of issues: those that concern *short-run* business cycles and those that concern the economy's *long-run* growth rate. This chapter begins to develop the theory of business cycles and examines the potential role of monetary and fiscal policy in dampening the amplitude of these cycles. Thus we will be concerned with the *short-run* behavior of the economy.

1   Business Cycles and the Theory of Income Determination

A business cycle refers to the alternation of periods of rapid or slow growth in real GDP. In this chapter we start to learn about the origins of business cycles; we put together into a simple economic model the numerous factors that contribute to economic volatility.

The Volatile Business Cycle: The Global Economic Crisis Follows the Great Moderation

The goals of monetary and fiscal policy are to dampen business cycles and move toward an ideal world in which real GDP grows steadily from one quarter to the next. The real world as shown in Figure 1 is far from that ideal world. Plotted along the red line are changes in real GDP compared with the same quarter one year earlier. The four-quarter growth rate of real GDP has been as high as 12.6 percent in 1950 and as low as −3.9 percent in 2009.

Our first impression from Figure 1 is of relentless volatility in GDP growth, with a repeated pattern of ups and downs. Yet if we look more closely, we see that during the period between 1985 and 2007 real GDP growth showed remarkable steadiness, with only two mild recessions in 1990–91 and in 2001. The period of relatively steady growth during the 1986–2007 period has been called the "Great Moderation," and macroeconomists have debated its causes. Were shocks to the economy smaller, was policy managed better, or both?

Complacency about the Great Moderation was dashed after 2007 when the economy tumbled into the worst recession since the 1930s. The scale of the economic disaster that we call the Global Economic Crisis raised doubts whether
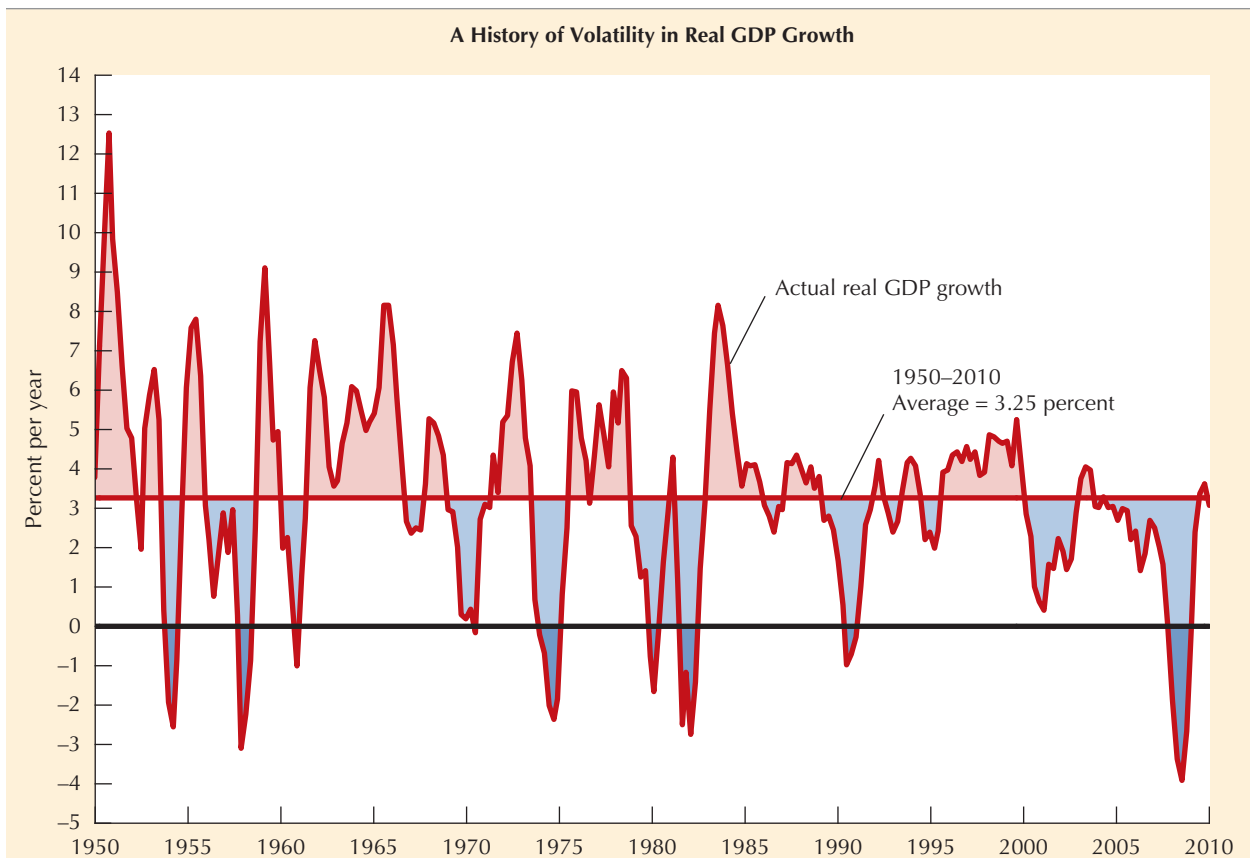
A History of Volatility in Real GDP Growth

Figure 1 Real GDP Growth in the United States, 1950–2010

The shading shows that the growth in real GDP (plotted as the change from four quarters ago) can be divided up into three types of performance. The shaded red periods are when the actual growth rate was faster than the 61-year average of 3.25 percent. The shaded light blue periods are when the actual growth rate was slower than 3.25 percent but greater than zero. The shaded darker blue periods indicate periods of negative real GDP growth.

there had been any fundamental improvement in monetary or fiscal policy during the period of the Great Moderation. It seemed plausible in retrospect that the economy performed well in 1985–2007 because shocks were moderate, and that in 2008–09 the economy was hit by a set of new unanticipated shocks.

In this chapter we begin the process of identifying what some of those shocks may be. Among the candidates are changes in consumer confidence and business optimism, changes in prices of residential homes and in prices on the stock market, and changes in foreign demand for goods and services produced in the United States. These shocks to **aggregate demand** (also known as **demand shocks**) are the basic source of business cycle volatility.

Monetary and fiscal policy are intended to stabilize the economy but sometimes can be the source of additional shocks, due for instance to monetary policy decisions that set interest rates too high or too low, and fiscal policy changes, particularly in military expenditures. The model of income determination developed in this chapter and the next shows that demand shocks have

Aggregate demand is the total amount of desired spending expressed in current (nominal) dollars.

A **demand shock** is a significant change in desired spending by consumers, business firms, the government, or foreigners.