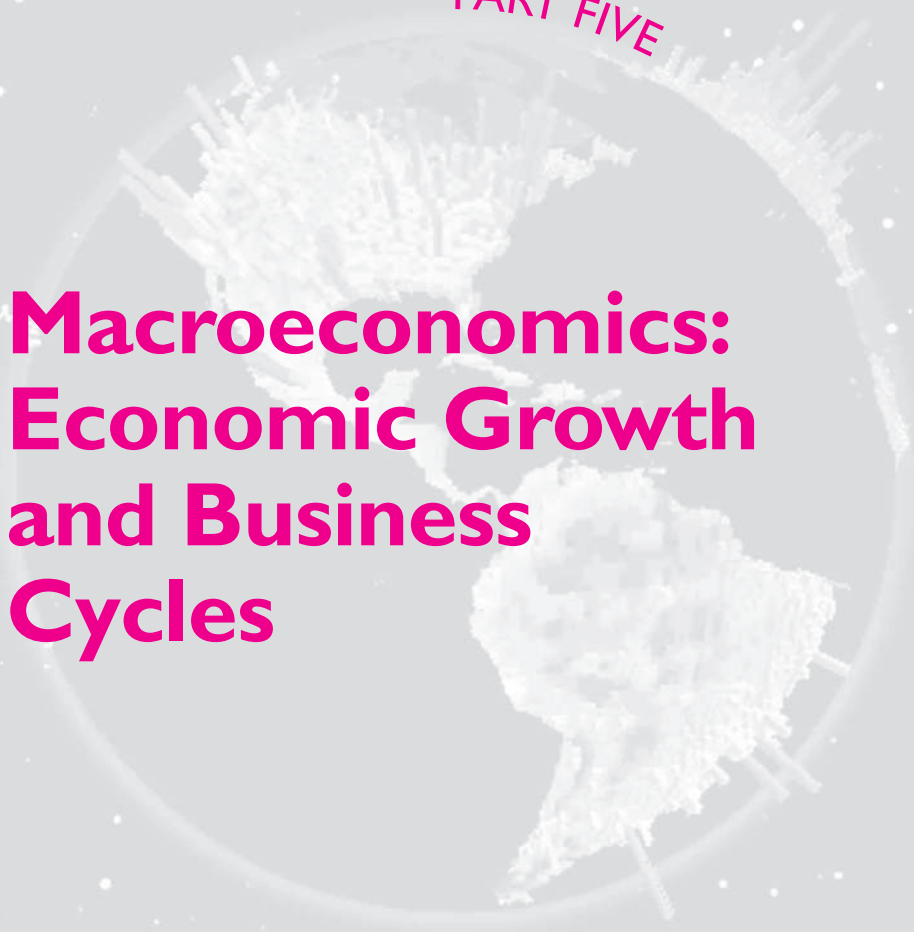
PART FIVE



# Macroeconomics: Economic Growth and Business Cycles

CHAPTER

# Overview of Macroeconomics

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*The whole purpose of the economy is production of goods or services for consumption now or in the future. I think the burden of proof should always be on those who would produce less rather than more, on those who would leave idle people or machines or land that could be used. It is amazing how many reasons can be found to justify such waste: fear of inflation, balance-of-payments deficits, unbalanced budgets, excessive national debt, loss of confidence in the dollar.*

James Tobin,
*National Economic Policy*

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Are jobs plentiful or hard to find? Are real wages and living standards growing rapidly, or are consumers struggling to make ends meet as price inflation reduces real wages? Is there a period of financial exuberance with stock prices rising rapidly? Or is the central bank using monetary policy to fight off the effects of falling housing prices and a financial crisis? What are the impacts of globalization and foreign trade on domestic employment and output? These questions are central to macroeconomics, which is the subject of the following chapters.

**Macroeconomics** is the study of the behavior of the economy as a whole. It examines the forces that affect firms, consumers, and workers in the aggregate. It contrasts with **microeconomics,** which studies individual prices, quantities, and markets.

Two central themes will run through our survey of macroeconomics:

- The short-term fluctuations in output, employment, financial conditions, and prices that we call the *business cycle*
- The longer-term trends in output and living standards known as *economic growth*

The development of macroeconomics was one of the major breakthroughs of twentieth-century economics, leading to a much better understanding of how to combat periodic economic crises and how to stimulate long-term economic growth. In response to the Great Depression, John Maynard Keynes developed his revolutionary theory, which helped explain the forces producing economic fluctuations and suggested how governments can

control the worst excesses of the business cycle. At the same time, economists have endeavored to understand the mechanics of long-term economic growth.

Macroeconomic issues dominated the U.S. political and economic agenda for much of the last century. In the 1930s, when production, employment, and prices collapsed in the United States and across much of the industrial world, economists and political leaders wrestled with the calamity of the Great Depression. During the Vietnam War in the 1960s and the energy crises of the 1970s, the burning issue was "stagflation," a combination of slow growth and rising prices. The 1990s witnessed a period of rapid growth, falling unemployment, and stable prices—years when everything went right, labeled by some as "the fabulous decade." Then asset-market bubbles burst twice in the first decade of the 2000s. The first shock was a sharp decline in the prices of technology stocks in 2000, and this was followed by a sharp decline in housing prices after 2007. The 2007–2009 housing-price decline produced a profound financial crisis and led to a deep and long recession.

Sometimes, macroeconomic failures raise life-and-death questions for countries and even for ideologies. The communist leaders of the former Soviet Union proclaimed that they would overtake the West economically. History proved that to be a hollow promise, as Russia, a country teeming with natural resources and military might, was unable to produce adequate butter for its citizens along with the guns for its imperial armies. Eventually, macroeconomic failures brought down the communist regimes of the Soviet Union and Eastern Europe and convinced people of the economic superiority of private markets as the best approach to encouraging rapid economic growth.

This chapter will serve as an introduction to macroeconomics. It presents the major concepts and shows how they apply to key historical and policy questions of recent years. But this introduction is only a first course to whet the appetite. Not until you have mastered all the chapters in Parts Five through Seven can you fully enjoy the rich macroeconomic banquet that has been a source of both inspiration for economic policy and continued controversy among macroeconomists.

# A. KEY CONCEPTS OF MACROECONOMICS

## THE BIRTH OF MACROECONOMICS

The 1930s marked the first stirrings of the science of macroeconomics, founded by John Maynard Keynes as he tried to understand the economic mechanism that produced the Great Depression. After World War II, reflecting both the increasing influence of Keynesian views and the fear of another depression, the U.S. Congress formally proclaimed federal responsibility for macroeconomic performance. It enacted the landmark Employment Act of 1946, which stated:

> The Congress hereby declares that it is the continuing policy and responsibility of the federal government to use all practicable means consistent with its needs and obligations . . . to promote maximum employment, production, and purchasing power.

For the first time, Congress affirmed the government's role in promoting output growth, fostering employment, and maintaining price stability. The Employment Act usefully frames the three central questions of macroeconomics:

1. *Why do output and employment sometimes fall, and how can unemployment be reduced?* All market economies show patterns of expansion and contraction known as *business cycles*. The latest business-cycle recession in the United States occurred after a severe financial-market crisis that began in 2007. Housing and stock prices fell sharply, and banks tightened credit and lending. As a result, output and employment fell sharply. Political leaders around the world used the tools of monetary and fiscal policy to reduce unemployment and stimulate economic activity.

   From time to time countries experience high unemployment that persists for long periods, sometimes as long as a decade. Such a period occurred in the United States during the Great Depression, which began in 1929. In the following years, unemployment rose to almost one-quarter of the workforce, while industrial production fell by one-half. One of the deepest

and most prolonged economic downturns of the modern era came in Japan, which experienced declining prices and was unable to shake off high unemployment and slow economic growth after 1990.

Macroeconomics studies the sources of persistent unemployment and high inflation. Having considered the symptoms, macroeconomists suggest possible remedies, such as using monetary policy to alter interest rates and credit conditions or using fiscal instruments such as taxes and spending. The lives and fortunes of millions of people depend upon whether economists find correct diagnoses for major macroeconomic ailments—and upon whether governments apply the right medicine at the right time.

2. *What are the sources of price inflation, and how can it be kept under control?* A market economy uses prices as a yardstick to measure economic values and conduct business. When prices are rising—a phenomenon we call *inflation*—the price yardstick loses its value. During periods of high inflation, people may get confused about relative prices and make mistakes in their spending and investment decisions. Tax burdens may rise. Households on fixed incomes find that inflation is eating away at their real incomes.

   Macroeconomic policy has increasingly emphasized low and stable inflation as a key goal. Many countries set "inflation targets" for their economic policy, with targets often being in the range from 1 to 3 percent per year. Except for brief spikes, the United States has succeeded in containing inflation over the last two decades, with an average inflation rate of 3 percent per year for the consumer price index. Many countries have not been so successful. Formerly socialist countries like Russia and many Latin American and developing countries experienced inflation rates of 50, 100, or 1000 percent per year in the last two decades. The inflationary record in the last few years was in troubled Zimbabwe, where inflation was around 20,000,000 percent per year in 2008. A chicken that cost 10 thousand Zimbabwean dollars at the beginning of the year would cost 10 trillion Zimbabwean dollars at the end! Why was the United States able to contain the inflationary tiger, while Zimbabwe failed to do so? Macroeconomics can suggest the proper role of monetary and fiscal policies, of exchange-rate systems, and of an independent central bank in containing inflation.

3. *How can a nation increase its rate of economic growth?* The single most important goal of macroeconomics concerns a nation's long-term economic growth. This refers to the growth in the per capita output of a country. Such growth is the central factor in determining the growth in real wages and living standards. Most countries of North America and Western Europe have enjoyed rapid economic growth for two centuries, and residents in these countries have high average incomes. Over the last five decades, Asian countries such as Japan, South Korea, and Taiwan produced dramatic gains in living standards for their peoples. China's growth has similarly been outstanding in recent years. A few countries, particularly those of sub-Saharan Africa, have suffered declining per capita output and living standards.

   Nations want to know the ingredients in a successful growth recipe. Economic historians have found that the key factors in long-term economic growth include reliance on well-regulated private markets for most economic activity, stable macroeconomic policy, high rates of saving and investment, openness to international trade, and accountable and noncorrupt governing institutions.

All economies face inevitable tradeoffs among these goals. Increasing the rate of growth of output over the long run may require greater investment in education and capital, but higher investment requires lower current consumption of items like food, clothing, and recreation. Additionally, policymakers are sometimes forced to rein in the economy through macroeconomic policies when it grows too fast in order to prevent rising inflation or when financial conditions exhibit irrational exuberance.

There are no magic formulas for ensuring low and stable inflation, high employment, and rapid growth. Macroeconomists have vigorous debates about both the goals and the appropriate policies for reaching the goals. But sound macroeconomic policies are essential if a country wishes to achieve its economic objectives in the most effective manner.

### The Patron Saint of Macroeconomics

Every discussion of macroeconomic policy must begin with John Maynard Keynes. Keynes (1883–1946) was a many-sided genius who won eminence in the fields of mathematics, philosophy, and literature. In addition, he found time to run a large insurance company, advise the British treasury, help govern the Bank of England, edit a world-famous economics journal, collect modern art and rare books, start a repertory theater, and marry a leading Russian ballerina. He was also an investor who knew how to make money by shrewd speculation, both for himself and for his college, King's College, Cambridge.

His principal contribution, however, was his invention of a new way of looking at macroeconomics and macroeconomic policy. Before Keynes, most economists and policymakers accepted the highs and lows of business cycles as being as inevitable as the tides. These long-held views left them helpless in the face of the Great Depression of the 1930s. But Keynes took an enormous intellectual leap in his 1936 book, *The General Theory of Employment, Interest, and Money*. He made a twofold argument: First, he argued that it is possible for high unemployment and underutilized capacity to persist in market economies. In addition, he argued that government fiscal and monetary policies can affect output and thereby reduce unemployment and shorten economic downturns.

These propositions had an explosive impact when Keynes first introduced them, engendering much controversy and dispute. In the years after World War II, Keynesian economics came to dominate macroeconomics and government policy. Since then, new developments incorporating supply factors, expectations, and alternative views of wage and price dynamics have undermined the earlier Keynesian consensus. While few economists now believe that government action can eliminate business cycles, as Keynesian economics once seemed to promise, neither economics nor economic policy has been the same since Keynes's great discovery.

## OBJECTIVES AND INSTRUMENTS OF MACROECONOMICS

Having surveyed the principal issues of macroeconomics, we now turn to a discussion of the major goals and instruments of macroeconomic policy. How do economists evaluate the success of an economy's overall performance? What are the tools that governments can use to pursue their economic goals? Table 19-1 lists the major objectives and instruments of macroeconomic policy.

| Objectives | |
|---|---|
| **Output:** | High level and rapid growth of output |
| **Employment:** | High level of employment with low involuntary unemployment |
| **Stable prices** | |
| **Instruments** | |
| **Monetary policy:** | Buying and selling bonds, regulating financial institutions |
| **Fiscal policy:** | Government expenditures<br>Taxation |

**TABLE 19-1. Goals and Instruments of Macroeconomic Policy**

The top part of the table displays the major goals of macroeconomic policy. The lower half shows the major instruments or policy measures available to modern economies. Policymakers change the instruments of policy to affect the pace and direction of economic activity.

### *Measuring Economic Success*

The major macroeconomic goals are a high level and rapid growth of output, low unemployment, and stable prices. We will use this section both to define the major macroeconomic terms and to discuss their importance. A more detailed treatment of the data of macroeconomics is postponed to the next chapter. Some key data are provided in the appendix to this chapter.

***Output.*** The ultimate objective of economic activity is to provide the goods and services that the population desires. What could be more important for an economy than to produce ample shelter, food, education, and recreation for its people?

The most comprehensive measure of the total output in an economy is the **gross domestic product** (GDP). GDP is the measure of the market value of all

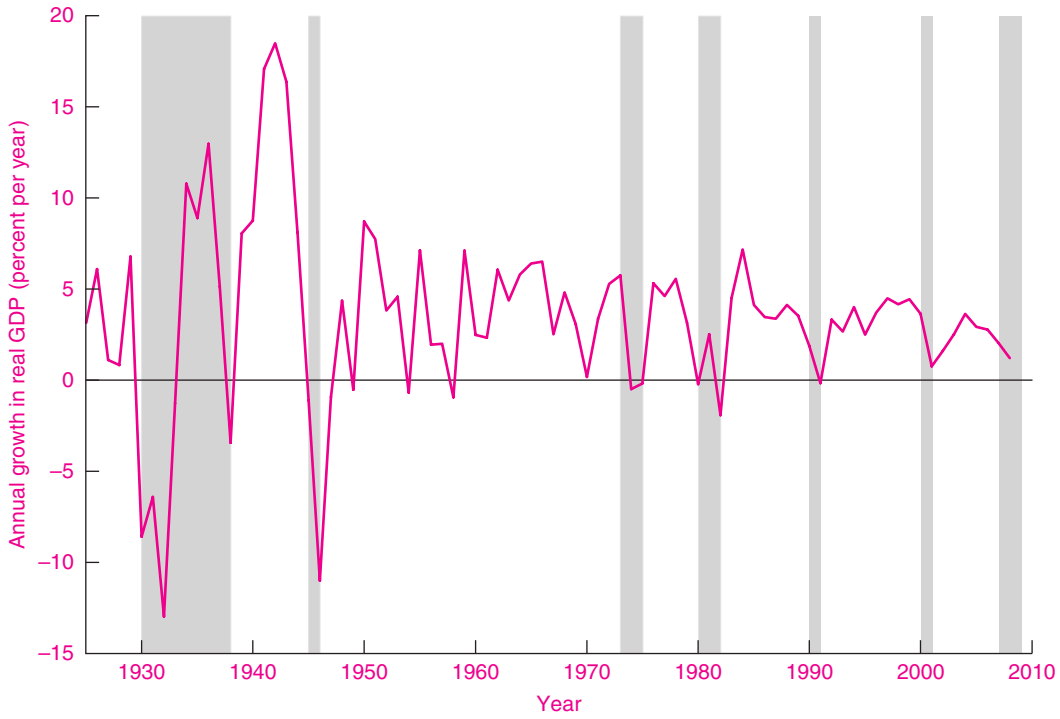


**FIGURE 19-1. Growth Rate of U.S. Real Gross Domestic Product, 1929–2008**

Real GDP is the most comprehensive measure of an economy's output. This figure shows the rate of growth from one year to the next. Note the string of negative growth rates in the Great Depression of the 1930s. Also, we see the Great Moderation of the last few years, in which output was less volatile than in earlier periods.

Source: U.S. Bureau of Economic Analysis at *www.bea.gov*. Shaded regions are major economic downturns.

final goods and services—beer, cars, rock concerts, donkey rides, and so on—produced in a country during a year. There are two ways to measure GDP. *Nominal GDP* is measured in actual market prices. *Real GDP* is calculated in constant or invariant prices (where we measure the number of cars times the prices of cars in a given year such as 2000).

Real GDP is the most closely watched measure of output; it serves as the carefully monitored pulse of a nation's economy. Figure 19-1 shows the growth rate of real GDP in the United States since 1929. The growth rate is defined as

$$\%\ \text{growth rate of real GDP in year } t = 100 \times \frac{\text{GDP}_t - \text{GDP}_{t-1}}{\text{GDP}_{t-1}}$$

For example, real GDP in 2006 was $11,294.8 billion and in 2007 was $11,523.9 billion (both in 2000 prices). A calculator will show that the growth of real GDP in 2007 was 2.0 percent over the year. It is worthwhile making sure you can replicate this calculation. Note the sharp economic decline during the Great Depression of the 1930s, the boom during World War II, and the recessions in 1974, 1982, 1991, and 2008.

Despite the short-term fluctuations seen in business cycles, advanced economies generally exhibit a steady long-term growth in real GDP and an improvement in living standards; this process is known as *economic growth*. The American economy has proved itself a powerful engine of progress over a period of more than a century, as shown by the growth in potential output.

**Potential GDP** represents the maximum sustainable level of output that the economy can produce. When an economy is operating at its

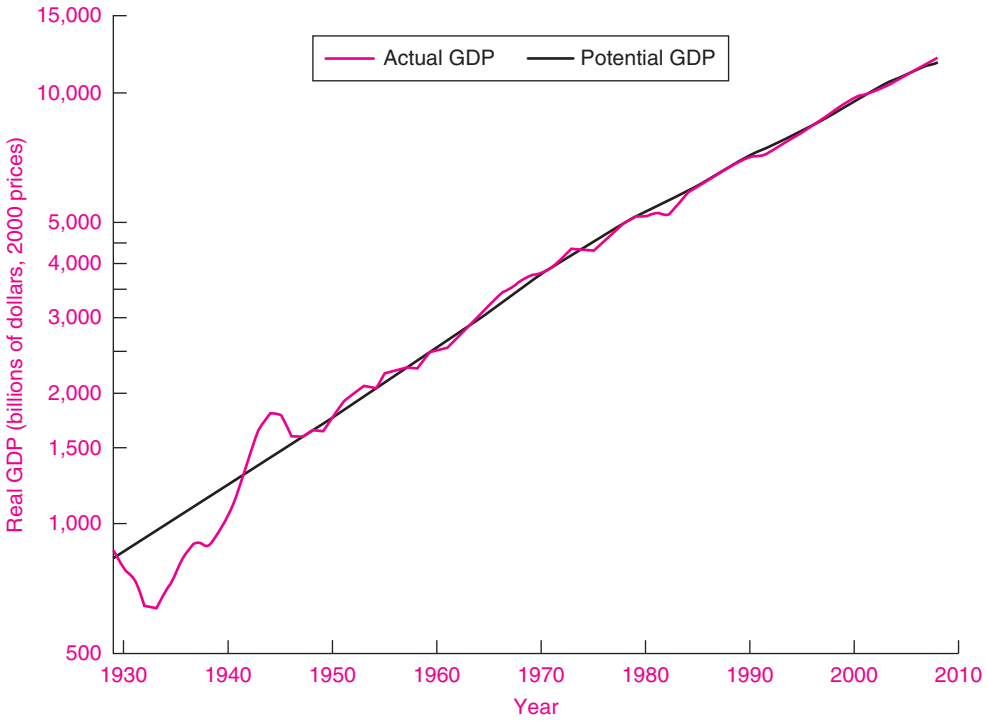


**FIGURE 19-2. Actual and Potential GDP in the United States**

Business cycles occur when actual output departs from its potential. The smooth blue line shows potential or trend output over the period 1929–2008. Potential output has grown about 3.4 percent annually. Note the large gap between actual and potential output during the Great Depression of the 1930s.

Source: U.S. Bureau of Economic Analysis, Congressional Budget Office, and authors' estimates. Note that actual GDP is directly estimated from underlying data while potential output is an analytical concept derived from actual GDP and unemployment data.

potential, there are high levels of utilization of the labor force and the capital stock. When output rises above potential output, price inflation tends to rise, while a below-potential level of output leads to high unemployment.

Potential output is determined by the economy's productive capacity, which depends upon the inputs available (capital, labor, land, etc.) and the economy's technological efficiency. Potential GDP tends to grow steadily because inputs like labor and capital and the level of technology change quite slowly over time. By contrast, actual GDP is subject to large business-cycle swings if spending patterns change sharply.

During business downturns, actual GDP falls below its potential, and unemployment rises. In 1982, for example, the U.S. economy produced about $400 billion less than its potential output. This represented $5000 lost per family during a single year. A *recession* is a period of significant decline in total output, income, and employment, usually lasting more than a few months and marked by widespread contractions in many sectors of the economy. A severe and protracted downturn is called a *depression*. Output can be temporarily above its potential during booms and wartime as capacity limits are strained, but the high utilization rates may bring rising inflation and are usually brought to an end by monetary or fiscal policy.

Figure 19-2 shows the estimated potential and actual output for the period 1929–2008. Note how large the gap between actual and potential output was during the Great Depression of the 1930s.


**FIGURE 19-3. Unemployment Rises in Recessions, Falls during Expansions**

The unemployment rate measures the fraction of the labor force that is looking for work but cannot find work. Unemployment rises in business-cycle downturns and falls during expansions. Shaded regions are NBER recessions.

Source: U.S. Bureau of Labor Statistics at *www.bea.gov*.

***High Employment, Low Unemployment.*** Of all the macroeconomic indicators, employment and unemployment are most directly felt by individuals. People want to be able to get high-paying jobs without searching or waiting too long, and they want to have job security and good benefits. In macroeconomic terms, these are the objectives of *high employment*, which is the counterpart of *low unemployment*. Figure 19-3 shows trends in unemployment over the last eight decades. The **unemployment rate** on the vertical axis is the percentage of the labor force that is unemployed. The labor force includes all employed persons and those unemployed individuals who are seeking jobs. It excludes those without work who are not looking for jobs.

The unemployment rate tends to reflect the state of the business cycle: when output is falling, the demand for labor falls and the unemployment rate rises. Unemployment reached epidemic proportions in the Great Depression of the 1930s, when as much as one-quarter of the workforce was idled. Since World War II, unemployment in the United States has fluctuated but has avoided the high rates associated with depressions.

***Price Stability.*** The third macroeconomic objective is *price stability*. This is defined as a low and stable inflation rate.

To track prices, government statisticians construct **price indexes,** or measures of the overall price level. An important example is the **consumer price index** (CPI), which measures the trend in the average price of goods and services bought by consumers. We will generally denote the overall price level by the letter $P$.

Economists measure price stability by looking at **inflation,** or the **rate of inflation.** The inflation rate is the percentage change in the overall level of prices from one year to the next. For example, the CPI was 201.6 in 2006 and 207.3 in 2007. The inflation-rate calculation is just like the growth-rate calculation above:

$$\text{Rate of inflation in year } t = 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

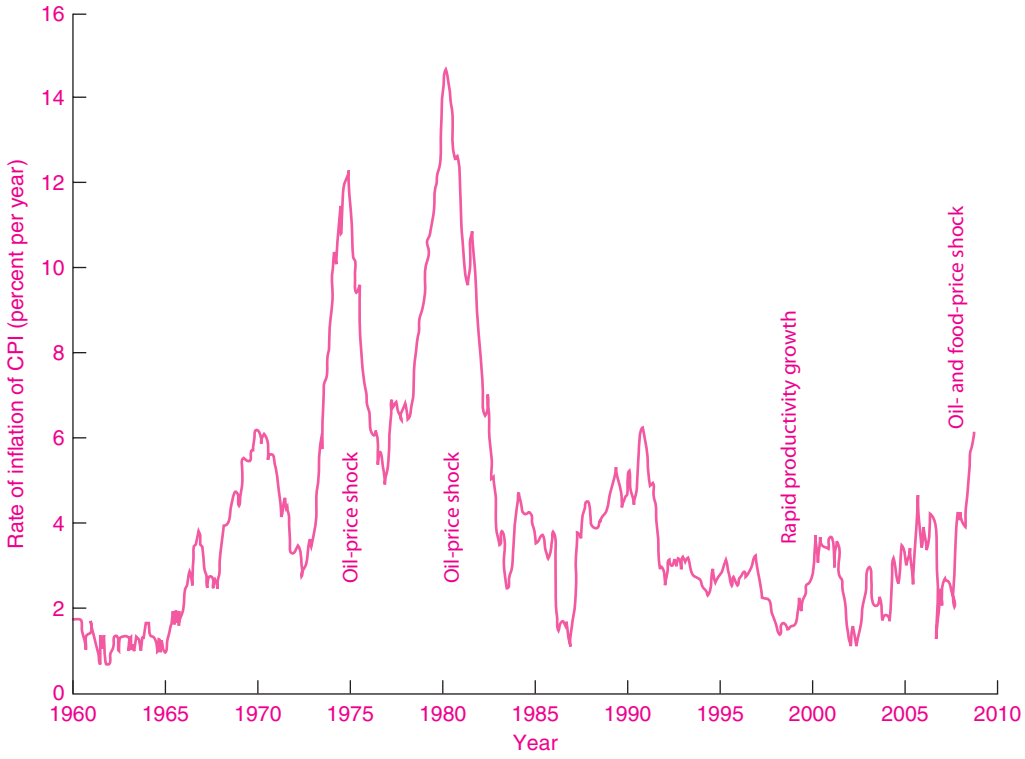


**FIGURE 19-4. U.S. Consumer Price Inflation, 1960–2008**

The rate of inflation measures the rate of change of prices from one year to the next; here we see the rate of inflation as measured by the consumer price index (CPI). Most inflationary episodes have been associated with shocks to oil or food prices. Note that inflation has moved in a narrow corridor since the mid-1980s.

Source: U.S. Bureau of Labor Statistics. Data show rate of inflation from 12 months earlier.

We thus calculate the inflation rate for 2007 as

$$\text{Rate of inflation in 2007} = 100 \times \frac{207.3 - 201.6}{201.6}$$
$$= 2.8\% \text{ per year}$$

Figure 19-4 shows the inflation rate for the CPI from 1960 to 2008. Since the end of the inflationary period in the early 1980s, inflation has averaged 3 percent per year through 2008.

A *deflation* occurs when prices decline (which means that the rate of inflation is negative). At the other extreme is a *hyperinflation*, a rise in the price level of a thousand or a million percent a year. In such situations, as in Weimar Germany in the 1920s, Brazil in the 1980s, Russia in the 1990s, or Zimbabwe in recent years, prices are virtually meaningless and the price system breaks down.

Price stability is important because a smoothly functioning market system requires that prices accurately convey information about relative scarcities. History has shown that high inflation imposes many costs—some visible and some hidden—on an economy. With high inflation, taxes become highly variable, the real values of people's pensions are eroded, and people spend real resources to avoid depreciating rubles or pesos. But declining prices (deflation) are also costly. Hence, most nations seek the golden mean of slowly rising prices as the best way of encouraging the price system to function efficiently.

To summarize:

The goals of macroeconomic policy are:

1. A high and growing level of national output
2. High employment with low unemployment
3. A stable or gently rising price level

## The Tools of Macroeconomic Policy

Put yourself in the shoes of the chief economist advising the government. Unemployment is rising and GDP is falling. Or perhaps the burst of a speculative bubble in housing prices has led to massive defaults, banking losses, and a credit crunch. Or your country has a balance-of-payments crisis, with a large trade deficit and a foreign-exchange rate that is in free fall. What policies will help reduce inflation or unemployment, speed economic growth, or correct a trade imbalance?

Governments have certain instruments that they can use to affect macroeconomic activity. A *policy instrument* is an economic variable under the control of government that can affect one or more of the macroeconomic goals. By changing monetary, fiscal, and other policies, governments can avoid the worst excesses of the business cycle or increase the growth rate of potential output. The major instruments of macroeconomic policy are listed in the bottom half of Table 19-1.

***Fiscal Policy.*** **Fiscal policy** denotes the use of taxes and government expenditures. *Government expenditures* come in two distinct forms. First there are government purchases. These comprise spending on goods and services—purchases of tanks, construction of roads, salaries for judges, and so forth. In addition, there are government transfer payments, which increase the incomes of targeted groups such as the elderly or the unemployed. Government spending determines the relative size of the public and private sectors, that is, how much of our GDP is consumed collectively rather than privately. From a macroeconomic perspective, government expenditures also affect the overall level of spending in the economy and thereby influence the level of GDP.

The other part of fiscal policy, *taxation,* affects the overall economy in two ways. To begin with, taxes affect people's incomes. By leaving households with more or less disposable or spendable income, taxes affect the amount people spend on goods and services as well as the amount of private saving. Private consumption and saving have important effects on investment and output in the short and long run.

In addition, taxes affect the prices of goods and factors of production and thereby affect incentives and behavior. The United States has often employed special tax provisions (such as an investment tax credit or accelerated depreciation) as ways of increasing investment and boosting economic growth. Many provisions of the tax code have an important impact on economic activity through their effect on the incentives to work and to save.

***Monetary Policy.*** The second major instrument of macroeconomic policy is **monetary policy,** which the government conducts through managing the nation's money, credit, and banking system. You may have read how our central bank, the Federal Reserve System, affects the economy by determining short-term interest rates. How does the Federal Reserve or any other central bank actually accomplish this? It does so primarily by setting short-run interest-rate targets and through buying and selling government securities to attain those targets. Through its operations, the Federal Reserve influences many financial and economic variables, such as interest rates, stock prices, housing prices, and foreign exchange rates. These financial variables affect spending on investment, particularly in housing, business investment, consumer durables, and exports and imports.

Historically, the Fed has raised interest rates when inflation threatened to rise too high. This led to reduced investment and consumption, causing a decline in GDP and lower inflation. In the most recent slowdown, which started in 2007, the Fed acted quickly to lower interest rates, provide credit, and extend its lending facilities outside traditional banking institutions.

The central bank is a key macroeconomic institution for every country. Japan, Britain, Russia, and the countries of the European Union all have powerful central banks. In an "open economy"—that is, one whose borders are open to goods, services, and financial flows—the exchange-rate system is also a central part of monetary policy.

Monetary policy is the tool that countries most often rely on to stabilize the business cycle, although it becomes less potent in deep recessions. The exact way that central banks can affect economic activity

will be thoroughly analyzed in the chapters on monetary policy.

Summary:

A nation has two major kinds of policies that can be used to pursue its macroeconomic goals—fiscal policy and monetary policy.

1. Fiscal policy consists of government expenditure and taxation. Government expenditure influences the relative size of collective spending and private consumption. Taxation subtracts from incomes, reduces private spending, and affects private saving. In addition, it affects investment and potential output. Fiscal policy is primarily used to affect long-term economic growth through its impact on national saving and investment; it is also used to stimulate spending in deep or sharp recessions.
2. Monetary policy, conducted by the central bank, determines short-run interest rates. It thereby affects credit conditions, including asset prices such as stock and bond prices and exchange rates. Changes in interest rates, along with other financial conditions, affect spending in sectors such as business investment, housing, and foreign trade. Monetary policy has an important effect on both actual GDP and potential GDP.

## INTERNATIONAL LINKAGES

No nation is an island unto itself. Nations increasingly participate in the world economy and are linked together through trade and finance—this is the phenomenon called *globalization*. As the costs of transportation and communication have declined, international linkages have become tighter than they were a generation ago. International trade has replaced empire-building and military conquest as the surest road to national wealth and influence.

The trade linkages of imports and exports of goods and services are seen when the United States imports cars from Japan or exports computers to Mexico. Financial linkages come in activities such as foreigners' buying U.S. bonds for their sovereign debt funds or Americans' diversifying their pension funds with emerging-market stocks.

Nations keep a close watch on their international transactions. One particularly important measure is the *balance on current account*. This represents the numerical difference between the value of exports and the value of imports, along with some other adjustments. (The current account is closely related to *net exports,* which is the difference between the value of exports and the value of imports of goods and services.) When exports exceed imports, the difference is a surplus, while a negative balance is a deficit. In 2007, exports totaled $2463 billion, while total imports and net transfers were $3194 billion; the difference was the U.S. current-account deficit of $731 billion.

For most of the twentieth century, the United States had a surplus in its foreign trade, exporting more than it imported. But trading patterns changed dramatically in the last quarter-century. As saving in the United States declined and foreign saving increased, a substantial part of foreign saving flowed to the United States. The counterpart of foreigners saving in the United States was that the current account turned sharply to deficit. As foreign investment in the nation increased, the United States by 2008 owed on balance around $2½ trillion to foreigners. Some economists worry that the large foreign debt poses major risks for the United States—risks that we will analyze in later chapters.

As economies become more closely linked, international economic policy becomes more important, particularly in small open economies. But remember that international trade and finance are not ends in themselves. Rather, international exchange serves the ultimate goal of improving living standards.

The major areas of concern are trade policies and international financial management. *Trade policies* consist of tariffs, quotas, and other regulations that restrict or encourage imports and exports. Most trade policies have little effect on short-run macroeconomic performance, but from time to time, as was the case in the 1930s, restrictions on international trade are so severe that they cause major economic dislocations, inflations, or recessions.

A second set of policies is *international financial management*. A country's international trade is influenced by its foreign exchange rate, which represents the price of its own currency in terms of the currencies of other nations. Foreign exchange systems are an integral part of monetary policy. In small open economies, managing the exchange rate is the single most important macroeconomic policy.

The international economy is an intricate web of trading and financial connections among countries.

When the international economic system runs smoothly, it contributes to rapid economic growth; when trading systems break down, production and incomes suffer throughout the world. Countries therefore consider the impacts of trade policies and international financial policies on their domestic objectives of high output, high employment, and price stability.

## B. AGGREGATE SUPPLY AND DEMAND

The economic history of nations can be seen in their macroeconomic performance. Economists have developed aggregate supply-and-demand analysis to help explain the major trends in output and prices. We begin by explaining this important tool of macroeconomics and then use it to understand some important historical events.

### INSIDE THE MACROECONOMY: AGGREGATE SUPPLY AND DEMAND

#### *Definitions of Aggregate Supply and Demand*

How do different forces interact to determine overall economic activity? Figure 19-5 shows the relationships among the different variables inside the macroeconomy. It separates variables into two categories: those affecting aggregate supply and those affecting aggregate demand. While the division is simplified, dividing variables into these two categories helps us understand what determines the levels of output, prices, and unemployment.

The lower part of Figure 19-5 shows the forces affecting aggregate supply. **Aggregate supply** refers to the total quantity of goods and services that the nation's businesses willingly produce and sell in a given period. Aggregate supply (often written *AS*) depends upon the price level, the productive capacity of the economy, and the level of costs.

In general, businesses would like to sell everything they can produce at high prices. Under some circumstances, prices and spending levels may be depressed, so businesses might find they have excess capacity. Under other conditions, such as during a wartime boom, factories may be operating at capacity as businesses scramble to produce enough to meet all their orders.

We see, then, that aggregate supply depends on the price level that businesses can charge as well as on the economy's capacity or potential output. Potential output in turn is determined by the availability of productive inputs (labor and capital being the most important) and the managerial and technical efficiency with which those inputs are combined.

National output and the overall price level are determined by the twin blades of the scissors of aggregate supply and demand. The second blade is **aggregate demand,** which refers to the total amount that different sectors in the economy willingly spend in a given period. Aggregate demand (often written *AD*) equals total spending on goods and services. It depends on the level of prices, as well as on monetary policy, fiscal policy, and other factors.

The components of aggregate demand include *consumption* (the cars, food, and other consumption goods bought by consumers); *investment* (construction of houses and factories as well as business equipment); *government purchases* (such as spending on teachers and missiles); and *net exports* (the difference between exports and imports). Aggregate demand is affected by the prices at which the goods are offered, by exogenous forces like wars and weather, and by government policies.

Using both blades of the scissors of aggregate supply and demand, we achieve the resulting equilibrium, as is shown in the right-hand circle of Figure 19-5. National output and the price level settle at that level where demanders willingly buy what businesses willingly sell. The resulting output and price level determine employment, unemployment, and international trade.

#### *Aggregate Supply and Demand Curves*

Aggregate supply and demand curves are often used to help analyze macroeconomic conditions. Recall that in Chapter 3 we used market supply and demand curves to analyze the prices and quantities of individual products. An analogous graphical apparatus can help us understand how monetary policy or technological change acts through aggregate supply and demand to determine national output and the price level.

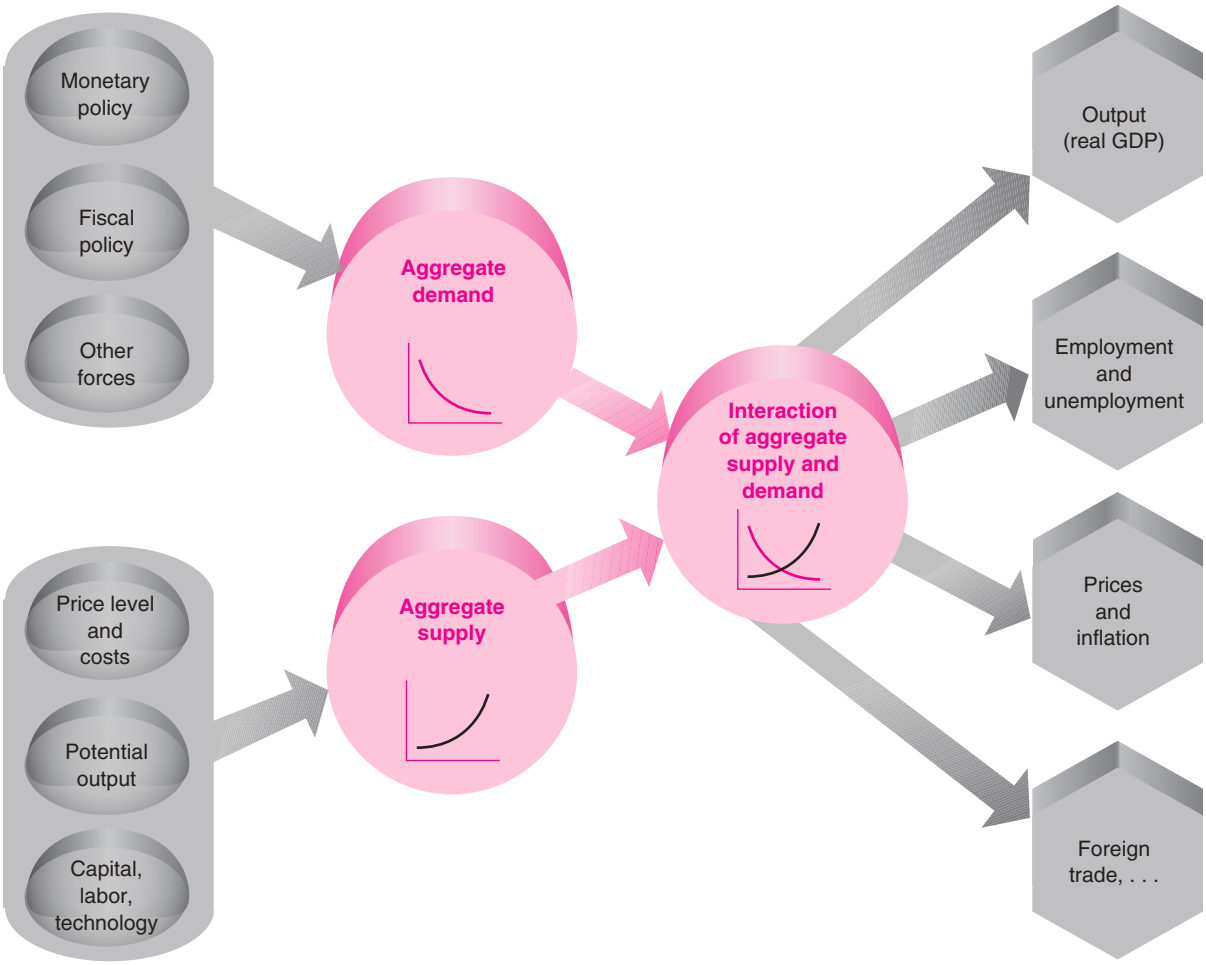


**FIGURE 19-5. Aggregate Supply and Demand Determine the Major Macroeconomic Variables**

This key diagram shows the major factors affecting overall economic activity. On the left are the major variables determining aggregate supply and demand; these include policy variables, like monetary and fiscal policies, along with stocks of capital and labor. In the center, aggregate supply and demand interact. The chief outcomes are shown on the right in hexagons: output, employment, the price level, and international trade.

Figure 19-6 shows the aggregate supply and demand schedules for the output of an entire economy. On the horizontal axis is the total output (real GDP) of the economy. On the vertical axis is the overall price level (as measured by the "price of GDP"). We use the symbol *Q* for real output and *P* for the price level.

The downward-sloping curve is the **aggregate demand schedule,** or *AD* curve. It represents what everyone in the economy—consumers, businesses, foreigners, and governments—would buy at different aggregate price levels (with other factors affecting aggregate demand held constant). From the curve, we see that at an overall price level of 150, total spending would be $3000 billion (per year). If the price level rises to 200, total spending would fall to $2300 billion.

The upward-sloping curve is the **aggregate supply schedule,** or *AS* curve. This curve represents the

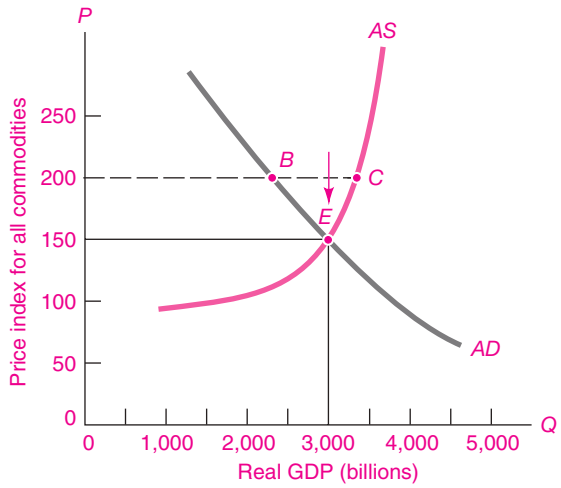


**FIGURE 19-6. Aggregate Price and Output Are Determined by the Interaction of Aggregate Supply and Demand**

The *AD* curve represents the quantity of total spending at different price levels, with other factors held constant. The *AS* curve shows what firms will produce and sell at different price levels, other things equal.

National output and the overall price level are determined at the intersection of the aggregate demand and supply curves, at point *E*. This equilibrium occurs at an overall price level where firms willingly produce and sell what consumers and other demanders willingly buy.

quantity of goods and services that businesses are willing to produce and sell at each price level (with other determinants of aggregate supply held constant). According to the curve, businesses will want to sell $3000 billion at a price level of 150; they will want to sell a higher quantity, $3300 billion, if prices rise to 200. As the level of total output demanded rises, businesses will want to sell more goods and services at a higher price level.

Warning on *AS* and *AD* Curves

Before proceeding, here is one important word of caution: Do not confuse the macroeconomic *AD* and *AS* curves with the microeconomic *DD* and *SS* curves. The microeconomic supply and demand curves show the quantities and prices of individual commodities, with such things as national income and other goods' prices held as given. By contrast, the aggregate supply and demand curves show the determination of total output and the overall price level, with such things as the money supply, fiscal policy, and the capital stock held constant.

Aggregate supply and demand explain how *total taxes* affect aggregate demand, national output, and the overall price level. Microeconomic supply and demand might consider the way increases in *gasoline taxes* affect purchases of gasoline, holding income constant. The two sets of curves have a superficial resemblance, but they explain very different phenomena.

Note as well that we have drawn the *AS* curve as upward-sloping and the *AD* curve as downward-sloping. We explain the reasons for these slopes in later chapters.

***Macroeconomic Equilibrium.*** We now see how aggregate output and the price level adjust or equilibrate to bring aggregate supply and aggregate demand into balance. That is, we use the *AS* and *AD* concepts to see how *equilibrium values of price and quantity* are determined or to find the *P* and *Q* that satisfy the buyers and sellers all taken together. For the *AS* and *AD* curves shown in Figure 19-6, the overall economy is in equilibrium at point *E*. Only at that point, where the level of output is $Q = 3000$ and $P = 150$, are spenders and sellers satisfied. Only at point *E* are demanders willing to buy exactly the amount that businesses are willing to produce and sell.

How does the economy reach its equilibrium? Indeed, what do we mean by equilibrium? A **macroeconomic equilibrium** is a combination of overall price and quantity at which all buyers and sellers are satisfied with their overall purchases, sales, and prices.

Figure 19-6 illustrates the concept. If the price level were higher than equilibrium, say, at $P = 200$, businesses would want to sell more than purchasers would want to buy; businesses would desire to sell quantity *C*, while buyers would want to purchase only amount *B*. Goods would pile up on the shelves as firms produced more than consumers bought. Because of the excess aggregate supply of goods, firms would cut production and shave their prices. The overall price level would begin to decline or rise less rapidly. As the price level declined from its original too high level, the gap between desired total spending and desired total sales would narrow. Eventually, prices would decline to the point where overall demand and production were in balance. At the macroeconomic equilibrium, there would be

neither excess supply nor excess demand—and no pressure to change the overall price level.

## MACROECONOMIC HISTORY: 1900–2008

We can use the aggregate supply-and-demand apparatus to analyze recent American macroeconomic history. We focus on the economic expansion during the Vietnam War, the deep recession caused by the monetary contraction of the early 1980s, and the phenomenal record of economic growth during the twentieth century. This chapter's appendix also provides data on major macroeconomic variables.

***Wartime Boom.*** The American economy entered the 1960s having experienced multiple recessions (see Figure 19-3). President John Kennedy brought Keynesian economics to Washington. His economic advisers recommended expansionary policies, and Congress enacted measures to stimulate the economy, particularly cuts in personal and corporate taxes in 1963 and 1964. GDP grew rapidly during this period, unemployment declined, and inflation was contained. By 1965, the economy was at its potential output.

Unfortunately, the government underestimated the magnitude of the buildup for the Vietnam War; defense spending grew by 55 percent from 1965 to 1968. Even when it became clear that a major inflationary boom was under way, President Johnson postponed painful fiscal steps to slow the economy. Tax increases and civilian expenditure cuts came only in 1968, which was too late to prevent inflationary pressures from overheating the economy. The Federal Reserve accommodated the expansion with rapid money growth and low interest rates. As a result, the economy grew very rapidly over the period 1966–1970. Under the pressure of low unemployment and high factory utilization, inflation began to rise, inaugurating the "Great Inflation" that lasted from 1966 through 1981.

Figure 19-7 illustrates the events of this period. The tax cuts and defense expenditures shifted the aggregate demand curve to the right from *AD* to *AD′*, with the equilibrium shifting from *E* to *E′*. Output and employment rose sharply, and inflation rose as output exceeded capacity limits. Economists learned

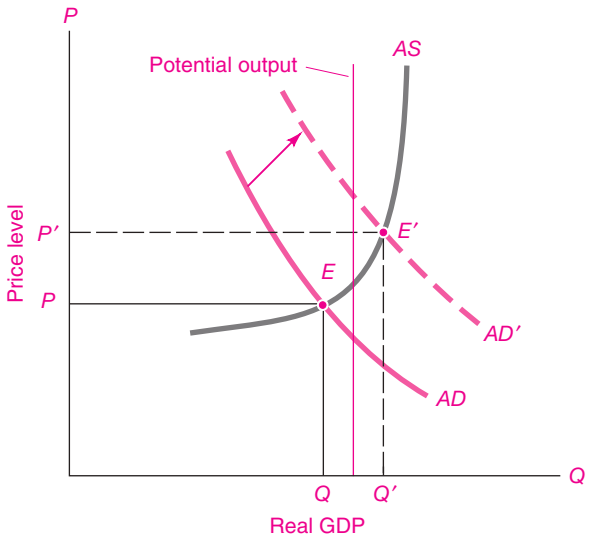


**FIGURE 19-7. Wartime Boom Is Propelled by Increasing Aggregate Demand**

During wartime, increased military spending increases aggregate spending, moving aggregate demand from *AD* to *AD′*, with equilibrium output increasing from *E* to *E′*. When output rises far above potential output, the price level moves up sharply from *P* to *P′*, and wartime inflation ensues.

that it was easier to stimulate the economy than to persuade policymakers to raise taxes to slow the economy when inflation threatened. This lesson led many to question the wisdom of using fiscal policies to stabilize the economy.

***Tight Money, 1979–1982.*** The 1970s were a time of troubles, with rising oil prices, grain shortages, a sharp increase in import prices, union militancy, and accelerating wages. Price inflation became embedded in the U.S. and many other economies. As Figure 19-4 on page 374 shows, inflation rose to double-digit levels in the 1978–1980 period.

Double-digit inflation was unacceptable. In response, the Federal Reserve, under the leadership of economist Paul Volcker, prescribed the strong medicine of tight money to slow the inflation. Interest rates rose sharply in 1979 and 1980, the stock market fell, and credit was hard to find. The Fed's tight-money policy slowed spending by

consumers and businesses. Particularly hard-hit were interest-sensitive components of aggregate demand. After 1979, housing construction, automobile purchases, business investment, and net exports declined sharply.

We can picture how tight money reduced aggregate demand in Figure 19-7 simply by reversing the arrow. That is, tight monetary policy reduced spending and produced a leftward and downward shift of the aggregate demand curve—exactly the opposite of the effect of the tax cuts and defense buildup during the 1960s.

The effects of the tight money were twofold. First, output moved below its potential and unemployment rose sharply (see Figure 19-3 on page 373). Second, tight money and high unemployment produced a dramatic decline in inflation, from an average of 12 percent per year in the 1978–1980 period to an average of around 4 percent per year in the subsequent period (see Figure 19-4). Tight monetary policies succeeded in bringing an end to the Great Inflation, but the nation paid through higher unemployment and lower output during the period of tight money.

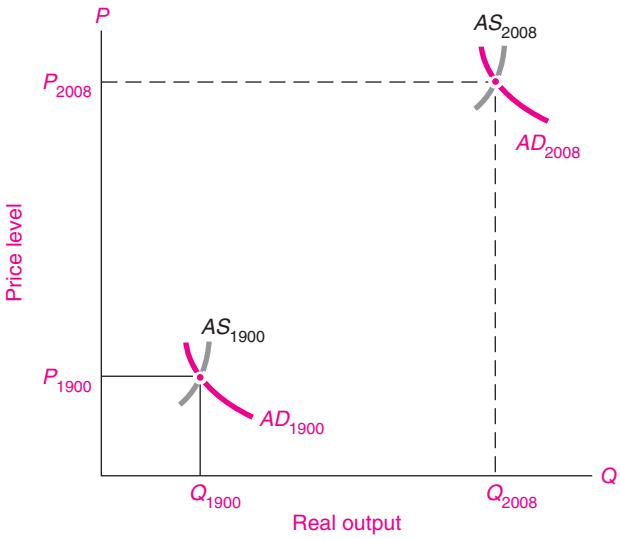


**FIGURE 19-8. Growth in Potential Output Determines Long-Run Economic Performance**

Over the twentieth century, increases in labor, capital, and efficiency led to a vast increase in the economy's productive potential, shifting aggregate supply far to the right. In the long run, aggregate supply is the primary determinant of output growth.

***The Growth Century.*** The final act in our macroeconomic drama concerns the growth of output and prices over the entire period since 1900. Output has grown by a factor of 34 since the beginning of the twentieth century. How can we explain this phenomenal increase?

A careful look at American economic growth reveals that the growth rate during the twentieth century averaged 3⅓ percent per year. Part of this growth was due to growth in the scale of production as inputs of capital, labor, and even land grew sharply over this period. Just as important were improvements in efficiency due to new products (such as automobiles) and new processes (such as electronic computing). Other, less visible factors also contributed to economic growth, such as improved management techniques and improved services (including such innovations as the assembly line and overnight delivery).

Many economists believe that the measured growth understates true growth because our official statistics tend to miss the contribution to living standards from new products and improvements in product quality. For example, with the introduction of the indoor toilet, millions of people no longer had to struggle through the winter snows to relieve themselves in outhouses, yet this increased comfort never showed up in measured gross domestic product.

How can we picture the tremendous rise in output in our *AS-AD* apparatus? Figure 19-8 shows the way. The increase in inputs and improvements in efficiency led to a massive rightward shift of the *AS* curve from $AS_{1900}$ to $AS_{2008}$. Production costs also increased sharply. For example, average earnings rose from $0.15 per hour in 1900 to over $30 per hour in 2008. These cost increases shifted the *AS* curve upward. The overall effect, then, was the increase in both output and prices shown in Figure 19-8.

## The Role of Macroeconomic Policy

Macroeconomic policy played a central role in the improved business-cycle conditions of the last half-century. The discovery and application of macroeconomics, along with a good appreciation of the role and limitations of monetary and fiscal policy, reduced business-cycle volatility and led to the

Great Moderation. The application of fiscal policy, and especially monetary policy, helped lower unemployment and ensured largely stable prices over the last two decades. When the United States faced a major shock to its financial system in 2007–2009, central bankers remembered *and understood* the lessons of the Great Depression. They knew that financial fears are contagious, that bank collapses can lead to bank runs, and that instability breeds more instability. Knowledge of macroeconomic history and theory, and the intervention of the central bank as a lender of last resort, can cushion a banking shock and prevent bank crises from turning into deep depressions.

There is no miracle cure for macroeconomic shocks, however. When a steep decline in output and employment hit the United States in 2007–2009, monetary and fiscal policies were launched to soften the blow, but they could not completely offset it. Up to now, the knowledge is available to prevent depressions, but not to banish recessions.

## SUMMARY

### A. Key Concepts of Macroeconomics

1. Macroeconomics is the study of the behavior of the entire economy: It analyzes long-run growth as well as the cyclical movements in total output, unemployment and inflation, and international trade and finance. This contrasts with microeconomics, which studies the behavior of individual markets, prices, and outputs.
2. The United States proclaimed its macroeconomic goals in the Employment Act of 1946, which declared that federal policy was "to promote maximum employment, production, and purchasing power." Since then, the nation's priorities among these three goals have shifted. But all market economies still face three central macroeconomic questions: (*a*) Why do output and employment sometimes fall, and how can unemployment be reduced? (*b*) What are the sources of price inflation, and how can it be kept under control? (*c*) How can a nation increase its rate of economic growth?
3. In addition to these perplexing questions is the hard fact that there are inevitable conflicts or tradeoffs among these goals: Rapid growth in future living standards may mean reducing consumption today, and curbing inflation may involve a temporary period of high unemployment.
4. Economists evaluate the success of an economy's overall performance by how well it attains these objectives: (*a*) high levels and rapid growth of output (measured by real gross domestic product) and consumption; (*b*) a low unemployment rate and high employment, with an ample supply of good jobs; (*c*) low and stable inflation.
5. Before the science of macroeconomics was developed, countries tended to drift around in the shifting macroeconomic currents without a rudder. Today, there are numerous instruments with which governments can steer the economy: (*a*) Fiscal policy (government spending and taxation) helps determine the allocation of resources between private and collective goods, affects people's incomes and consumption, and provides incentives for investment and other economic decisions. (*b*) Monetary policy—particularly the setting of short-term interest rates by the central bank—affects all interest rates, asset prices, credit conditions, and exchange rates. The most heavily affected sectors are housing, business investment, consumer durables, and net exports.
6. The nation is but a small part of an increasingly integrated global economy in which countries are linked together through trade of goods and services and through financial flows. A smoothly running international economic system contributes to rapid economic growth, but the international economy can throw sand in the engine of growth when trade flows are interrupted or the international financial mechanism breaks down. Dealing with international trade and finance is high on the agenda of all countries.

### B. Aggregate Supply and Demand

7. The central concepts for understanding the determination of national output and the price level are aggregate supply (*AS*) and aggregate demand (*AD*). Aggregate demand consists of the total spending in an economy by households, businesses, governments, and foreigners. It represents the total output that would be willingly bought at each price level, given the monetary and fiscal policies and other factors affecting demand. Aggregate supply describes how much output businesses would willingly produce and sell given prices, costs, and market conditions.

8. *AS* and *AD* curves have the same shapes as the familiar supply and demand curves analyzed in microeconomics. But beware of potential confusions of microeconomic and aggregate supply and demand.
9. The overall macroeconomic equilibrium, determining both aggregate price and output, comes where the *AS* and *AD* curves intersect. At the equilibrium price level, purchasers willingly buy what businesses willingly sell. Equilibrium output can depart from full employment or potential output.
10. Recent American history shows an irregular cycle of aggregate demand and supply shocks and policy reactions. In the mid-1960s, war-bloated deficits plus easy money led to a rapid increase in aggregate demand. The result was a sharp upturn in prices and inflation. At the end of the 1970s, economic policymakers reacted to the rising inflation by tightening monetary policy and raising interest rates. The result lowered spending on interest-sensitive demands such as housing, investment, and net exports. Since the mid-1980s, the U.S. economy has experienced a period of low inflation and infrequent and, until recently, mild recessions.
11. Over the long run, the growth of potential output increased aggregate supply enormously and led to steady growth in output and living standards.

## CONCEPTS FOR REVIEW

### Major Macroeconomic Concepts

macroeconomics vs. microeconomics
gross domestic product (GDP), actual and potential
employment, unemployment, unemployment rate
inflation, deflation
consumer price index (CPI)
net exports
fiscal policy (government expenditures, taxation)
monetary policy

### Aggregate Supply and Demand

aggregate supply, aggregate demand
*AS* curve, *AD* curve
equilibrium of *AS* and *AD*
sources of long-run economic growth

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

The great classic of macroeconomics is John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (Harcourt, New York, first published in 1935). Keynes was one of the most graceful writers among economists. An online edition of *The General Theory* is available at *www.marxists.org/reference/subject/economics/keynes/general-theory/*.

There are many good intermediate textbooks on macroeconomics. You may consult these when you want to dig more deeply into specific topics.

### Websites

Macroeconomic issues are a central theme of analysis in *Economic Report of the President*. Various years are available online at *www.access.gpo.gov/eop*. Another good source on macroeconomic issues is the Congressional Budget Office, which issues periodic reports on the economy and the state of the budget at *www.cbo.gov*.

Research organizations often contain excellent online discussions of current macroeconomic issues. See especially the websites of the Brookings Institution, *www.brookings.org*, and the American Enterprise Institute, *www.aei.org*.

Some excellent blogs containing macroeconomics are the following: A blog of leading European and some American economists contains much interesting economic commentary at *www.voxeu.org;* the *International Herald Tribune* has a fine group of expert writers at *blogs.iht.com/tribtalk/business/globalization*.

## QUESTIONS FOR DISCUSSION

1. What are the major objectives of macroeconomics? Write a brief definition of each of these objectives. Explain carefully why each objective is important.
2. Using the data from the appendix to this chapter, calculate the following:
   a. The inflation rate in 1981 and 2007
   b. The growth rate of real GDP in 1982 and 1984
   c. The average inflation rate from 1970 to 1980 and from 2000 to 2007
   d. The average growth rate of real GDP from 1929 to 2008

   {*Hint:* The formulas in the text give the technique for calculating 1-year growth rates. Growth rates for multiple years use the following formula:

$$g_t^{(n)} = 100 \times \left[ \left( \frac{X_t}{X_{t-n}} \right)^{1/n} - 1 \right]$$

   where $g_t^{(n)}$ is the average annual growth rate of the variable $X$ for the $n$ years between year $(t - n)$ and year $t$. For example, assume that the CPI in $(t - 2)$ is 100.0 while the CPI in year $t$ is 106.09. Then the average rate of inflation is $100 \times \left[ \left( \frac{106.09}{100.0} \right)^{1/2} - 1 \right] = 3$ percent per year.}
3. What would be the effect of each of the following on aggregate demand or on aggregate supply, as indicated (always holding other things constant)?
   a. A large cut in personal and business taxes (on *AD*)
   b. An arms-reduction agreement reducing defense spending (on *AD*)
   c. An increase in potential output (on *AS*)
   d. A monetary loosening that lowers interest rates (on *AD*)
4. For each of the events listed in question 3, use the *AS-AD* apparatus to show the effect on output and on the overall price level.
5. Put yourself in the shoes of an economic policymaker. The economy is in equilibrium with $P = 100$ and $Q = 3000$ = potential GDP. You refuse to "accommodate" inflation; that is, you want to keep prices absolutely stable at $P = 100$, no matter what happens to output. You can use monetary and fiscal policies to affect aggregate demand, but you cannot affect aggregate supply in the short run. How would you respond to:
   a. A surprise increase in investment spending
   b. A sharp food-price increase following catastrophic flooding of the Mississippi River
   c. A productivity decline that reduces potential output
   d. A sharp decrease in net exports that followed a deep depression in East Asia
6. In 1981–1983, the Reagan administration implemented a fiscal policy that reduced taxes and increased government spending.
   a. Explain why this policy would tend to increase aggregate demand. Show the impact on output and prices assuming only an *AD* shift.
   b. The supply-side school holds that tax cuts would affect aggregate supply mainly by increasing potential output. Assuming that the Reagan fiscal measures affected *AS* as well as *AD*, show the impact on output and the price level. Explain why the impact of the Reagan fiscal policies on output is unambiguous while the impact on prices is unclear.
7. The Clinton economic package as passed by Congress in 1993 had the effect of tightening fiscal policy by raising taxes and lowering spending. Show the effect of this policy $(a)$ assuming that there is no counteracting monetary policy and $(b)$ assuming that monetary policy completely neutralized the impact on GDP and that the lower deficit leads to higher investment and higher growth of potential output.
8. The United States experienced a major economic downturn in the early 1980s. Consider the data on real GDP and the price level in Table 19-2.
   a. For the years 1981 to 1985, calculate the rate of growth of real GDP and the rate of inflation. Can you determine in which year there was a steep business downturn or recession?
   b. In an *AS-AD* diagram like Figure 19-6 (page 379), draw a set of *AS* and *AD* curves that trace out the price and output equilibria shown in the table. How would you explain the recession that you have identified?

| Year | Real GDP ($, billion, 2000 prices) | Price level* (2000 = 100) |
|---|---|---|
| 1980 | 5,161.7 | 54.1 |
| 1981 | 5,291.7 | 59.1 |
| 1982 | 5,189.3 | 62.7 |
| 1983 | 5,423.8 | 65.2 |
| 1984 | 5,813.6 | 67.7 |
| 1985 | 6,053.7 | 69.7 |

*Note that the price index shown is the price index for GDP, which measures the price trend for all components of GDP.

**TABLE 19-2.**

# Appendix 19

## MACROECONOMIC DATA FOR THE UNITED STATES

| Year | Nominal GDP ($, billion) | Real GDP, 2000 prices ($, billion) | Unemployment rate (%) | CPI 1982–1984 = 100 | Inflation rate (CPI) (% per year) | Federal budget surplus (+) or deficit (−) ($, billion) | Net exports ($, billion) |
|---|---|---|---|---|---|---|---|
| 1929 | 103.6 | 865.2 | 3.2 | 17.1 | 0.0 | 1.0 | 0.4 |
| 1933 | 56.4 | 635.5 | 24.9 | 13.0 | −5.2 | −0.9 | 0.1 |
| 1939 | 92.2 | 950.7 | 17.2 | 13.9 | −1.4 | −2.1 | 0.8 |
| 1945 | 223.1 | 1,786.3 | 1.9 | 18.0 | 2.2 | −29.0 | −0.8 |
| 1948 | 269.2 | 1,643.2 | 3.8 | 24.0 | 7.4 | 3.6 | 5.5 |
| 1950 | 293.8 | 1,777.2 | 5.2 | 24.1 | 1.1 | 5.5 | 0.7 |
| 1960 | 526.4 | 2,501.8 | 5.5 | 29.6 | 1.5 | 7.2 | 4.2 |
| 1970 | 1,038.5 | 3,771.9 | 5.0 | 38.8 | 5.7 | −15.2 | 4.0 |
| 1971 | 1,127.1 | 3,898.7 | 6.0 | 40.5 | 4.1 | −28.4 | 0.6 |
| 1972 | 1,238.3 | 4,104.9 | 5.6 | 41.8 | 3.2 | −24.4 | −3.4 |
| 1973 | 1,382.7 | 4,341.4 | 4.9 | 44.4 | 6.1 | −11.3 | 4.1 |
| 1974 | 1,500.0 | 4,319.5 | 5.6 | 49.3 | 10.4 | −13.8 | −0.8 |
| 1975 | 1,638.3 | 4,311.2 | 8.5 | 53.8 | 8.7 | −69.0 | 16.0 |
| 1976 | 1,825.3 | 4,540.9 | 7.7 | 56.9 | 5.6 | −51.7 | −1.6 |
| 1977 | 2,030.9 | 4,750.6 | 7.1 | 60.6 | 6.3 | −44.1 | −23.1 |
| 1978 | 2,294.7 | 5,015.0 | 6.1 | 65.2 | 7.4 | −26.5 | −25.4 |
| 1979 | 2,563.3 | 5,173.5 | 5.9 | 72.6 | 10.7 | −11.3 | −22.5 |
| 1980 | 2,789.5 | 5,161.7 | 7.2 | 82.4 | 12.7 | −53.6 | −13.1 |
| 1981 | 3,128.4 | 5,291.7 | 7.6 | 90.9 | 9.9 | −53.3 | −12.5 |
| 1982 | 3,255.0 | 5,189.3 | 9.7 | 96.5 | 6.0 | −131.9 | −20.0 |
| 1983 | 3,536.7 | 5,423.8 | 9.6 | 99.6 | 3.1 | −173.0 | −51.7 |
| 1984 | 3,933.2 | 5,813.6 | 7.5 | 103.9 | 4.3 | −168.1 | −102.7 |
| 1985 | 4,220.3 | 6,053.8 | 7.2 | 107.6 | 3.5 | −175.0 | −115.2 |
| 1986 | 4,462.8 | 6,263.6 | 7.0 | 109.7 | 1.9 | −190.8 | −132.7 |
| 1987 | 4,739.5 | 6,475.1 | 6.2 | 113.6 | 3.5 | −145.0 | −145.2 |
| 1988 | 5,103.8 | 6,742.7 | 5.5 | 118.3 | 4.0 | −134.5 | −110.4 |
| 1989 | 5,484.4 | 6,981.4 | 5.3 | 123.9 | 4.7 | −130.1 | −88.2 |
| 1990 | 5,803.1 | 7,112.5 | 5.6 | 130.7 | 5.3 | −172.0 | −78.0 |
| 1991 | 5,995.9 | 7,100.5 | 6.9 | 136.2 | 4.1 | −213.7 | −27.5 |
| 1992 | 6,337.7 | 7,336.6 | 7.5 | 140.3 | 3.0 | −297.4 | −33.2 |
| 1993 | 6,657.4 | 7,532.7 | 6.9 | 144.5 | 2.9 | −273.5 | −65.0 |
| 1994 | 7,072.2 | 7,835.5 | 6.1 | 148.2 | 2.6 | −212.3 | −93.6 |
| 1995 | 7,397.7 | 8,031.7 | 5.6 | 152.4 | 2.8 | −197.0 | −91.4 |
| 1996 | 7,816.9 | 8,328.9 | 5.4 | 156.9 | 2.9 | −141.8 | −96.2 |
| 1997 | 8,304.3 | 8,703.5 | 4.9 | 160.5 | 2.3 | −55.8 | −101.6 |
| 1998 | 8,747.0 | 9,066.9 | 4.5 | 163.0 | 1.5 | 38.8 | −159.9 |
| 1999 | 9,268.4 | 9,470.4 | 4.2 | 166.6 | 2.2 | 103.6 | −260.5 |
| 2000 | 9,817.0 | 9,817.0 | 4.0 | 172.2 | 3.3 | 189.5 | −379.5 |
| 2001 | 10,128.0 | 9,890.7 | 4.7 | 177.0 | 2.8 | 46.7 | −367.0 |
| 2002 | 10,469.6 | 10,048.9 | 5.8 | 179.9 | 1.6 | −247.9 | −424.4 |
| 2003 | 10,960.8 | 10,301.1 | 6.0 | 184.0 | 2.3 | −372.1 | −499.4 |
| 2004 | 11,685.9 | 10,675.7 | 5.5 | 188.9 | 2.6 | −370.6 | −615.4 |
| 2005 | 12,433.9 | 11,003.5 | 5.1 | 195.3 | 3.3 | −318.3 | −714.6 |
| 2006 | 13,194.7 | 11,319.4 | 4.6 | 201.6 | 3.2 | −220.0 | −762.0 |
| 2007 | 13,807.6 | 11,523.9 | 4.6 | 207.3 | 2.8 | −399.4 | −707.8 |
| 2008 | 14,304.4 | 11,666.0 | 5.8 | 215.2 | 4.1 | −456.5 | −727.9 |

**TABLE 19A-1.**

Table 19A-1 contains some of the major macroeconomic data discussed in this chapter. Major data can be obtained through government websites at *www.fedstats.gov, www.bea.gov,* or *www.bls.gov.*

CHAPTER

# 20

# Measuring Economic Activity

*When you can measure what you are speaking about, and express it in numbers, you know something about it; when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science.*

Lord Kelvin

The single most important concept in macroeconomics is the gross domestic product (GDP), which measures the total value of goods and services produced in a country during a year. GDP is part of the *national income and product accounts* (or *national accounts*), which are a body of statistics that enables policymakers to determine whether the economy is contracting or expanding and whether a severe recession or inflation threatens. When economists want to determine the level of economic development of a country, they look at its GDP per capita.

While the GDP and the rest of the national accounts may seem to be arcane concepts, they are truly among the great inventions of modern times. Much as a satellite in space can survey the weather across an entire continent, so can the GDP give an overall picture of the state of the economy. In this chapter, we explain how economists measure GDP and other major macroeconomic indicators.

## GROSS DOMESTIC PRODUCT: THE YARDSTICK OF AN ECONOMY'S PERFORMANCE

What is the *gross domestic product*? GDP is the name we give to the total market value of the final goods and services produced within a nation during a given year. It is the figure you get when you apply the measuring rod of money to the diverse goods and services—from apples to zithers—that a country produces with its land, labor, and capital resources. GDP equals the total production of consumption and investment goods, government purchases, and net exports to other lands.

The gross domestic product (GDP) is the most comprehensive measure of a nation's total output of goods and services. It is the sum of the dollar values of consumption ($C$), gross investment ($I$), government purchases of goods and services ($G$), and

net exports ($X$) produced within a nation during a given year.

In symbols:

$$\text{GDP} = C + I + G + X$$

GDP is used for many purposes, but the most important one is to measure the overall performance of an economy. If you were to ask an economic historian what happened during the Great Depression, the best short answer would be:

> Between 1929 and 1933, GDP fell from $104 billion to $56 billion. This sharp decline in the dollar value of goods and services produced by the American economy caused high unemployment, hardship, a steep stock market decline, bankruptcies, bank failures, riots, and political turmoil.

Similarly, if you were to ask a macroeconomist about the second half of the twentieth century, she might reply:

> The second half of the twentieth century was a unique economic period. During those years, the affluent regions of the North—consisting of Japan, the United States, and Western Europe—experienced the most rapid growth of output per capita in recorded history. From the end of World War II until 2000, for example, real GDP per capita in the United States expanded by almost 250 percent.

We now discuss the elements of the national income and product accounts. We start by showing different ways of measuring GDP and distinguishing real from nominal GDP. We then analyze the major components of GDP. We conclude with a discussion of the measurement of the general price level and the rate of inflation.

## Two Measures of National Product: Goods Flow and Earnings Flow

How do economists actually measure GDP? One of the major surprises is that we can measure GDP in two entirely independent ways. As Figure 20-1 shows, GDP can be measured either as a flow of products or as a sum of earnings.

To demonstrate the different ways of measuring GDP, we begin by considering an oversimplified world in which there is no government, no foreign trade, and no investment. For the moment, our little economy produces only *consumption goods,* which are items that are purchased by households to satisfy their wants. (Important note: Our first example is oversimplified to show the basic ideas. In the realistic examples that follow, we will add investment, government, and the foreign sector.)

***Flow-of-Product Approach.*** Each year the public consumes a wide variety of final goods and services: goods such as apples, computer software, and blue jeans; services such as health care and haircuts. We include only *final goods*—goods ultimately bought and used by consumers. Households spend their incomes for these consumer goods, as is shown in the upper loop of Figure 20-1. Add together all the consumption dollars spent on these final goods, and you will arrive at this simplified economy's total GDP.

Thus, in our simple economy, you can easily calculate national income or product as the sum of the annual flow of final goods and services: (price of blue jeans × number of blue jeans) plus (price of apples × number of apples) and so forth for all other final goods. The gross domestic product is defined as the total money value of the flow of final products produced by the nation.

National accountants use market prices as weights in valuing different commodities because market prices reflect the relative economic value of diverse goods and services. That is, the relative prices of different goods reflect how much consumers value their last (or marginal) units of consumption of these goods.

***Earnings or Income Approach.*** The second and equivalent way to calculate GDP is the income accounts (also called the earnings or cost approach). Look at the lower loop in Figure 20-1. Through it flow all the costs of doing business; these costs include the wages paid to labor, the rents paid to land, the profits paid to capital, and so forth. But these business costs are also the earnings that households receive from firms. By measuring the annual flow of these earnings or incomes, statisticians will again arrive at the GDP.

Hence, a second way to calculate GDP is as the total of factor earnings (wages, interest, rents, and

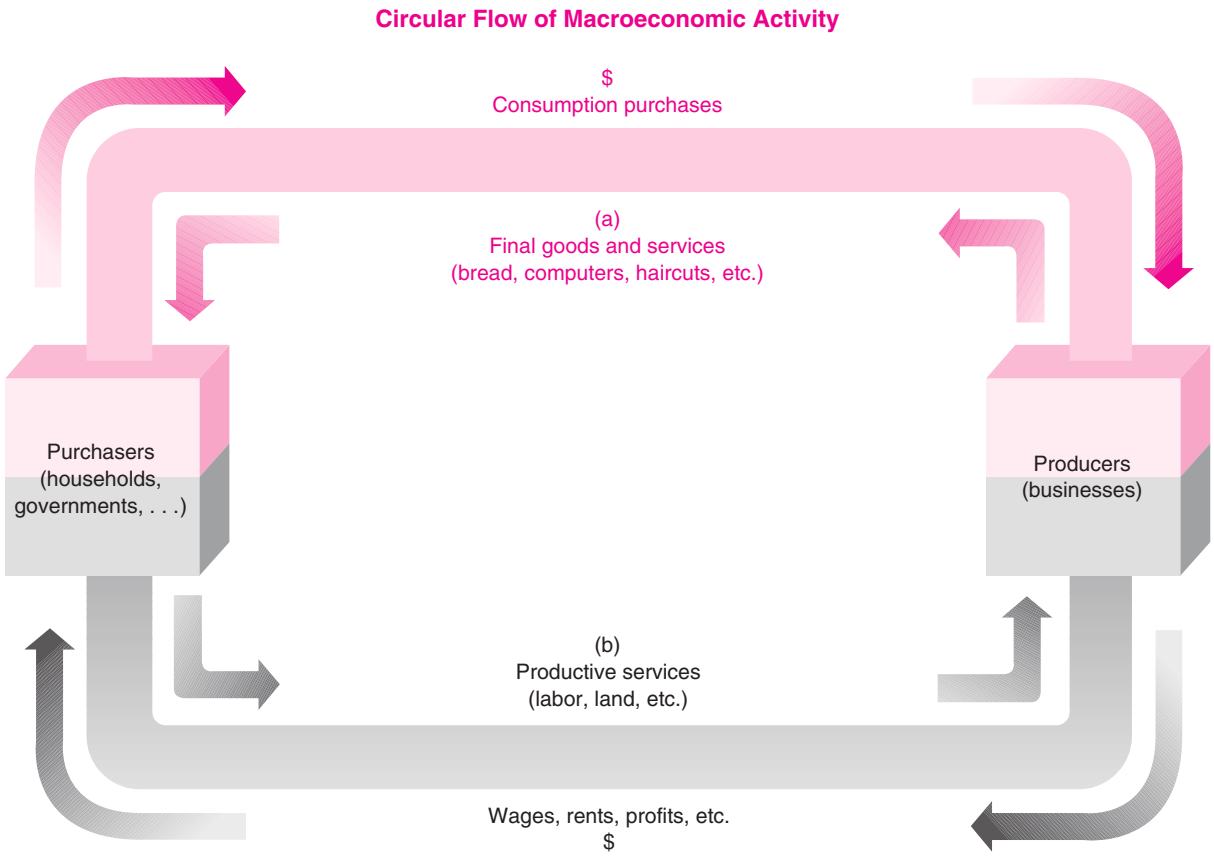


**FIGURE 20-1. Gross Domestic Product Can Be Measured Either as (*a*) a Flow of Final Products or, Equivalently, as (*b*) a Flow of Earnings or Incomes**

In the upper loop, purchasers buy final goods and services. The total dollar flow of their spending each year is one measure of gross domestic product. The lower loop measures the annual flow of costs of output: the earnings that businesses pay out in wages, rent, interest, dividends, and profits.

The two measures of GDP must always be identical. Note that this figure is the macroeconomic counterpart of Fig. 2-1, which presented the circular flow of supply and demand.

profits) that are the costs of producing society's final products.

***Equivalence of the Two Approaches.*** Now we have calculated GDP by the upper-loop flow-of-product approach and by the lower-loop earnings-flow approach. Which is the better approach? The surprise is that *they are exactly the same.*

We can see why the product and earnings approaches are identical by examining a simple barbershop economy. Say the barbers have no expenses other than labor. If they sell 10 haircuts at $8 each, GDP is $80. But the barbers' earnings (in wages and profits) are also exactly $80. Hence, the GDP here is identical whether measured as a flow of products ($80 worth of haircuts) or as a flow of costs and incomes ($80 worth of wages and profits).

In fact, the two approaches are identical because we have included "profits" in the lower loop along with other incomes. What exactly is profit? Profit is what remains from the sale of a product after you have paid the other factor costs—wages, interest, and rents. It

**(a) Income Statement of Typical Farm**

| Output in Farming | | Earnings | |
|---|---|---|---|
| **Sales of goods (corn, apples, etc.)** | **$1,000** | **Costs of production:** | |
| | | Wages | $ 800 |
| | | Rents | 100 |
| | | Interest | 25 |
| | | Profits (residual) | 75 |
| Total | $1,000 | Total | $1,000 |

**(b) National Product Account (millions of dollars)**

| Upper-Loop Flow of Product | | Lower-Loop Flow of Earnings | |
|---|---|---|---|
| **Final output (10 × 1,000)** | **$10,000** | **Costs or earnings:** | |
| | | Wages (10 × 800) | $ 8,000 |
| | | Rents (10 × 100) | 1,000 |
| | | Interest (10 × 25) | 250 |
| | | Profits (10 × 75) | 750 |
| **GDP total** | **$10,000** | **GDP total** | **$10,000** |

**TABLE 20-1. Construction of National Product Accounts from Business Accounts**

Part **(a)** shows the income statement of a typical farm. The left side shows the value of production, while the right side shows the farm's costs. Part **(b)** then adds up or aggregates the 10 million identical farms to obtain total GDP. Note that GDP from the product side exactly equals GDP from the earnings side.

is the residual that adjusts automatically to make the lower loop's costs or earnings exactly match the upper loop's value of goods and services.

To sum up:

GDP, or gross domestic product, can be measured in two different ways: (1) as the flow of spending on final products, or (2) as the total costs or incomes of inputs. Both approaches yield exactly the same measure of GDP.

## National Accounts Derived from Business Accounts

You might wonder where on earth economists find all the data for the national accounts. In practice, government economists draw on a wide array of sources, including surveys, income-tax returns, retail-sales statistics, and employment data.

The most important source of data is business accounts. An *account* for a firm or nation is a numerical record of all flows (outputs, costs, etc.) during a given period. We can show the relationship between business accounts and national accounts by constructing the accounts for an economy made up only of farms. The top half of Table 20-1 shows the results of a year's farming operations for a single, typical farm. We put sales of final products on the left-hand side and the various costs of production on the right. The bottom half of Table 20-1 shows how to construct the GDP accounts for our simple agrarian economy in which all final products are produced on 10 million identical farms. The national accounts simply add together or *aggregate* the outputs and costs of the 10 million identical farms to get the two different measures of GDP.

## The Problem of "Double Counting"

We defined GDP as the total production of final goods and services. A *final product* is one that is produced and sold for consumption or investment. GDP excludes *intermediate goods*—goods that are used up to produce other goods. GDP therefore includes

bread but not flour, and home computers but not computer chips.

For the flow-of-product calculation of GDP, excluding intermediate products poses no major complications. We simply include the bread and home computers in GDP but avoid including the flour and yeast that went into the bread or the chips and plastic that went into the computers. If you look again at the upper loop in Figure 20-1, you will see that bread and computers appear in the flow of products, but you will not find any flour or computer chips.

What has happened to products like flour and computer chips? They are intermediate products and are simply cycling around inside the block marked "Producers." If they are not bought by consumers, they never show up as final products in GDP.

***"Value Added" in the Lower Loop.*** A new statistician who is being trained to make GDP measurements might be puzzled, saying:

> I can see that, if you are careful, your upper-loop product approach to GDP will avoid including intermediate products. But aren't you in some trouble when you use the lower-loop cost or earnings approach?
>
> After all, when we gather income statements from the accounts of firms, won't we pick up what grain merchants pay to wheat farmers, what bakers pay to grain merchants, and what grocers pay to bakers? Won't this result in double counting or even triple counting of items going through several productive stages?

These are good questions, but there is an ingenious technique that resolves the problem. In making lower-loop earnings measurements, statisticians are very careful to include in GDP only a firm's value added. **Value added** is the difference between a firm's sales and its purchases of materials and services from other firms.

In other words, in calculating the GDP earnings or value added by a firm, the statistician includes all costs except for payments made to other businesses. Hence business costs in the form of wages, salaries, interest payments, and dividends are included in value added, but purchases of wheat or steel or electricity are excluded from value added. Why are all the purchases from other firms excluded from value added to obtain GDP? Because those purchases will get properly counted in GDP in the values added by other firms.

Table 20-2 uses the stages of bread production to illustrate how careful adherence to the value-added approach enables us to subtract purchases of intermediate goods that show up in the income statements

**Bread Receipts, Costs, and Value Added (cents per loaf)**

| Stage of production | (1) Sales receipts | (2) *Less:* Cost of intermediate products | | (3) Value added (wages, profits, etc.) (3) = (1) − (2) |
|---|---|---|---|---|
| Wheat | 23 | 0 | = | 23 |
| Flour | 53 | 23 | = | 30 |
| Baked dough | 110 | 53 | = | 57 |
| Final product: bread | 190 | 110 | = | 80 |
| Total | 376 | 186 | | 190 (sum of value added) |

**TABLE 20-2. GDP Sums Up Value Added at Each Production Stage**

To avoid double counting of intermediate products, we calculate value added at each stage of production. This involves subtracting all the costs of materials and intermediate products bought from other businesses from total sales. Note that every blue intermediate-product item both appears in column (1) and is subtracted in the next stage of production in column (2). (By how much would we overestimate GDP if we counted all receipts, not just value added? The overestimate would be 186 cents per loaf.)

of farmers, millers, bakers, and grocers. The final calculation shows the desired equality between (1) final sales of bread and (2) total earnings, calculated as the sum of all values added in all the different stages of bread production.

*Value-added approach:* To avoid double counting, we take care to include only final goods in GDP and to exclude the intermediate goods that are used up in making the final goods. By measuring the value added at each stage, taking care to subtract expenditures on the intermediate goods bought from other firms, the lower-loop earnings approach properly avoids all double counting and records wages, interest, rents, and profits exactly one time.

## DETAILS OF THE NATIONAL ACCOUNTS

Now that we have an overview of the national income and product accounts, we will proceed, in the rest of this chapter, on a whirlwind tour of the various sectors. Before we start on the journey, look at Table 20-3 to get an idea of where we are going. This table shows a summary set of accounts for both the product and the income sides. If you understand the structure of the table and the definitions of the terms in it, you will be well on your way to understanding GDP and its family of components.

### *Real vs. Nominal GDP: "Deflating" GDP by a Price Index*

We define GDP as the dollar value of goods and services. In measuring the dollar value, we use the measuring rod of *market prices* for the different goods and services. But prices change over time, as inflation generally sends prices upward year after year. Who would want to measure things with a rubber yardstick—one that stretches in your hands from day to day—rather than a rigid and invariant yardstick?

The problem of changing prices is one of the problems economists have to solve when they use money as their measuring rod. Clearly, we want a measure of the nation's output and income that uses an invariant yardstick. Economists can replace the elastic yardstick with a reliable one by removing the price-increase component so as to create a real or quantity index of national output.

Here is the basic idea: We can measure the GDP for a particular year using the actual market prices of that year; this gives us the **nominal GDP,** or GDP at current prices. But we are usually more interested in determining what has happened to the **real GDP,** which is an index of the volume or quantity of goods and services produced. Real GDP is calculated by tracking the volume or quantity of production after removing the influence of changing prices or inflation. Hence, nominal GDP is calculated using changing prices, while real GDP represents the change in the volume of total output after price changes are removed.

| Product Approach | Earnings Approach |
|---|---|
| **Components of gross domestic product:** | **Earnings or income approach to gross domestic product:** |
| Consumption ($C$) | Compensation of labor (wages, salaries, and supplements) |
| + Gross private domestic investment ($I$) | + Corporate profits |
| + Government purchases ($G$) | + Other property income (rent, interest, proprietors' income) |
| + Net exports ($X$) | + Depreciation |
| | + Net production taxes |
| **Equals: Gross domestic product** | **Equals: Gross domestic product** |

**TABLE 20-3. Overview of the National Income and Product Accounts**

This table presents the major components of the two sides of the national accounts. The left side shows the components of the product approach (or upper loop); the symbols $C$, $I$, $G$, and $X$ are often used to represent these four items of GDP. The right side shows the components of the earnings or income approach (or lower loop). Each approach will ultimately add up to exactly the same GDP.

| Date | (1) Nominal GDP (current $, billion) | (2) Index number of prices (GDP deflator, 1929 = 1) | (3) Real GDP ($, billion, 1929 prices) (3) = (1)/(2) |
|---|---|---|---|
| 1929 | 104 | 1.00 | $\frac{104}{1.00} = 104$ |
| 1933 | 56 | 0.74 | $\frac{56}{0.74} = 76$ |

**TABLE 20-4. Real (or Inflation-Corrected) GDP Is Obtained by Dividing Nominal GDP by the GDP Deflator**

Using the price index of column (2), we deflate column (1) to get real GDP in column (3). (Riddle: Can you show that 1929's real GDP was $77 billion in terms of 1933 prices? *Hint:* With 1933 as a base of 1, 1929's price index is 1.35.)

The difference between nominal GDP and real GDP is the **price of GDP,** sometimes called the **GDP deflator.**

A simple example will illustrate the general idea. Say that a country produces 1000 bushels of corn in year 1 and 1010 bushels in year 2. The price of a bushel is $1 in year 1 and $2 in year 2. We can calculate nominal GDP ($PQ$) as $\$1 \times 1000 = \$1000$ in year 1 and $\$2 \times 1010 = \$2020$ in year 2. Nominal GDP therefore grew by 102 percent between the two years.

But the actual amount of output did not grow anywhere near that rapidly. To find real output, we need to consider what happened to prices. One common approach is to use the first year as the base year. The *base year* is the year in which we measure prices. We can, for index purposes, set the price index for the first year (the base year) at $P_1 = 1$. This means that output will be measured in prices of the base year. From the data in the previous paragraph, we see that the GDP deflator is $P_2 = \$2/\$1 = 2$ in year 2. Real GDP ($Q$) is equal to nominal GDP ($PQ$) divided by the GDP deflator ($P$). Hence real GDP was equal to $\$1000/1 = \$1000$ in year 1 and $\$2020/2 = \$1010$ in year 2. Thus the growth in real GDP, which corrects for the change in prices, is 1 percent and equals the growth in the output of corn, as it should.

A 1929–1933 comparison will illustrate the deflation process for an actual historical episode. Table 20-4 gives nominal GDP figures of $104 billion for 1929 and $56 billion for 1933. This represents a 46 percent drop in nominal GDP from 1929 to 1933. But the government estimates that prices on average dropped about 26 percent over this period. If we choose 1929 as our base year, with the GDP deflator of 1 in that year, this means that the 1933 price index was 0.74. So our $56 billion of GDP in 1933 was really worth much more than half the $104 billion GDP of 1929. Table 20-4 shows that, in terms of 1929 prices, or dollars of 1929 purchasing power, real GDP fell to $76 billion. Hence, part of the near-halving shown by the nominal GDP was due to the rapidly declining price level, or deflation, during the Great Depression.

The green line in Figure 20-2 shows the growth of nominal GDP since 1929, expressed in the actual dollars and prices that were current in each historical year. Then, for comparison, the real GDP, expressed in 2000 dollars, is shown in blue. Clearly, much of the increase in nominal GDP over the last eight decades was due to inflation in the price units of our money yardstick.

Table 20-4 shows the simplest way of calculating real GDP and the GDP deflator. Sometimes these calculations give misleading results, particularly when the relative prices and quantities of important goods are changing rapidly. For example, over the last three decades, computer prices have been falling very sharply while the quantity of computers produced has risen rapidly (we return to this issue in our discussion of price indexes below).

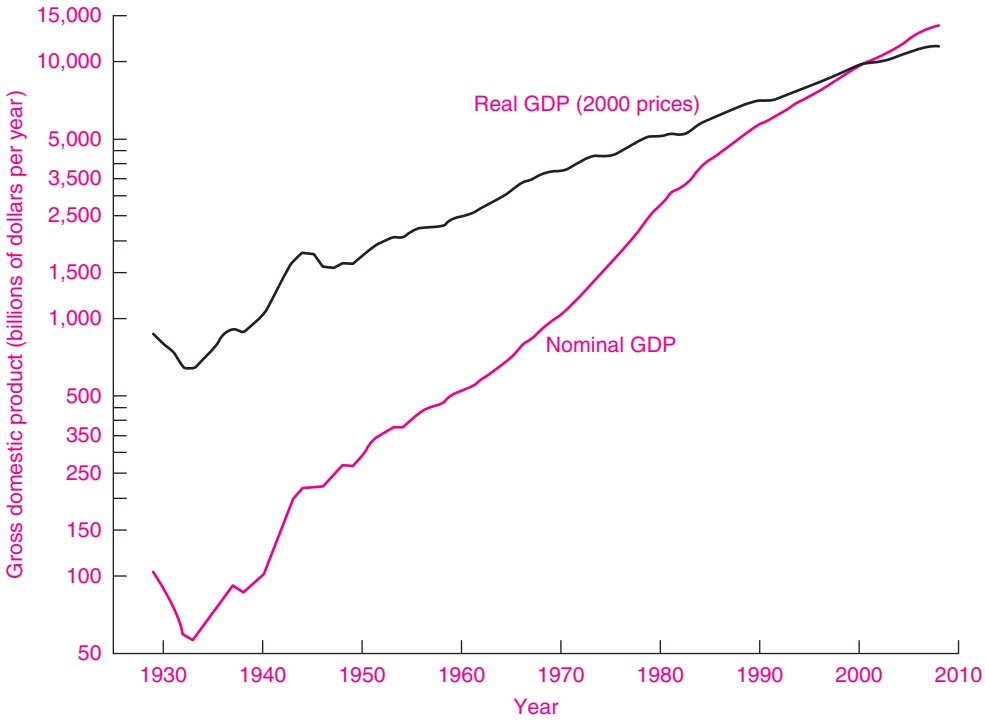


**FIGURE 20-2. Nominal GDP Grows Faster than Real GDP because of Price Inflation**

The rise in nominal GDP exaggerates the rise in output. Why? Because growth in nominal GDP includes increases in prices as well as growth in output. To obtain an accurate measure of real output, we must correct GDP for price changes.

Source: U.S. Bureau of Economic Analysis.

When relative prices of different goods are changing very rapidly, using prices of a fixed year will give a misleading estimate of real GDP growth. To correct for this bias, statisticians use a procedure known as *chain weighting*. Instead of the relative weights on each good being kept fixed (say, by the use of weights for a given year, like 1990), the weights of the different goods and services change each year to reflect the changes in spending patterns in the economy. Today, the official U.S. government measures of real GDP and the GDP price index rely upon chain weights. The technical names for these constructs are "real GDP in chained dollars" and the "chain-type price index for GDP." As a shorthand, we generally refer to these as real GDP and the GDP price index.

***Further Details on Chain Weights.*** The details of using chain weights are somewhat involved, but we can get the basic idea using a simple example. The calculation of chain weights involves linking the output or price series together by multiplying the growth rates from one period to another. An example for a haircut economy will show how this works. Say that the value of the haircuts was $300 in 2003. Further suppose that the quantity of haircuts increased by 1 percent from 2003 to 2004 and by 2 percent from 2004 to 2005. The value of real GDP (in chained 2003 dollars) would be $300 in 2003, then $300 × 1.01 = $303 in 2004, and then $303 × 1.02 = $309.06 in 2005. With many different goods and services, we would add together the growth rates of the different components of apples, bananas, catamarans, and so on, and weight the growth rates by the expenditure or output shares of the different goods.

To summarize:

Nominal GDP ($PQ$) represents the total money value of final goods and services produced in a given year, where the values are expressed in terms of the

market prices of each year. Real GDP ($Q$) removes price changes from nominal GDP and calculates GDP in terms of the quantities of goods and services. The following equations provide the link between nominal GDP, real GDP, and the GDP price index:

$$Q = \text{real GDP} = \frac{\text{nominal GDP}}{\text{GDP price index}} = \frac{PQ}{P}$$

To correct for rapidly changing relative prices, the U.S. national accounts use chain weights to construct real GDP and price indexes.

### Consumption

The first important part of GDP is consumption, or "personal consumption expenditures." Consumption is by far the largest component of GDP, equaling about two-thirds of the total in recent years. Figure 20-3 shows the fraction of GDP devoted to consumption over the last eight decades. Consumption expenditures are divided into three categories: durable goods such as automobiles, nondurable goods such as food, and services such as medical care. The most rapidly growing sector is services.

### Investment and Capital Formation

So far, our analysis has banished all capital. In real life, however, nations devote part of their output to production of capital—durable items that increase future production. Increasing capital requires the sacrifice of current consumption to increase future consumption. Instead of eating more pizza now, people build new pizza ovens to make it possible to produce more pizza for future consumption.

In the accounts, **investment** consists of the additions to the nation's capital stock of buildings, equipment, software, and inventories during a year. The


**FIGURE 20-3. Share of Consumption in National Output Has Risen Recently**

The share of consumption in total GDP rose during the Great Depression as investment prospects soured, then shrank sharply during World War II when the war effort displaced civilian needs. In recent years, consumption has grown more rapidly than total output as the national saving rate and government purchases have declined.

Source: U.S. Bureau of Economic Analysis.

national accounts include mainly tangible capital (such as buildings and computers) and omit most intangible capital (such as research-and-development or educational expenses).

**Real Investment versus Financial Investment**

Economists define "investment" (or sometimes *real investment*) as production of durable capital goods. In common usage, "investment" often denotes using money to buy General Motors stock or to open a savings account. For clarity, economists call this *financial investment*. Try not to confuse these two different uses of the word "investment."

If I take $1000 from my safe and buy some stocks, this is not what macroeconomists call investment. I have simply exchanged one financial asset for another. Investment takes place when a durable capital good is produced.

How does investment fit into the national accounts? Economic statisticians recognize that if people are using part of society's production for capital formation, such outputs must be included in the upper-loop flow of GDP. Investments represent additions to the stock of durable capital that increase production possibilities in the future. So we must modify our original definition to read:

Gross domestic product is the sum of all final products. Along with consumption goods and services, we must also include gross investment.

***Net vs. Gross Investment.*** Our revised definition includes "gross investment" along with consumption. What does the word "gross" mean in this context? It indicates that investment includes all investment goods produced. Gross investment is not adjusted for **depreciation,** which measures the amount of capital that has been used up in a year. Thus gross investment includes all the machines, factories, and houses built during a year—even though some were produced simply to replace old capital goods that burned down or were thrown on the scrap heap.

If you want to get a measure of the increase in society's capital, gross investment is not a sensible measure. Because it does not subtract depreciation, gross investment is too large a number—too gross.

An analogy to population will make clear the importance of considering depreciation. If you want to measure the increase in the size of the population, you cannot simply count the number of births, for this would clearly exaggerate the net change in population. To get population growth, you must also subtract the number of deaths.

The same point holds for capital. To find the net increase in capital, you must start with gross investment and subtract the deaths of capital in the form of depreciation, or the amount of capital used up.

Thus to estimate the increase in the capital stock we measure *net investment*. Net investment is always births of capital (gross investment) less deaths of capital (capital depreciation):

Net investment equals gross investment minus depreciation.

## Government Purchases

Some of our national output is purchased by federal, state, and local governments, and these purchases are clearly part of our GDP. Some government purchases are consumption-type goods (like food for the military), while some are investment-type items (such as schools or roads). In measuring government's contribution to GDP, we simply add all these government purchases to the flow of private consumption, private investment, and, as we will see later, net exports.

Hence, all the government payroll expenditures on its employees plus the costs of goods it buys from private industry (lasers, roads, and airplanes) are included in this third category of flow of products, called "government consumption expenditures and gross investment." This category equals the contribution of federal, state, and local governments to GDP.

***Exclusion of Transfer Payments.*** Does this mean that every dollar of government expenditure is included in GDP? Definitely not. GDP includes only government purchases; it excludes spending on transfer payments.

Government **transfer payments** are payments to individuals that are not made in exchange for goods or services supplied. Examples of government transfers include unemployment insurance, veterans' benefits, and old-age or disability payments. These

payments meet important social purposes. But they are not purchases of current goods or services, and they are therefore omitted from GDP.

Thus if you teach in the local public school and receive a salary from the government, your salary is a factor payment and your services are included in GDP. If you receive a social security benefit as a retired worker, that payment is a transfer payment and is excluded from GDP. Similarly, government interest payments are treated as transfers and are excluded from GDP.

Finally, do not confuse the way the national accounts measure government spending on goods and services ($G$) with the official government budget. When the Treasury measures its expenditures, it includes purchases of goods and services ($G$) *plus* transfers.

***Taxes.*** In using the flow-of-product approach to compute GDP, we need not worry about how the government finances its spending. It does not matter whether the government pays for its goods and services by taxing, by printing money, or by borrowing. Wherever the dollars come from, the statistician computes the governmental component of GDP as the actual cost to the government of the goods and services.

But while it is fine to ignore taxes in the flow-of-product approach, we must account for taxes in the earnings or cost approach to GDP. Consider wages, for example. Part of my wage is turned over to the government through personal income taxes. These direct taxes definitely do get included in the wage component of business expenses, and the same holds for direct taxes (personal or corporate) on interest, rent, and profits.

Or consider the sales tax and other indirect taxes that manufacturers and retailers have to pay on a loaf of bread (or on the wheat, flour, and dough stages). Suppose these indirect taxes total 10 cents per loaf, and suppose wages, profit, and other value-added items cost the bread industry 90 cents. What will the bread sell for in the product approach? For 90 cents? Surely not. The bread will sell for $1, equal to 90 cents of factor costs plus 10 cents of indirect taxes.

Thus the cost approach to GDP includes both indirect and direct taxes as elements of the cost of producing final output.

### Net Exports

The United States is an open economy engaged in importing and exporting goods and services. The last component of GDP—and an increasingly important one in recent years—is **net exports,** the difference between exports and imports of goods and services.

How do we draw the line between our GDP and other countries' GDPs? The U.S. GDP represents all goods and services produced within the boundaries of the United States. Production differs from sales in the United States in two respects. First, some of our production (Iowa wheat and Boeing aircraft) is bought by foreigners and shipped abroad, and these items constitute our *exports.* Second, some of what we consume at home (Mexican oil and Japanese cars) is produced abroad, and such items are American *imports.*

***A Numerical Example.*** We can use a simple farming economy to understand how the national accounts work. Suppose that Agrovia produces 100 bushels of corn and 7 bushels are imported. Of these, 87 bushels are consumed (in $C$), 10 go for government purchases to feed the army (as $G$), and 6 go into domestic investment as increases in inventories ($I$). In addition, 4 bushels are exported, so net exports ($X$) are 4 – 7, or minus 3.

What, then, is the composition of the GDP of Agrovia? It is the following:

$$\begin{aligned}\text{GDP} &= 87 \text{ of } C + 10 \text{ of } G + 6 \text{ of } I - 3 \text{ of } X \\ &= 100 \text{ bushels}\end{aligned}$$

### Gross Domestic Product, Net Domestic Product, and Gross National Product

Although GDP is the most widely used measure of national output in the United States, two other concepts are frequently cited: net domestic product and gross national product.

Recall that GDP includes *gross* investment, which is net investment plus depreciation. A little thought suggests that including depreciation is rather like including wheat as well as bread. A better measure would include only *net* investment in total output. By subtracting depreciation from GDP we obtain **net domestic product** (NDP). If NDP is a sounder measure of a nation's output than GDP, why do national accountants focus on GDP? They do so because

1. **GDP from the product side is the sum of four major components:**
   - Personal consumption expenditures on goods and services ($C$)
   - Gross private domestic investment ($I$)
   - Government consumption expenditures and gross investment ($G$)
   - Net exports of goods and services ($X$), or exports minus imports
2. **GDP from the cost side is the sum of the following major components:**
   - Compensation (wages, salaries, and supplements)
   - Property income (corporate profits, proprietors' incomes, interest, and rents)
   - Production taxes and depreciation of capital

   (Remember to use the value-added technique to prevent double counting of intermediate goods bought from other firms.)
3. **The product and cost measures of GDP are identical** (by adherence to the rules of value-added bookkeeping and the definition of profit as a residual).
4. **Net domestic product (NDP) equals GDP minus depreciation.**

**TABLE 20-5. Key Concepts of the National Income and Product Accounts**

depreciation is somewhat difficult to estimate, whereas gross investment can be estimated fairly accurately.

An alternative measure of national output, widely used until recently, is **gross national product** (GNP). What is the difference between GNP and GDP? GNP is the total output produced with labor or capital *owned by U.S. residents,* while GDP is the output produced with labor and capital *located inside the United States.*

For example, some of the U.S. GDP is produced in Honda plants that are owned by Japanese corporations operating in the U.S. The profits from these plants are included in U.S. GDP but not in U.S. GNP because Honda is a Japanese company. Similarly, when an American economist flies to Japan to give a paid lecture on baseball economics, payment for that lecture would be included in Japanese GDP and in American GNP. For the United States, GDP is very close to GNP, but these may differ substantially for very open economies.

To summarize:

Net domestic product (NDP) equals the total final output produced within a nation during a year, where output includes net investment, or gross investment less depreciation:

$$\text{NDP} = \text{GDP} - \text{depreciation}$$

Gross national product (GNP) is the total final output produced with inputs owned by the residents of a country during a year.

Table 20-5 provides a comprehensive definition of important components of GDP.

## GDP and NDP: A Look at Numbers

Armed with an understanding of the concepts, we can turn to look at the actual data in the important Table 20-6.

***Flow-of-Product Approach.*** Look first at the left side of Table 20-6. It gives the upper-loop, flow-of-product approach to GDP. Each of the four major components appears there, along with the dollar total for each component for 2007. Of these, $C$ and $G$ and their obvious subclassifications require little discussion.

Gross private domestic investment does require one comment. Its total ($2130 billion) includes all new business investment, residential construction, and increase in inventory of goods. This gross total is the amount before a subtraction for depreciation of capital. After subtracting $1721 billion of depreciation from gross investment, we obtain $410 billion of net investment.

Finally, note the large negative entry for net exports, −$708 billion. This negative entry represents the fact that in 2007 the United States imported $708 billion more in goods and services than it exported.

Adding up the four components on the left gives the total GDP of $13,808 billion. This is the harvest

**Gross Domestic Product, 2007 (billions of current dollars)**

| Production Approach | | | Earnings or Cost Approach | |
|---|---|---|---|---|
| 1. Personal consumption expenditures | | 9,710 | 1. Compensation of employees | 7,812 |
| Durable goods | 1,083 | | 2. Proprietors' income | 1,056 |
| Nondurable goods | 2,833 | | 3. Rental income | 40 |
| Services | 5,794 | | 4. Net interest | 664 |
| 2. Gross private domestic investment | | 2,130 | 5. Corporate profits (with adjustments) | 1,642 |
| Fixed investment | | | 6. Depreciation | 1,721 |
| Nonresidential | 1,504 | | 7. Production taxes, statistical discrepancy, and miscellaneous | 872 |
| Residential | 630 | | | |
| Change in private inventories | −4 | | | |
| 3. Net exports of goods and services | | −708 | | |
| Exports | 1,662 | | | |
| Imports | 2,370 | | | |
| 4. Government consumption expenditures and gross investment | | 2,675 | | |
| Federal | 979 | | | |
| State and local | 1,696 | | | |
| **Gross domestic product** | | **13,808** | **Gross domestic product** | **13,808** |

**TABLE 20-6. The Two Ways of Looking at the GDP Accounts, in Actual Numbers**

The left side measures flow of products (at market prices). The right side measures flow of costs (factor earnings and depreciation).

Source: U.S. Bureau of Economic Analysis.

we have been working for: the money measure of the American economy's overall performance for 2007.

***Flow-of-Cost Approach.*** Now turn to the right-hand side of the table, which gives the lower-loop, flow-of-cost approach. Here we have all *costs of production* plus *taxes* and *depreciation*.

Compensation of employees represents wages, salaries, and other employee supplements. Net interest is a similar item.

Rent income of persons includes rents received by landlords. In addition, if you own your own home, you are treated as *paying rent to yourself*. This is one of many "imputations" (or derived data) in the national accounts. It makes sense if we really want to measure the housing services the American people are enjoying and do not want the estimate to change when people decide to own a home rather than rent one.

Production taxes are included as a separate item along with some small adjustments, including the inevitable "statistical discrepancy," which reflects the fact that the officials never have every bit of needed data.[1]

Depreciation on capital goods that were used up must appear as an expense in GDP, just like other expenses. Profit is a residual—what is left over after all other costs have been subtracted from total sales. There are two kinds of profits: profit of corporations and net earnings of unincorporated enterprises.

Income of unincorporated enterprises consists of earnings of partnerships and single-ownership businesses. This includes much farm and professional

[1] Statisticians work with incomplete reports and fill in data gaps by estimation. Just as measurements in a chemistry lab differ from the ideal, so do errors creep into both upper- and lower-loop GDP estimates. These are balanced by an item called the "statistical discrepancy." Along with the civil servants who are heads of units called "Wages," "Interest," and so forth, there actually used to be someone with the title "Head of the Statistical Discrepancy." If data were perfect, that individual would have been out of a job.

income. Finally, corporate profits before taxes are shown.

On the right side, the flow-of-cost approach gives us the same $13,808 billion of GDP as does the flow-of-product approach. The right and left sides do agree.

### From GDP to Disposable Income

The basic GDP accounts are of interest not only for themselves but also because of their importance for understanding how consumers and businesses behave. Some further distinctions will help illuminate the way the nation's books are kept.

***National Income.*** To help us understand the division of total income among the different factors of production, we construct data on *national income (NI)*. *NI* represents the total incomes received by labor, capital, and land. It is constructed by subtracting depreciation from GDP. National income equals total compensation of labor, rental income, net interest, income of proprietors, and corporate profits.

The relationship between GDP and national income is shown in the first two bars of Figure 20-4. The left-hand bar shows GDP, while the second bar shows the subtractions required to obtain *NI*.

**From GDP to National Income to Disposable Income**

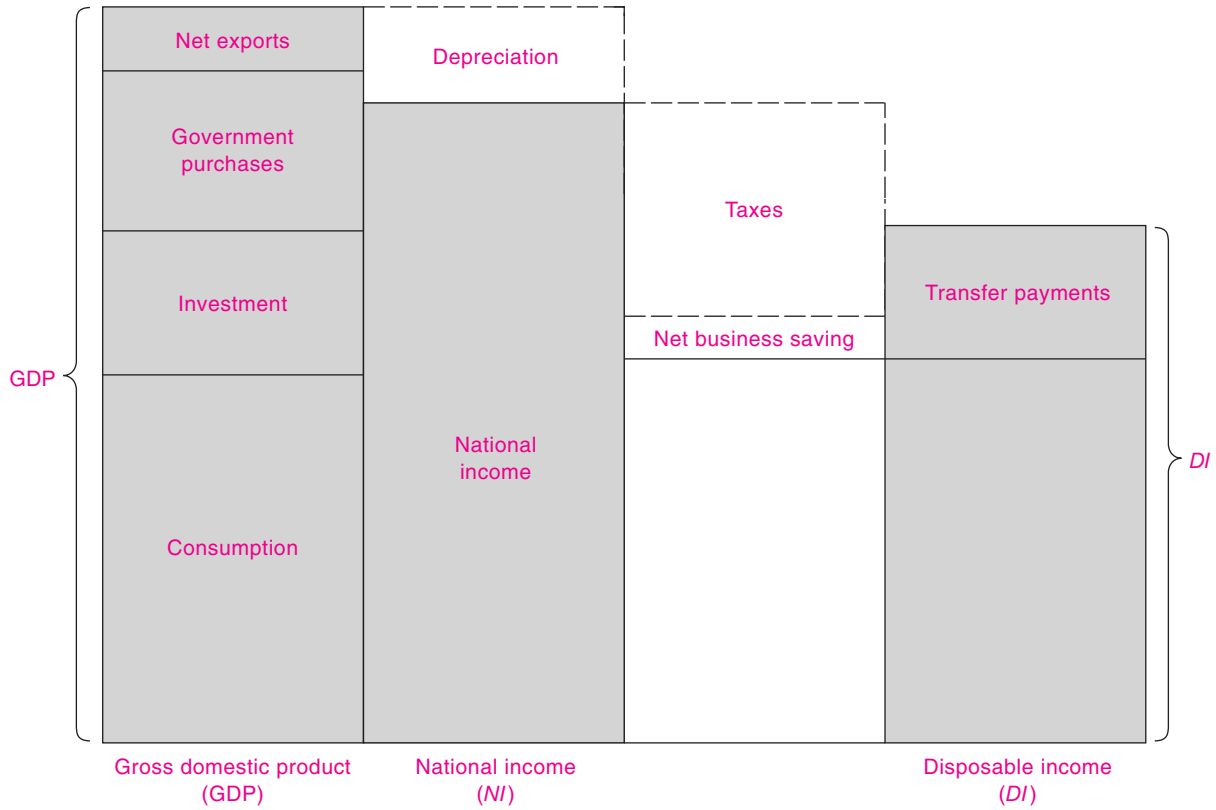


**FIGURE 20-4. Starting with GDP, We Can Calculate National Income (*NI*) and Disposable Personal Income (*DI*)**

Important income concepts are (1) GDP, which is total gross income to all factors; (2) national income, which is the sum of factor incomes and is obtained by subtracting depreciation from GDP; and (3) disposable personal income, which measures the total incomes of the household sector, including transfer payments but subtracting taxes.

***Disposable Income.*** A second important concept asks, How many dollars per year do households actually have available to spend? The concept of disposable personal income (usually called **disposable income,** or *DI*) answers this question. To get disposable income, you calculate the market and transfer incomes received by households and subtract personal taxes.

Figure 20-4 shows the calculation of *DI*. We begin with national income in the second bar. We then subtract all taxes and further subtract net business saving. (Net business saving is profits after depreciation less dividends.) Finally, we add back the transfer payments that households receive from governments. This constitutes *DI,* shown as the right-hand bar in Figure 20-4. Disposable income is what actually gets into the hands of consumers to dispose of as they please. (This discussion omits some minor items such as the statistical discrepancy and net foreign factor incomes that are usually close to zero.)

As we will see in the next chapters, *DI* is what people divide between (1) consumption spending and (2) personal saving.

### Saving and Investment

As we have seen, output can be either consumed or invested. Investment is an essential economic activity because it increases the capital stock available for future production. One of the most important points about national accounting is the identity between saving and investment. We will show that, under the accounting rules described above, *measured saving is exactly equal to measured investment.* This equality is an *identity,* which means that it must hold by definition.

In the simplest case, assume for the moment that there is no government or foreign sector. Investment is that part of national output which is not consumed. Saving is that part of national income which is not consumed. But since national income and output are equal, this means that saving equals investment. In symbols:

$$I = \text{product-approach GDP minus } C$$
$$S = \text{earnings-approach GDP minus } C$$

However, both approaches always give the same measure of GDP, so

$I = S$: the identity between measured saving and investment

That is the simplest case. We also need to consider the complete case which brings businesses, government, and net exports into the picture. On the saving side, *total* or *national saving* ($S^T$) is composed of *private saving* by households and businesses ($S^P$) along with *government saving* ($S^G$). Government saving equals the government's budget surplus or the difference between tax revenues and expenditures.

On the investment side, total or *national investment* ($I^T$) starts with *gross private domestic investment* ($I$) but also adds *net foreign investment,* which is approximately the same as net exports ($X$). Hence, the complete saving-investment identity is given by[2]

$$\begin{aligned}\text{National investment} &= \text{private investment} + \text{net exports} \\ &= \text{private saving} + \text{government saving} = \text{national saving}\end{aligned}$$

or

$$I^T = I + X = S^P + S^G = S^T$$

National saving equals national investment by definition. The components of investment are private domestic investment and foreign investment (or net exports). The sources of saving are private saving (by households and businesses) and government saving (the government budget surplus). Private investment plus net exports equals private saving plus the budget surplus. These identities must hold always, whatever the state of the business cycle.

## BEYOND THE NATIONAL ACCOUNTS

Advocates of the existing economic and social system often argue that market economies have produced a growth in real output never before seen in human history. "Look how GDP has grown because of the genius of free markets," say the admirers of capitalism.

But critics point out the deficiencies of GDP. GDP includes many questionable entries and omits many

[2] For this discussion, we consider only private investment and therefore treat all government purchases as consumption. In most national accounts today, government purchases are divided between consumption and tangible investments. If we include government investment, then this amount will add to both national investment and the government surplus.

valuable economic activities. As one dissenter said, "Don't speak to me of all your production and your dollars, your gross domestic product. To me, GDP stands for gross domestic pollution!"

What are we to think? Isn't it true that GDP includes government production of bombs and missiles along with salaries paid to prison guards? Doesn't an increase in crime boost sales of home alarms, which adds to the GDP? Doesn't cutting our irreplaceable redwoods show up as a positive output in our national accounts? Doesn't GDP fail to account for environmental degradation such as acid rain and global warming?

In recent years, economists have begun developing new measures to correct the major defects of the standard GDP numbers and better reflect the true satisfaction-producing outputs of our economy. The new approaches attempt to extend the boundaries of the traditional accounts by including important nonmarket activities as well as correcting for harmful activities that are included as part of national output. Let's consider some of the omitted pluses and minuses.

***Omitted Nonmarket Activities.*** Recall that the standard accounts include primarily market activities. Much useful economic activity takes place outside the market. For example, college students are investing in human capital. The national accounts record the tuition, but they omit the opportunity costs of earnings forgone. Studies indicate that inclusion of nonmarket investments in education and other areas would more than double the national saving rate.

Similarly, many household activities produce valuable "near-market" goods and services such as meals, laundering, and child-care services. Recent estimates of the value of unpaid household work indicate that it might be half as large as total market consumption. Perhaps the largest omission from the market accounts is the value of leisure time. On average, Americans spend as much of their time on utility-producing leisure activities as they do on money-producing work activities. Yet the value of leisure time is excluded from our official national statistics.

You might wonder about the underground economy, which covers a wide variety of market activities that are not reported to the government. These include activities like gambling, prostitution, drug dealing, work done by illegal immigrants, bartering of services, and smuggling. Actually, much underground activity is intentionally excluded because national output excludes illegal activities—these are by social consensus "bads" and not "goods." A swelling cocaine trade will not enter into GDP. For legal but unreported activities, like unreported tips, the Commerce Department makes estimates on the basis of surveys and audits by the Internal Revenue Service.

***Omitted Environmental Damage.*** In addition to omitting activities, sometimes GDP omits some of the harmful side effects of economic activity. An important example is the omission of environmental damages. For example, suppose the residents of Suburbia buy 10 million kilowatt-hours of electricity to cool their houses, paying Utility Co. 10 cents per kilowatt-hour. That $1 million covers the labor costs, plant costs, and fuel costs. But suppose the company damages the neighborhood with pollution in the process of producing electricity. It incurs no monetary costs for this externality. Our measure of output should not only add in the value of the electricity (which GDP does) but also subtract the environmental damage caused by the pollution (which GDP does not).

Suppose that in addition to 10 cents of direct costs, there are 2 cents per kilowatt-hour of environmental damages to human health. These are the "external costs" of pollution not paid by Utility Co., and they total $200,000. To correct for this hidden cost in a set of augmented accounts, we should subtract $200,000 of "pollution bads" from the $1,000,000 flow of "electricity goods." In fact, government statisticians do *not* subtract pollution costs in the economic accounts.

Economists have made considerable progress in developing *augmented national accounts*, which are designed to include activities beyond the traditional definitions of the national accounts. The general principle of augmented accounting is to include as much of economic activity as is feasible, whether or not that activity takes place in the market. Examples of augmented accounts include estimates of the value of research and development, nonmarket investments in human capital, the value of unpaid production in the home, the value of forests, and the value of leisure time. Economists are even developing accounts for the damages from air pollution

and global warming. When these further accounts are completed, we will have a more comprehensive financial picture of the economy.

But be warned that even the most refined economic accounts still measure only economic activity. They do not attempt to—indeed, cannot—measure the ultimate satisfactions, pleasures, or pains of people in their everyday lives. This point was eloquently put by Robert Kennedy in one of his last speeches:

> The gross national product does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages; the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage; neither our wisdom nor our learning; neither our compassion nor our devotion to our country.

## PRICE INDEXES AND INFLATION

This chapter has up to now focused on measuring national output and its components. But people today worry about overall price trends, that is to say, about inflation. What do these terms mean?

Let us begin with a careful definition:

A **price index** (with symbol $P$) is a measure of the average level of prices. **Inflation** (with symbol $\pi$, or "pi") denotes a rise in the general level of prices. The **rate of inflation** is defined as the rate of change of the general price level and is measured as follows:

$$\text{Rate of inflation in year } t = \pi_t = 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

Most periods in recent history have been ones of positive inflation. The opposite of inflation is **deflation,** which occurs when the general price level is falling. Deflations have been rare in the last half-century. In the United States, the last time consumer prices actually fell from one year to the next was 1955. Sustained deflations, in which prices fall steadily over a period of several years, are associated with depressions, such as those that occurred in the United States in the 1890s and the 1930s. More recently, Japan experienced a deflation over much of the last two decades as its economy suffered a prolonged recession.

### Price Indexes

When newspapers tell us "Inflation is rising," they are really reporting the movement of a price index. A price index is a weighted average of the price of a basket of goods and services. In constructing price indexes, economists weight individual prices by the economic importance of each good. The most important price indexes are the consumer price index, the GDP price index, and the producer price index.

***The Consumer Price Index (CPI).*** The most widely used measure of the overall price level is the consumer price index, also known as the CPI, calculated by the U.S. Bureau of Labor Statistics (BLS). The CPI is a measure of the average price paid by urban consumers for a market basket of consumer goods and services. Each month, government statisticians record the prices of around 80,000 goods and services for more than 200 major categories. The prices are then arranged into the following eight major groups, listed with some examples:

- Food and beverages (breakfast cereal, milk, and snacks)
- Housing (rent of primary residence, owner's equivalent rent, bedroom furniture)
- Apparel (shirts and sweaters, jewelry)
- Transportation (new vehicles, gasoline, motor vehicle insurance)
- Medical care (prescription drugs, physicians' services, eyeglasses)
- Recreation (televisions, sports equipment, admissions)
- Education and communication (college tuition, computer software)
- Other goods and services (haircuts, funeral expenses)

How are the different prices weighted in constructing price indexes? It would clearly be silly merely to add up the different prices or to weight them by their mass or volume. Rather, a price index is constructed by *weighting each price according to the economic importance of the commodity in question.*

In the case of the traditional CPI, each item is assigned a fixed weight proportional to its relative importance in consumer expenditure budgets; the weight for each item is proportional to the total spending by consumers on that item as determined by a survey of consumer expenditures in the

2005–2006 period. As of 2008, housing-related costs were the single biggest category in the CPI, taking up more than 42 percent of consumer spending budgets. By comparison, the cost of new cars and other motor vehicles accounts for only 7 percent of the CPI's consumer expenditure budgets.

### Calculating the CPI

It is worth spending a moment on the exact technique that is used to calculate CPI changes. The formula in the text is correct, but we need to explain how the formula works when there are many goods and services. The change in the overall CPI is the weighted average of the change of the components:

$$\text{\% change in CPI in period } t = 100 \times \left\{ \sum_{\text{All items}} [\text{weight of good } i \text{ in } (t-1)] \times [\text{\% change in the price of good } i \text{ from } (t-1) \text{ to } t] \right\}$$

To take a concrete example, the following table shows the actual price-change and relative-importance data:

| Expenditure category | Relative importance, December 2007 (%) | Percentage change over the last year |
|---|---|---|
| Food and beverages | 14.9 | 4.4 |
| Housing | 42.4 | 3.0 |
| Apparel | 3.7 | –1.4 |
| Transportation | 17.7 | 8.2 |
| Medical care | 6.2 | 4.6 |
| Recreation | 5.6 | 1.3 |
| Education and communication | 6.1 | 3.0 |
| Other goods and services | 3.3 | 3.2 |
| **All items** | **100.0** | **4.0** |

The rate of inflation over the period from March 2007 to March 2008 is seen to be 4.0 percent per year. (Question 9 at the end of this chapter examines this calculation further.)

This example captures the essence of how the traditional CPI measures inflation. The only difference between this simplified calculation and the actual ones is that the CPI contains many more commodities and regions. Otherwise, the procedure is exactly the same.

***GDP Price Index.*** Another widely used price index is the *GDP price index* (also sometimes referred to as the GDP deflator), which we met earlier in this chapter. The GDP price index is the price of all goods and services produced in the country (consumption, investment, government purchases, and net exports) rather than of a single component (such as consumption). This index also differs from the traditional CPI because it is a chain-weighted index that takes into account the changing shares of different goods (see the discussion of chain weights on page 393). In addition, there are price indexes for components of GDP, such as for investment goods, computers, personal consumption, and so forth, and these are sometimes used to supplement the CPI.

***The Producer Price Index (PPI).*** This index, dating from 1890, is the oldest continuous statistical series published by the BLS. It measures the level of prices at the wholesale or producer stage. It is based on over 8000 commodity prices, including prices of foods, manufactured products, and mining products. The fixed weights used to calculate the PPI are the net sales of each commodity. Because of its great detail, this index is widely used by businesses.

### Getting the Prices Right

Measuring prices accurately is one of the central issues of empirical economics. Price indexes affect not only obvious things like the inflation rate. They also are embedded in measures of real output and productivity. And through government policies, they affect monetary policy, taxes, government transfer programs like social security, and many private contracts.

The purpose of the consumer price index is to measure the cost of living. You might be surprised to learn that this is a difficult task. Some problems are intrinsic to price indexes. One issue is the *index-number problem,* which involves how the different prices are weighted or averaged. Recall that the traditional CPI uses a fixed weight for each good. As a result, the cost of living is

overestimated compared to the situation where consumers substitute relatively inexpensive for relatively expensive goods.

The case of energy prices can illustrate the problem. When gasoline prices rise sharply, people tend to reduce their gasoline purchases, buy smaller cars, and travel less. Yet the CPI assumes that they buy the same quantity of gasoline even though gasoline prices may have doubled. The overall rise in the cost of living is thereby exaggerated. Statisticians have devised ways of minimizing such index-number problems by using different weighting approaches, such as adjusting the weights as expenditures change, but government statisticians are just beginning to experiment with these newer approaches for the CPI.

A more important problem arises because of the difficulty of adjusting price indexes to capture the contribution of *new and improved goods and services*. An example will illustrate this problem. In recent years, consumers have benefited from compact fluorescent lightbulbs; these lightbulbs deliver light at approximately one-fourth the cost of the older, incandescent bulbs. Yet none of the price indexes incorporate the quality improvement. Similarly, as CDs and MP3s replaced long-playing records, as cable TV with hundreds of channels replaced the older technology with a few fuzzy channels, as air travel replaced rail or road travel, and in thousands of other improved goods and services, the price indexes did not reflect the improved quality.

Recent studies indicate that if quality change had been properly incorporated into price indexes, the CPI would have risen less rapidly in recent years. This problem is especially acute for medical care. In this sector, reported prices have risen sharply in the last two decades. Yet we have no adequate measure of the quality of medical care, and the CPI completely ignores the introduction of new products, such as pharmaceuticals which replace intrusive and expensive surgery.

A panel of distinguished economists led by Stanford's Michael Boskin examined this issue and estimated that the upward bias in the CPI was slightly more than 1 percent per year. This is a small number with large implications. It indicates that our real-output numbers may have been *underestimated* by the same amount. If the CPI bias carries through to the GDP deflator, then the growth in output per hour worked in the United States would be understated by around 1 percent per year.

This finding also implies that cost-of-living adjustments (which are used for social security benefits and the tax system) have overcompensated people for changes in the cost of living. The bias would have substantial effects on overall taxes and benefits over a period of many years. Price indexes are not just abstruse concepts of interest only to a handful of technicians. Proper construction of price and output indexes affects our government budgets, our retirement programs, and even the way we assess our national economic performance.

In response to its own research and to its critics, the BLS has undertaken a major overhaul of the CPI. The most important innovation was the publication starting in 2002 of a "chained consumer price index" that augments the fixed-weight price index with a changing-weight system (like the chain weights used in the GDP accounts discussed on page 393 above) that accounts for consumer substitution. Over the decade since it was published, the chain CPI did indeed rise more slowly than the traditional CPI. It appears that critics were correct that the traditional CPI overstates inflation, although the size of the overstatement is likely to be less than the large number estimated by the Boskin Commission.[3]

## ACCOUNTING ASSESSMENT

This chapter has examined the way economists measure national output and the overall price level. Having reviewed the measurement of national output and analyzed the shortcomings of the GDP, what should we conclude about the adequacy of our measures? Do they capture the major trends? Are they adequate measures of overall social welfare? The answer was aptly stated in a review by Arthur Okun:

> It should be no surprise that national prosperity does not guarantee a happy society, any more than personal prosperity ensures a happy family. No growth of GDP can counter the tensions arising from an unpopular and unsuccessful war, a long overdue self-confrontation with conscience on racial injustice, a volcanic eruption of sexual mores, and an unprecedented assertion of independence by the young. Still, prosperity . . . is a precondition for success in achieving many of our aspirations.[4]

[3] See this chapter's Further Reading section for a symposium on CPI design.

[4] *The Political Economy of Prosperity* (Norton, New York, 1970), p. 124.

## SUMMARY

1. The national income and product accounts contain the major measures of income and product for a country. The gross domestic product (GDP) is the most comprehensive measure of a nation's production of goods and services. It comprises the dollar value of consumption ($C$), gross private domestic investment ($I$), government purchases ($G$), and net exports ($X$) produced within a nation during a given year. Recall the formula:

   $$\text{GDP} = C + I + G + X$$

   This will sometimes be simplified by combining private domestic investment and net exports into total gross national investment ($I^T = I + X$):

   $$\text{GDP} = C + I^T + G$$

2. We can match the upper-loop, flow-of-product measurement of GDP with the lower-loop, flow-of-cost measurement, as shown in Figure 20-1. The flow-of-cost approach uses factor earnings and carefully computes value added to eliminate double counting of intermediate products. And after summing up all (before-tax) wage, interest, rent, depreciation, and profit income, it adds to this total all indirect tax costs of business. GDP does not include transfer items such as social security benefits.
3. By use of a price index, we can "deflate" nominal GDP (GDP in current dollars) to arrive at a more accurate measure of real GDP (GDP expressed in dollars of some base year's purchasing power). Use of such a price index corrects for the "rubber yardstick" implied by changing levels of prices.
4. Net investment is positive when the nation is producing more capital goods than are currently being used up in the form of depreciation. Since depreciation is hard to estimate accurately, statisticians have more confidence in their measures of gross investment than in those of net investment.
5. National income and disposable income are two additional official measurements. Disposable income ($DI$) is what people actually have left—after all tax payments, corporate saving of undistributed profits, and transfer adjustments have been made—to spend on consumption or to save.
6. Using the rules of the national accounts, measured saving must exactly equal measured investment. This is easily seen in a hypothetical economy with nothing but households. In a complete economy, *private saving and government surplus equal domestic investment plus net foreign investment.* The identity between saving and investment is just that: saving must equal investment no matter whether the economy is in boom or recession, war or peace. It is a consequence of the definitions of national income accounting.
7. Gross domestic product and even net domestic product are imperfect measures of genuine economic welfare. In recent years, statisticians have started correcting for nonmarket activities such as unpaid work at home and environmental externalities.
8. Inflation occurs when the general level of prices is rising (and deflation occurs when it is falling). We measure the overall price level and rate of inflation using price indexes—weighted averages of the prices of thousands of individual products. The most important price index is the consumer price index (CPI), which traditionally measured the cost of a fixed market basket of consumer goods and services relative to the cost of that bundle during a particular base year. Recent studies indicate that the CPI trend has a major upward bias because of index-number problems and omission of new and improved goods, and the government has undertaken steps to correct some of this bias.
9. Recall the useful formulas from this and the prior chapter:
   a. For calculating single-period growth of GDP:

      $$\text{Growth of real GDP in year } t = 100 \times \frac{\text{GDP}_t - \text{GDP}_{t-1}}{\text{GDP}_{t-1}}$$

   b. For calculating inflation with a single good:

      $$\text{Rate of inflation in year } t = \pi_t = 100 \times \frac{P_t - P_{t-1}}{P_{t-1}}$$

   c. Multiyear growth rate:

      $$\text{Growth from } (t-n) \text{ to } t: \quad g_t^{(n)} = 100 \times \left[ \left( \frac{X_t}{X_{t-n}} \right)^{1/n} - 1 \right]$$

   d. For calculating the CPI with multiple goods:

      $$\%\text{ change in CPI} = 100 \times \left[ \sum_{\text{All items}} (\text{weight}_i) \times (\%\text{ change } p_i) \right]$$

## CONCEPTS FOR REVIEW

national income and product
    accounts (national accounts)
real and nominal GDP
GDP deflator
GDP = $C + I + G + X$
net investment =
    gross investment − depreciation
GDP in two equivalent views:
    product (upper loop)
    earnings (lower loop)
intermediate goods, value added
NDP = GDP − depreciation
government transfers
disposable income (*DI*)
investment-saving identity:
    $I = S$
    $I^T = I + X = S^P + S^G = S^T$
inflation, deflation
price index:
    CPI
    GDP price index
    PPI
growth-rate formulas

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

A magnificent compilation of historical data on the United States is Susan Carter et al., *Historical Statistics of the United States: Millennial Edition* (Cambridge, 2006). This is available online from many college websites at *hsus.cambridge.org/HSUSWeb/HSUSEntryServlet*. A review of the issues involving measuring the consumer price index is contained in "Symposium on the CPI," *Journal of Economic Perspectives,* Winter 1998.

Robert Kennedy's remarks are from "Recapturing America's Moral Vision," March 18, 1968, in *RFK: Collected Speeches* (Viking Press, New York, 1993).

### Websites

The premium site for the U.S. national income and product accounts is maintained by the Bureau of Economic Analysis (BEA) at *www.bea.gov*. This site also contains issues of *The Survey of Current Business,* which discusses recent economic trends.

A comprehensive launching pad for government data in many areas is "FRED," assembled by the Federal Reserve Bank of St. Louis at *research.stlouisfed.org/fred2*. The best single statistical source for data on the United States is *The Statistical Abstract of the United States,* published annually. It is available online at *www.census.gov/compendia/statab/*. Many important data sets can be found at *www.economagic.com/*.

A recent review of alternative approaches to augmented and environmental accounting is contained in a report by the National Academy of Sciences in William Nordhaus and Edward Kokkelenberg, eds., *Nature's Numbers: Expanding the National Accounts to Include the Environment* (National Academy Press, Washington, D.C., 1999), available at *www.nap.edu*.

## QUESTIONS FOR DISCUSSION

1. Define carefully the following and give an example of each:
    a. Consumption
    b. Gross private domestic investment
    c. Government consumption and investment purchases (in GDP)
    d. Government transfer payments (not in GDP)
    e. Exports
2. You sometimes hear, "You can't add apples and oranges." Show that we can and do add apples and oranges in the national accounts. Explain how.
3. Examine the data in the appendix to Chapter 19. Locate the figures for nominal and real GDP for 2006 and 2007. Calculate the GDP deflator. What were the rates of growth of nominal GDP and real GDP for 2007? What was the rate of inflation (as measured by

the GDP deflator) for 2007? Compare the rate of inflation using the GDP deflator with that using the CPI.

4. Robinson Crusoe produces upper-loop product of $1000. He pays $750 in wages, $125 in interest, and $75 in rent. What must his profit be? If three-fourths of Crusoe's output is consumed and the rest invested, calculate Crusoeland's GDP with both the product and the income approaches and show that they must agree exactly.
5. Here are some brain teasers. Can you see why the following are not counted in U.S. GDP?
   a. The gourmet meals produced by a fine home chef
   b. The purchase of a plot of land
   c. The purchase of an original Rembrandt painting
   d. The value I get in 2009 from playing a 2005 compact disc
   e. Damage to houses and crops from pollution emitted by electric utilities
   f. Profits earned by IBM on production in a British factory
6. Consider the country of Agrovia, whose GDP is discussed in "A Numerical Example" on page 396. Construct a set of national accounts like that in Table 20-6 assuming that wheat costs $5 per bushel, there is no depreciation, wages are three-fourths of national output, indirect business taxes are used to finance 100 percent of government spending, and the balance of income goes as rent income to farmers.
7. Review the discussion of bias in the CPI. Explain why failure to consider the quality improvement of a new good leads to an upward bias in the trend of the CPI. Pick a good you are familiar with. Explain how its quality has changed and why it might be difficult for a price index to capture the increase in quality.
8. In recent decades, women have worked more hours in paid jobs and fewer hours in unpaid housework.
   a. How would this increase in work hours affect GDP?
   b. Explain why this increase in measured GDP will overstate the true increase in output. Also explain how a set of augmented national accounts which includes home production would treat this change from nonmarket work to market work.
   c. Explain the paradox, "When a person marries his or her gardener, GDP goes down."
9. Examine the price-change numbers shown in the example on page 403.
   a. Use the formula to calculate the increase in the CPI from March 2007 to March 2008 to two decimal places. Verify that the number shown in the table is correct to a single decimal place.
   b. The level of the CPI in March 2007 was 205.10. Calculate the CPI for March 2008.
10. Robert Kennedy's remarks about the shortcomings of measures of national output also contained the following: "The Gross National Product includes air pollution and advertising for cigarettes, and ambulances to clear our highways of carnage. It counts special locks for our doors, and jails for the people who break them. GNP includes the destruction of the redwoods and the death of Lake Superior." List ways that the accounts can be redesigned to incorporate these effects.

CHAPTER

# 21

# Consumption and Investment

*Micawber's equation:*
*Income 20 pounds; expenditure 19 pounds, 19 shillings and sixpence = happiness.*
*Income 20 pounds; annual expenditure 20 pounds and sixpence = misery.*

Charles Dickens
*David Copperfield*

The major components of national output are consumption and investment. Naturally, nations want high levels of consumption—items such as housing, food, education, and recreation. The purpose of the economy is, after all, to transform inputs like labor and capital into consumption.

But saving and investment—that part of output that is not consumed—also play a central role in a nation's economic performance. Nations that save and invest large fractions of their incomes tend to have rapid growth of output, income, and wages; this pattern characterized the United States in the nineteenth century, Japan in the twentieth century, and the miracle economies of East Asia in recent decades. By contrast, nations that consume most of their incomes, like many poor countries in Africa and Latin America, have obsolete capital, low educational standards, and backward techniques; they experience low rates of growth of productivity and real wages. High consumption relative to income spells low investment and slow growth; high saving leads to high investment and rapid growth.

The interaction between spending and income plays quite a different role during business-cycle expansions and contractions. When consumption grows rapidly, this increases total spending or aggregate demand, raising output and employment in the short run. America's economic boom of the late 1990s was largely fueled by rapid growth in consumer spending, but when American consumers tightened their belts, this contributed to the recession of 2007–2009.

Because consumption and investment are so central to macroeconomics, we devote this chapter to them.

## A. CONSUMPTION AND SAVING

This section considers consumption and saving behavior, beginning with individual spending patterns and then looking at aggregate consumption behavior. Recall from Chapter 20 that *consumption* (or, more precisely, personal consumption expenditures) is expenditures by households on final goods and services. *Saving* is that part of personal disposable income that is not consumed.

Consumption is the largest single component of GDP, constituting 70 percent of total spending over the last decade. What are the major elements of consumption? Among the most important categories

| Category of consumption | Value of consumption ($, billion, 2007) | Percent of total |
|---|---|---|
| **Durable goods** | **1,083** | 11.2% |
| Motor vehicles and parts | 440 | |
| Furniture and household equipment | 415 | |
| Other | 227 | |
| **Nondurable goods** | **2,833** | 29.2% |
| Food | 1,329 | |
| Clothing and shoes | 374 | |
| Energy goods | 367 | |
| Other | 763 | |
| **Services** | **5,794** | 59.7% |
| Housing | 1,461 | |
| Household operation | 526 | |
| Transportation | 357 | |
| Medical care | 1,681 | |
| Recreation | 403 | |
| Other | 1,366 | |
| **Total personal consumption expenditures** | **9,710** | **100.0%** |

**TABLE 21-1. The Major Components of Consumption**

We divide consumption into three categories: durable goods, nondurable goods, and services. The service sector is growing in importance as basic needs for food are met and as health, recreation, and education claim a larger part of family budgets.

Source: U.S. Bureau of Economic Analysis, available at *www.bea.gov*.

are housing, motor vehicles, food, and medical care. Table 21-1 displays the major elements, broken down into the three main categories of durable goods, nondurable goods, and services. The items themselves are familiar, but their relative importance, particularly the increasing importance of services, is worth a moment's study.

## Budgetary Expenditure Patterns

How do the patterns of consumption spending differ across different households in the United States? No two families spend their disposable incomes in exactly the same way. Yet statistics show that there is a predictable regularity in the way people allocate their expenditures among food, clothing, and other major items. The thousands of budgetary investigations of household spending patterns show remarkable agreement on the general, qualitative patterns of behavior.[1] Figure 21-1 on page 410 tells the story.

Poor families must spend their incomes largely on the necessities of life: food and shelter. As income increases, expenditure on many food items goes up. People eat more and eat better. There are, however, limits to the extra money people will spend on food when their incomes rise. Consequently, the proportion of total spending devoted to food declines as income increases.

Expenditure on clothing, recreation, and automobiles increases more than proportionately to after-tax

[1] The spending patterns shown in Fig. 21-1 are called "Engel's Laws," after the nineteenth-century Prussian statistician Ernst Engel. The average behavior of consumption expenditure does change fairly regularly with income. But averages do not tell the whole story. Within each income class, there is a considerable spread of consumption around the average.

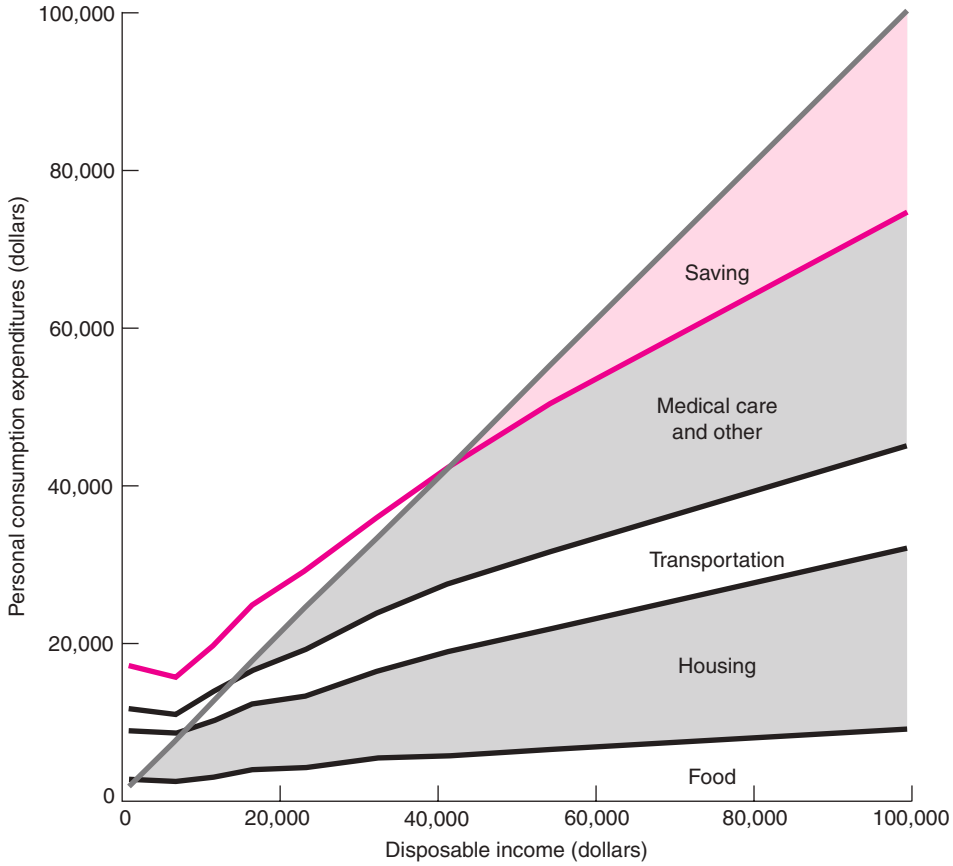


**FIGURE 21-1. Family Budget Expenditures Show Regular Patterns**

Surveys verify the importance of disposable income as a determinant of consumption expenditures. Notice the drop in food as a percentage of income as incomes rise. Note also that saving is negative at low incomes but rises substantially at high incomes.

Source: U.S. Department of Labor, *Consumer Expenditure Surveys, 1998,* available on the Internet at *www.bls.gov/csxstnd.htm.*

income, until high incomes are reached. Spending on luxury items increases in greater proportion than income. Finally, as we look across families, note that saving rises rapidly as income increases. Saving is the greatest luxury of all.

### The Evolution of Consumption in the Twentieth Century

Continual changes in technology, incomes, and social forces have led to dramatic changes in U.S. consumption patterns over time. In 1918, American households on average spent 41 percent of their incomes on food and drink. By comparison, households now spend only about 14 percent on these items. What lies behind this striking decline? The major factor is that spending on food tends to grow more slowly than incomes. Similarly, spending on apparel has fallen from 18 percent of household income at the beginning of the twentieth century to only 4 percent today.

What are the "luxury goods" that Americans are spending more on? One big item is transportation. In 1918, Americans spent only 1 percent of their incomes on vehicles—but of course Henry Ford didn't sell his first Model T until 1908. Today, there are 1.2 cars for every licensed driver in the United States. It is not surprising that

11 cents out of every dollar of spending goes for automotive transportation expenses. What about recreation and entertainment? Households now lay out large sums for televisions, cellular phones, and digital video recorders, items that did not exist 75 years ago. Housing services take about the same fraction of expenditures—15 percent of the total. However, those dollars today can buy a much larger house packed with consumer durables that make housework less of a chore.

Over the last decade, the biggest increase in consumption spending has been for health care. Surprisingly, consumers' out-of-pocket expenses for health care take about the same share of the *household* budget as they did in the early part of the twentieth century. The major increase has come as governments pay for an ever-larger fraction of health care.

## CONSUMPTION, INCOME, AND SAVING

Income, consumption, and saving are all closely linked. More precisely, **personal saving** is that part of disposable income that is not consumed; saving equals income minus consumption.

The relationship between income, consumption, and saving for the United States in 2007 is shown in Table 21-2. Begin with personal income (composed, as Chapter 20 showed, of wages, fringe benefits, interest, rents, dividends, transfer payments, and so forth). In 2007, 12.8 percent of personal income went to personal taxes. This left $10,171 billion of **personal disposable income.** Household outlays for consumption (including interest) amounted to 99.4 percent of disposable income, leaving $57 billion as personal saving. The last item in the table shows the important **personal saving rate.** This is equal to personal saving as a percent of disposable income—a tiny 0.6 percent in 2007.

| Item | Amount, 2007 ($, billion) |
|---|---|
| **Personal income** | 11,663 |
| Less: Personal taxes | 1,493 |
| **Equals: Disposable personal income** | 10,171 |
| Less: Personal outlays (consumption and interest) | 10,113 |
| **Equals: Personal saving** | 57.4 |
| Memo: Personal saving as percent of disposable personal income | 0.6 |

**TABLE 21-2. Saving Equals Disposable Income Less Consumption**

Source: U.S. Bureau of Economic Analysis, available at *www.bea.gov.*

Economic studies have shown that income is the primary determinant of consumption and saving. Rich people save more than poor people, both absolutely and as a percent of income. The very poor are unable to save at all. Instead, as long as they can borrow or draw down their wealth, they tend to dissave. That is, they tend to spend more than they earn, reducing their accumulated savings or going deeper into debt.

Table 21-3 contains illustrative data on disposable income, saving, and consumption drawn from budget studies on American households. The first column shows seven different levels of disposable income. Column (2) indicates saving at each level of income, and the third column indicates consumption spending at each level of income.

The *break-even point*—where the representative household neither saves nor dissaves but consumes all its income—comes at $25,000. Below the

| | (1) Disposable income ($) | (2) Net saving (+) or dissaving (−) ($) | (3) Consumption ($) |
|---|---|---|---|
| A | 24,000 | −200 | 24,200 |
| B | 25,000 | 0 | 25,000 |
| C | 26,000 | 200 | 25,800 |
| D | 27,000 | 400 | 26,600 |
| E | 28,000 | 600 | 27,400 |
| F | 29,000 | 800 | 28,200 |
| G | 30,000 | 1,000 | 29,000 |

**TABLE 21-3. Consumption and Saving Are Primarily Determined by Income**

Consumption and saving rise with disposable income. The break-even point at which people have zero saving is shown here at $25,000. How much of each extra dollar of income do people devote to extra consumption at this income level? How much to extra saving? (Answer: 80 cents and 20 cents, respectively, when we compare row B and row C.)

break-even point, say, at $24,000, the household actually consumes more than its income; it dissaves (see the −$200 item). Above $25,000 it begins to show positive saving [see the +$200 and other positive items in column (2)].

Column (3) shows the consumption spending for each income level. Since each dollar of income is divided between the part consumed and the remaining part saved, columns (3) and (2) are not independent; they must always exactly add up to column (1).

To understand the way consumption affects national output, we need to introduce some new tools. We need to understand how each dollar of additional income is divided between additional saving and additional consumption. This relationship is shown by:

- The consumption function, relating consumption and income
- Its twin, the saving function, relating saving and income

## The Consumption Function

One of the most important relationships in all macroeconomics is the **consumption function.** The consumption function shows the relationship between the level of consumption expenditures and the level of disposable personal income. This concept, introduced by Keynes, is based on the hypothesis that there is a stable empirical relationship between consumption and income.

We can see the consumption function most vividly in the form of a graph. Figure 21-2 plots the seven levels of income listed in Table 21-3. Disposable income [column (1) of Table 21-3] is placed on the horizontal axis, and consumption [column (3)] is on the vertical axis. Each of the income-consumption

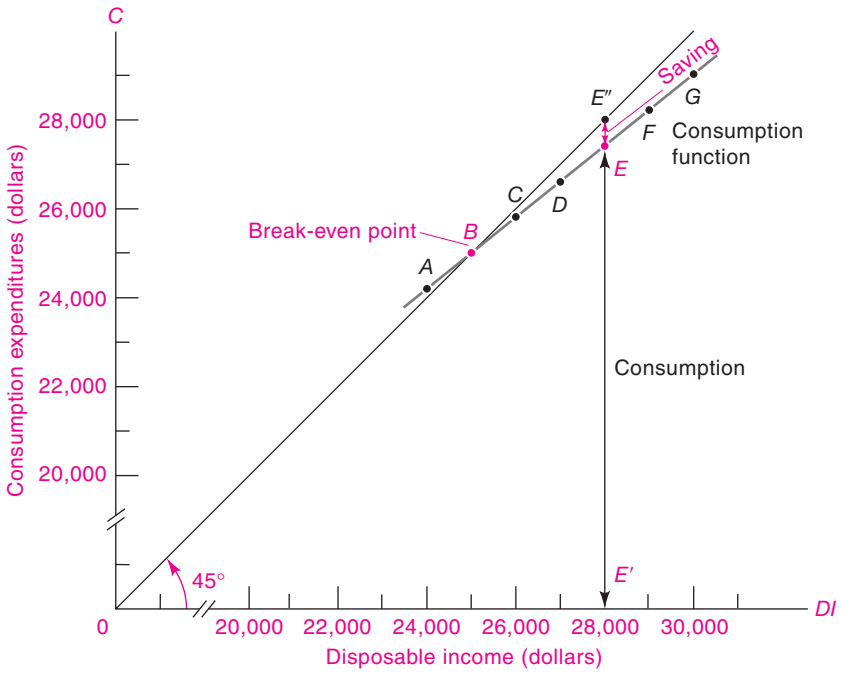


**FIGURE 21-2. A Plot of the Consumption Function**

The curve through *A, B, C,…, G* is the consumption function. The horizontal axis depicts the level of disposable income (*DI*). For each level of *DI*, the consumption function shows the dollar level of consumption (*C*) for the household. Note that consumption rises with increases in *DI*. The 45° line helps locate the break-even point and helps our eye measure net saving.

Source: Table 21-3.

combinations is represented by a single point, and the points are then connected by a smooth curve.

The relationship between consumption and income shown in Figure 21-2 is called the consumption function.

***The "Break-Even" Point.*** To understand the figure, it is helpful to look at the 45° line drawn northeast from the origin. Because the vertical and horizontal axes have exactly the same scale, the 45° line has a very special property. At any point on the 45° line, the distance up from the horizontal axis (consumption) exactly equals the distance across from the vertical axis (disposable income). You can use your eyes or a ruler to verify this fact.

The 45° line tells us immediately whether consumption spending is equal to, greater than, or less than the level of disposable income. The point where the consumption schedule intersects the 45° line is the **break-even point**—it is the level of disposable income at which households just break even.

This break-even point is at *B* in Figure 21-2. Here, consumption expenditures exactly equal disposable income; the household is neither a borrower nor a saver. To the right of point *B*, the consumption function lies below the 45° line. The relationship between income and consumption can be seen by examining the thin blue line from *E′* to *E* in Figure 21-2. At an income of $28,000, the level of consumption is $27,400 (see Table 21-3). We can see that consumption is less than income by the fact that the consumption function lies below the 45° line at point *E*.

What a household is not spending, it must be saving. The 45° line enables us to find how much the household is saving. Net saving is measured by the vertical distance from the consumption function up to the 45° line, as shown by the *EE″* saving arrow in green.

The 45° line tells us that to the left of point *B* the household is spending more than its income. The excess of consumption over income is "dissaving" and is measured by the vertical distance between the consumption function and the 45° line.

To review:

At any point on the 45° line, consumption exactly equals income and the household has zero saving. When the consumption function lies above the 45° line, the household is dissaving. When the consumption function lies below the 45° line, the household has positive saving. The amount of dissaving or saving is always measured by the vertical distance between the consumption function and the 45° line.

## The Saving Function

The **saving function** shows the relationship between the level of saving and income. This is shown graphically in Figure 21-3. Again we show disposable income on the horizontal axis; but now saving, whether negative or positive in amount, is on the vertical axis.

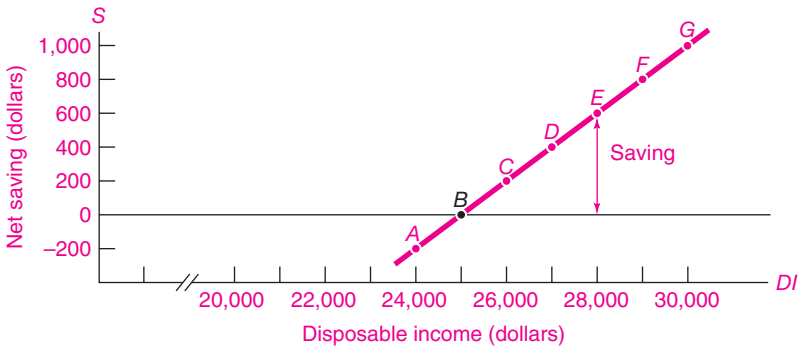


**FIGURE 21-3. The Saving Function Is the Mirror Image of the Consumption Function**

This saving schedule is derived by subtracting consumption from income. Graphically, the saving function is obtained by subtracting vertically the consumption function from the 45° line in Fig. 21-2. Note that the break-even point *B* is at the same $25,000 income level as in Fig. 21-2.

This saving function comes directly from Figure 21-2. It is the vertical distance between the 45° line and the consumption function. For example, at point *A* in Figure 21-2, we see that the household's saving is negative because the consumption function lies above the 45° line. Figure 21-3 shows this dissaving directly—the saving function is below the zero-saving line at point *A*. Similarly, positive saving occurs to the right of point *B* because the saving function is above the zero-saving line.

## The Marginal Propensity to Consume

Modern macroeconomics attaches much importance to the response of consumption to changes in income. This concept is called the marginal propensity to consume, or *MPC*.

The **marginal propensity to consume** is the extra amount that people consume when they receive an extra dollar of disposable income.

The word "marginal" is used throughout economics to mean extra or additional. For example, "marginal cost" means the additional cost of producing an extra unit of output. "Propensity to consume" designates the desired level of consumption. The *MPC* is therefore the additional or extra consumption that results from an extra dollar of disposable income.

Table 21-4 rearranges Table 21-3's data in a more convenient form. First, verify its similarity to Table 21-3. Then, look at columns (1) and (2) to see how consumption expenditure goes up with higher levels of income.

Column (3) shows how we compute the marginal propensity to consume. From B to C, income rises by $1000, going from $25,000 to $26,000. How much does consumption rise? Consumption grows from $25,000 to $25,800, an increase of $800. The extra consumption is therefore 0.80 of the extra income. Out of each extra dollar of income, 80 cents goes to consumption and 20 cents goes to saving.

The example shown here is a linear consumption function—one in which the *MPC* is constant. You can verify that the *MPC* is everywhere 0.80. In reality,

| | (1) Disposable income (after taxes) ($) | (2) Consumption expenditure ($) | (3) Marginal propensity to consume *MPC* | (4) Net saving ($) (4) = (1) − (2) | (5) Marginal propensity to save *MPS* |
|---|---|---|---|---|---|
| A | 24,000 | 24,200 | | −200 | |
| | | | 800/1,000 = 0.80 | | 200/1,000 = 0.20 |
| B | 25,000 | 25,000 | | 0 | |
| | | | 800/1,000 = 0.80 | | 200/1,000 = 0.20 |
| C | 26,000 | 25,800 | | 200 | |
| | | | 800/1,000 = 0.80 | | 200/1,000 = 0.20 |
| D | 27,000 | 26,600 | | 400 | |
| | | | 800/1,000 = 0.80 | | 200/1,000 = 0.20 |
| E | 28,000 | 27,400 | | 600 | |
| | | | 800/1,000 = 0.80 | | 200/1,000 = 0.20 |
| F | 29,000 | 28,200 | | 800 | |
| | | | 800/1,000 = 0.80 | | 200/1,000 = 0.20 |
| G | 30,000 | 29,000 | | 1,000 | |

**TABLE 21-4. The Marginal Propensities to Consume and to Save**

Each dollar of disposable income not consumed is saved. Each extra dollar of disposable income goes either into extra consumption or into extra saving. Combining these facts allows us to calculate the marginal propensity to consume (*MPC*) and the marginal propensity to save (*MPS*).

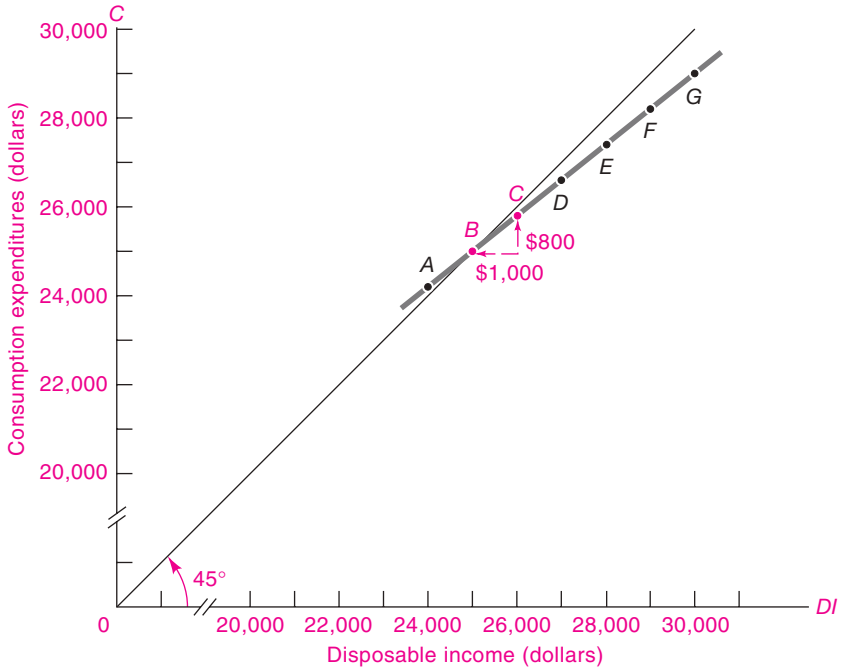


**FIGURE 21-4. The Slope of the Consumption Function Is Its *MPC***

To calculate the marginal propensity to consume (*MPC*), we measure the slope of the consumption function by forming a right triangle and relating height to base. From point *B* to point *C*, the increase in consumption is $800 while the change in disposable income is $1000. The slope, equal to the change in *C* divided by the change in *DI*, gives the *MPC*. If the consumption function is everywhere upward-sloping, what does this imply about the *MPC*? If the line is a straight line, with a constant slope, what does this imply about the *MPC*?

consumption functions are unlikely to be exactly linear, but this is a reasonable approximation for our purposes.

***Marginal Propensity to Consume as Geometrical Slope.*** We now know how to calculate the *MPC* from data on income and consumption. Figure 21-4 shows how we can calculate the *MPC* graphically. Near points *B* and *C* a little right triangle is drawn. As income increases by $1000 from point *B* to point *C*, the amount of consumption rises by $800. The *MPC* in this range is therefore $800/$1000 = 0.80. But, as the appendix to Chapter 1 showed, the numerical slope of a line is "the rise over the run."[2] We can therefore see that the slope of the consumption function is the same as the marginal propensity to consume.

The slope of the consumption function, which measures the change in consumption per dollar change in disposable income, is the marginal propensity to consume.

## The Marginal Propensity to Save

Along with the marginal propensity to consume goes its mirror image, the marginal propensity to save, or *MPS*. The **marginal propensity to save** is defined as the fraction of an extra dollar of disposable income that goes to extra saving.

Why are *MPC* and *MPS* related like mirror images? Recall that disposable income equals consumption plus saving. This implies that each extra dollar of disposable income must be divided between

[2] For curved lines, we calculate the slope as the slope of the tangent line at a point.

extra consumption and extra saving. Thus if *MPC* is 0.80, then *MPS* must be 0.20. (What would *MPS* be if *MPC* were 0.6? Or 0.99?) Comparing columns (3) and (5) of Table 21-4 confirms that at any income level, *MPC* and *MPS* must always add up to exactly 1, no more and no less. *MPS* + *MPC* = 1, always and everywhere.

### Brief Review of Definitions

Let's review briefly the main definitions we have learned:

1. The *consumption function* relates the level of consumption to the level of disposable income.
2. The *saving function* relates saving to disposable income. Because what is saved equals what is not consumed, saving and consumption schedules are mirror images.
3. The *marginal propensity to consume (MPC)* is the amount of extra consumption generated by an extra dollar of disposable income. Graphically, it is given by the slope of the consumption function.
4. The *marginal propensity to save (MPS)* is the extra saving generated by an extra dollar of disposable income. Graphically, this is the slope of the saving schedule.
5. Because the part of each dollar of disposable income that is not consumed is necessarily saved, $MPS \equiv 1 - MPC$.

## NATIONAL CONSUMPTION BEHAVIOR

Up to now we have examined the budget patterns and consumption behavior of typical families at different incomes. Let's now consider consumption for the entire nation. This transition from household behavior to national trends exemplifies the methodology of macroeconomics: We begin by examining economic activity on the individual level and then add up or aggregate the totality of individuals to study the way the overall economy operates.

Why are we interested in national consumption trends? Consumption behavior is crucial for understanding both short-term business cycles and long-term economic growth. In the short run, consumption is a major component of aggregate spending. When consumption changes sharply, the change is likely to affect output and employment through its impact on aggregate demand. This mechanism will be described in the chapters on Keynesian macroeconomics.

Additionally, consumption behavior is crucial because what is not consumed—that is, what is saved—is available for investment in new capital goods, and capital serves as a driving force behind long-term economic growth. *Consumption and saving behavior are key to understanding economic growth and business cycles.*

### Determinants of Consumption

We begin by analyzing the major forces that affect consumer spending. What factors in a nation's life and livelihood set the pace of its consumption outlays?

***Disposable Income.*** Figure 21-5 shows how closely consumption followed current disposable income over the period 1970–2008. When *DI* declines in recessions, consumption usually follows the decline. Increases in *DI,* say, following tax cuts, stimulate consumption growth. The effects of the large cuts in personal taxes in 1981–1983 can be seen in the growth of *DI* and *C*.

***Permanent Income and the Life-Cycle Model of Consumption.*** The simplest theory of consumption uses only the current year's income to predict consumption expenditures. Consider the following examples, which suggest why other factors might also be important:

> If bad weather destroys a crop, farmers will draw upon their previous savings to finance consumption.
>
> Similarly, law-school students borrow for consumption purposes while in school because they expect that their postgraduate incomes will be much higher than their meager student earnings.

In both these circumstances, people are in effect asking, "Given my current and future income, how much can I consume today without incurring excessive debts?"

Careful studies show that consumers generally choose their consumption levels with an eye to both current income and long-run income prospects. In order to understand how consumption depends

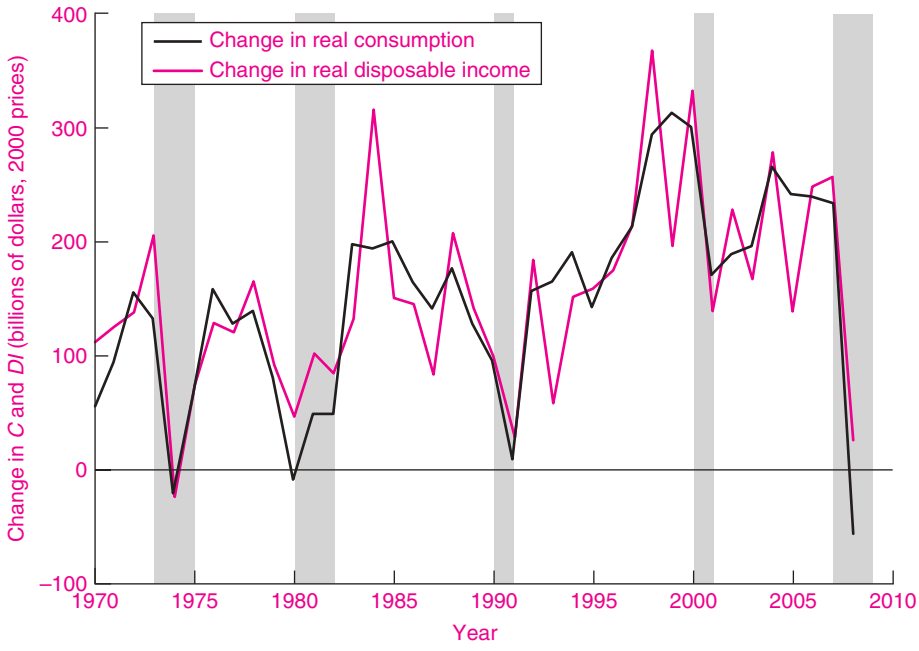


**FIGURE 21-5. Changes in Consumption and Disposable Income, 1970–2008**

Note how changes in consumption track changes in disposable income. Macroeconomists can forecast consumption accurately based on the historical consumption function. Recessions usually produce declines in consumption as income declines.

Source: U.S. Bureau of Economic Analysis. Real disposable income is calculated using the price index for personal consumption expenditures.

on long-term income trends, economists have developed the permanent-income theory and the life-cycle hypothesis.

*Permanent income* is the trend level of income—that is, income after removing temporary or transient influences due to windfall gains or losses. According to the permanent-income theory, consumption responds primarily to permanent income. This approach implies that consumers do not respond equally to all income shocks. If a change in income appears permanent (such as being promoted to a secure and high-paying job), people are likely to consume a large fraction of the increase in income. On the other hand, if the income change is clearly transitory (for example, if it arises from a one-time bonus or a good harvest), a significant fraction of the additional income may be saved.

The *life-cycle hypothesis* assumes that people save in order to smooth their consumption over their lifetime. One important objective is to have an adequate retirement income. Hence, people tend to save while working so as to build up a nest egg for retirement and then spend out of their accumulated savings in their twilight years. One implication of the life-cycle hypothesis is that a program like social security, which provides a generous income supplement for retirement, will reduce saving by middle-aged workers since they no longer need to save as much for retirement.

***Wealth and Other Influences.*** A further important determinant of the amount of consumption is wealth. Consider two consumers, each earning $50,000 per year. One has $200,000 in the bank, while the other has no savings at all. The first person may consume part of wealth, while the second has no wealth to draw down. The fact that higher wealth leads to higher consumption is called the *wealth effect.*

Wealth usually changes slowly from year to year. However, when wealth rises or declines sharply, this

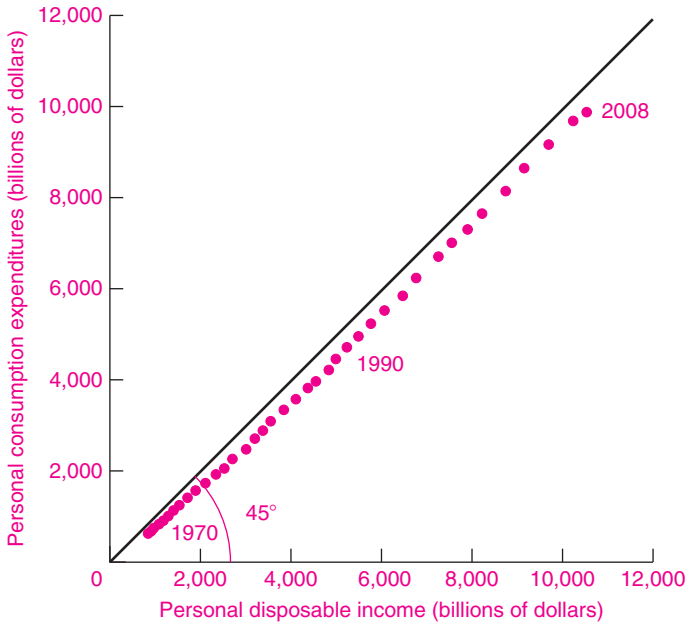


**FIGURE 21-6. A Consumption Function for the United States, 1970–2008**

The figure shows a scatter plot of personal disposable income and consumption. We have drawn a 45° line that shows where consumption exactly equals *DI*. Next, draw a consumption-function line through the points. Make sure you understand why the slope of the line you have drawn is the *MPC*. Can you verify that the *MPC* slope of the fitted line is close to 0.96?

Source: U.S. Bureau of Economic Analysis.

may lead to major changes in consumption spending. One important historical case was the stock market crash in 1929, when fortunes collapsed and paper-rich capitalists became paupers overnight. Economic historians believe that the sharp decline in wealth after the 1929 stock market crash reduced consumption spending and contributed to the depth of the Great Depression.

Over the last decade, the rise and decline of housing prices had a marked effect on consumption. From 2000 to 2006, the total value of household real estate rose over $7000 billion (about $70,000 per household). Many households refinanced their homes, took out home equity loans, or dipped into their savings. This is one of the reasons for the decline in the saving rate in recent years, as we will see shortly.

However, what went up then went down. By early 2009, the average price of residential houses had declined almost 30 percent from the peak in 2006. The wealth effect from declining housing values was a drag on consumer spending during this period.

## The National Consumption Function

Having reviewed the theory of consumption behavior, we conclude that the determinants are complex, including disposable income, wealth, and expectations of future income. We can plot the simplest consumption function in Figure 21-6. The scatter diagram shows data for the period 1970–2008, with each point representing the level of consumption and disposable income for a given year.

In addition, you might draw a line in Figure 21-6 through the scatter points and label it "Fitted consumption function." This fitted consumption function shows how closely consumption has followed disposable income over the period shown. In fact, economic historians have found that a close relationship between disposable income and consumption holds back to the nineteenth century.

### The Declining Personal Saving Rate

Although consumption behavior tends to be stable over time, the personal saving rate dropped sharply in the United States over the last three decades. The personal saving rate as measured in the national accounts averaged around 8 percent of personal disposable income over most of the twentieth century. Starting about 1980, however, it began to decline and is now close to zero. (See Figure 21-7.)

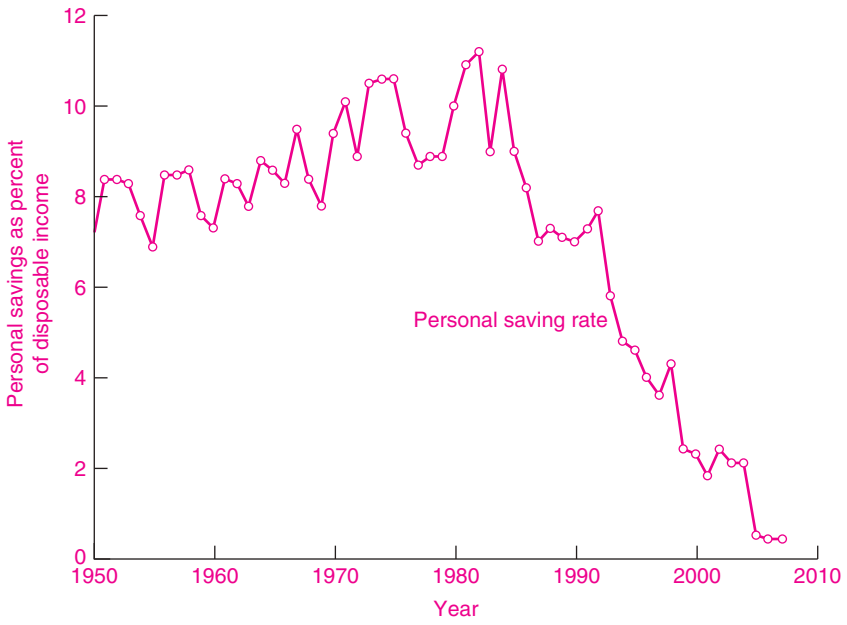


**FIGURE 21-7. Personal Saving Rate Has Declined**

After rising slowly over the postwar period, the personal saving rate took a sharp nosedive after 1980.

Source: U.S. Bureau of Economic Analysis.

This drop alarmed many economists because, over the long run, the growth in a nation's capital stock is largely determined by its national saving rate. National saving is composed of private and government saving. A high-saving nation has a rapidly growing capital stock and enjoys a rapid growth in its potential output. When a nation's saving rate is low, its equipment and factories become obsolete and its infrastructure begins to rot away. (This discussion abstracts away from borrowing abroad, but that cannot be a substantial fraction of income forever.)

What were the reasons for the sharp decline in the personal saving rate? This is a controversial question today, but economists point to the following potential causes:

- *Social security.* Some economists argued that the social security system has removed some of the need for private saving. In earlier times, as the life-cycle model of consumption suggests, a household would save during working years to build up a nest egg for retirement. When the government collects social security taxes and pays out social security benefits, people have less need to save for retirement. Other income-support systems have a similar effect, reducing the need to save for a rainy day. Disaster insurance for farmers, unemployment insurance for workers, and medical care for the poor and elderly all reduce the precautionary motive for people to save.
- *Financial markets.* For most of economic history, financial markets had numerous imperfections. People found it hard to borrow funds for worthwhile purposes, whether to buy a house, finance an education, or start a business. As financial markets developed, often with the help of the government, new loan instruments allowed people to borrow more easily. One example is the proliferation of credit cards, which encourage people to borrow (even though the interest rates are quite high). A generation ago, it would be difficult to borrow more than $1000 unless a person had substantial assets. Today, credit-card solicitations arrive daily in the mail. It is not unusual to receive multiple promotions offering credit lines of $5,000 or more in a single week!

  Perhaps the biggest and ultimately most troublesome source of finance was the "subprime" mortgages that proliferated in the early 2000s. These were loans at as much as 100 percent of the value of a house, sometimes to people with no documented income. When housing prices declined, literally hundreds of billions of dollars of these loans were in default, and investors worldwide took huge losses.
- *The rapid growth in paper wealth.* Part of the decline in personal saving in the 1990–2007 period was caused by the rapid increase in personal wealth. First, the

stock market boomed, and then housing prices took off. Economists calculate that the wealth effect alone might have contributed to a decline in the personal saving rate of 3 percentage points by the late 2000s.

### *Alternative Measures of Saving*

You might at this point ask, "If people are saving so little, why are there so many rich people?" This question raises an important point about measuring personal saving. Saving looks different to the household than to the nation as a whole. This is so because saving as measured in the national income and product accounts is not the same as that measured by accountants or in balance sheets. The *national-accounts measure of saving* is the difference between disposable income (excluding capital gains) and consumption. The *balance-sheet measure of saving* calculates the change in real net worth (that is, assets less liabilities, corrected for inflation) from one year to the next; this measure includes real capital gains.

If we examine the balance-sheet savings rate for the decade from 1997 to 2007—the viewpoint from the dining room table, so to speak—the savings rate was relatively high. Average household net worth over this period in 2007 prices rose from $157,000 to $191,000. The change in net worth was 17 percent of disposable income. So the balance-sheet saving rate was 17 percent, while the national-account saving rate shown in Figure 21-7 was 2 percent.

Does this alternative view mean that we can breathe a sigh of relief? Probably not. The reason is that the high saving over the last decade was largely an increase in "paper wealth." A rise in stock prices or the prices of existing assets like housing does not necessarily reflect the productivity or "real wealth" of the economy. Although people feel richer when asset prices rise in a speculative bubble, the economy cannot produce more cars, computers, food, or housing. Indeed, if everyone wanted to sell their houses, they would find that prices would fall and they could not convert their paper wealth into consumption.

Hence, economists are justified in worrying about the decline in the national-accounts saving rate. While consumers may *feel* richer because of a booming stock or housing market, an economy is *actually* richer only when its productive tangible and intangible assets increase.

## B. INVESTMENT

The second major component of private spending, after consumption, is investment. Investment plays two roles in macroeconomics. First, because it is a large and volatile component of spending, investment often leads to changes in aggregate demand and affects the business cycle. In addition, investment leads to capital accumulation. Adding to the stock of buildings and equipment increases the nation's potential output and promotes economic growth in the long run.

Thus investment plays a dual role, affecting short-run output through its impact on aggregate demand and influencing long-run output growth through the impact of capital formation on potential output and aggregate supply.

The Meaning of "Investment" in Economics

Remember that macroeconomists use the term "investment" or "real investment" to mean additions to the stock of productive assets or capital goods like computers or trucks. When Amazon.com builds a new warehouse or when the Smiths build a new house, these activities represent investment.

Many people speak of "investing" when buying a piece of land, an old security, or any title to property. In economics, these purchases are really financial transactions or "financial investments," because what one person is buying, someone else is selling, and the net effect is zero. There is investment only when real capital is produced.

### DETERMINANTS OF INVESTMENT

In this discussion, we focus on *gross private domestic investment*, or *I*. This is the domestic component of national investment. Recall, however, that *I* is but one component of total social investment, which also includes foreign investment, government investment, and intangible investments in human capital and improved knowledge.

The major types of gross private domestic investment are the building of residential structures; investment in business fixed equipment, software, and structures; and additions to inventory. In this discussion, we focus on business investment, but the principles apply to investments by other sectors as well.

Why do businesses invest? Ultimately, businesses buy capital goods when they expect that this action will earn them a profit—that is, will bring them revenues greater than the costs of the investment. This simple statement contains the three elements essential to understanding investment: revenues, costs, and expectations.

### Revenues

An investment will bring the firm additional revenue if it helps the firm sell more product. This suggests that the overall level of output (or GDP) will be an important determinant of investment. When factories are lying idle, firms have relatively little need for new factories, so investment is low. More generally, investment depends upon the revenues that will be generated by the state of overall economic activity. Most studies find that investment is very sensitive to the business cycle.

### Costs

A second important determinant of the level of investment is the costs of investing. Because investment goods last many years, reckoning the costs of investment is somewhat more complicated than doing so for other commodities like coal or wheat. For durable goods, the cost of capital includes not only the price of the capital good but also the interest rate that borrowers pay to finance the capital as well as the taxes that firms pay on their incomes.

To understand this point, note that investors often raise the funds for buying capital goods by borrowing (say, through a mortgage or in the bond market). What is the cost of borrowing? It is the *interest rate* on borrowed funds. Recall that the interest rate is the price paid for borrowing money for a period of time; for example, you might have to pay 8 percent to borrow $1000 for a year. In the case of a family buying a house, the interest rate is the mortgage interest rate.

Additionally, taxes can have a major effect on investment. One important tax is the federal corporation income tax. This tax takes up to 35 cents of the last dollar of corporate profits, thereby discouraging investment in the corporate sector. Sometimes, the government gives tax breaks to particular activities or sectors. For example, the government encourages home ownership by allowing homeowners to deduct real-estate taxes and mortgage interest from their taxable income.

### Expectations

Additionally, profit expectations and business confidence are central to investment decisions. Investment is a gamble on the future. This means that business investments require a weighing of certain present costs with uncertain future profits. If businesses are concerned that political conditions in Russia are unstable, they will be reluctant to invest there. Conversely, if businesses believe that Internet commerce is the key to riches, they will invest heavily in that sector.

However, economists also realize that emotions weigh in the balance, that some investments are moved as much by intuition as by spreadsheets. This point was emphasized by J. M. Keynes as one of the reasons for the instability of a market economy:

> Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than mathematical expectations, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as the result of *animal spirits*—a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.

Thus, investment decisions hang by a thread on expectations and forecasts. But accurate forecasting is difficult. Businesses spend much energy analyzing investments and trying to narrow the uncertainties about their investments.

We can sum up our review of the forces lying behind investment decisions as follows:

Businesses invest to earn profits. Because capital goods last many years, investment decisions depend on (1) the level of output produced by the new investments, (2) the interest rates and taxes that influence the costs of the investment, and (3) business expectations about the state of the economy.

## THE INVESTMENT DEMAND CURVE

In analyzing the determinants of investment, we focus particularly on the relationship between interest rates and investment. This linkage is crucial because interest rates (influenced by central banks) are the

major instrument by which governments influence investment. To show the relationship between interest rates and investment, economists use a schedule called the **investment demand curve.**

Consider a simplified economy where firms can invest in different projects: A, B, C, and so forth, up to H. These investments are so durable (like power plants or buildings) that we can ignore the need for replacement. Further, they yield a constant stream of net income each year, and there is no inflation. Table 21-5 shows the financial data on each of the investment projects.

Consider project A. This project costs $1 million. It has a very high return—$1500 per year of revenues per $1000 invested (this is a rate of return of 150 percent per year). Columns (4) and (5) show the cost of investment. For simplicity, assume that the investment is financed purely by borrowing at the market interest rate, here taken alternately as 10 percent per year in column (4) and 5 percent in column (5).

Thus at a 10 percent annual interest rate, the cost of borrowing $1000 is $100 a year, as is shown in all entries of column (4); at a 5 percent interest rate, the borrowing cost is $50 per $1000 borrowed per year.

Finally, the last two columns show the *annual net profit* from each investment. For lucrative project A, the net annual profit is $1400 a year per $1000 invested at a 10 percent interest rate. Project H loses money.

To review our findings: In choosing among investment projects, firms compare the annual revenues from an investment with the annual cost of capital, which depends upon the interest rate. The difference between annual revenue and annual cost is the annual net profit. When annual net profit is positive, the investment makes money, while a negative net profit denotes that the investment loses money.

Look again at Table 21-5 and examine the last column, showing annual net profit at a 5 percent interest rate. Note that at this interest rate, investment

| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|
| | | | Cost per $1,000 Borrowed at Annual Interest Rate of: | | Annual Net Profit per $1,000 Borrowed at Annual Interest Rate of: | |
| Project | Total investment in project ($, million) | Annual revenues per $1,000 invested ($) | 10% ($) | 5% ($) | 10% ($) (6) = (3) − (4) | 5% ($) (7) = (3) − (5) |
| A | 1 | 1,500 | 100 | 50 | 1,400 | 1,450 |
| B | 4 | 220 | 100 | 50 | 120 | 170 |
| C | 10 | 160 | 100 | 50 | 60 | 110 |
| D | 10 | 130 | 100 | 50 | 30 | 80 |
| E | 5 | 110 | 100 | 50 | 10 | 60 |
| F | 15 | 90 | 100 | 50 | −10 | 40 |
| G | 10 | 60 | 100 | 50 | −40 | 10 |
| H | 20 | 40 | 100 | 50 | −60 | −10 |

**TABLE 21-5. The Profitability of Investment Depends on the Interest Rate**

The economy has eight investment projects, ranked in order of return. Column (2) shows the investment in each project. Column (3) calculates the perpetual return each year per $1000 invested. Columns (4) and (5) then show the cost of the project, assuming all funds are borrowed, at interest rates of 10 and 5 percent; this is shown per $1000 borrowed.

The last two columns calculate the annual net profit per $1000 invested in the project. If net profit is positive, profit-maximizing firms will undertake the investment; if negative, the investment project will be rejected.

Note how the cutoff between profitable and unprofitable investments moves as the interest rate rises. (Where would the cutoff be if the interest rate rose to 15 percent per year?)

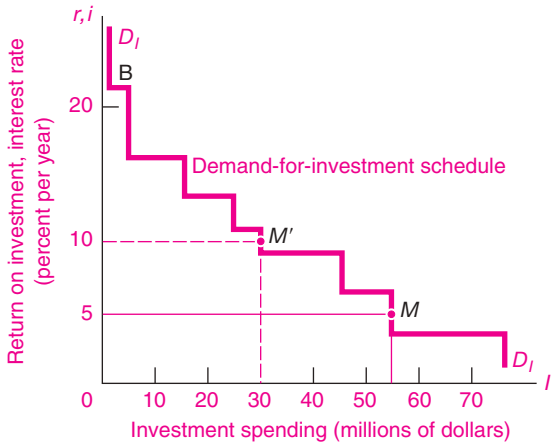


**FIGURE 21-8. Investment Depends upon Interest Rate**

The downward-stepping demand-for-investment schedule plots the amount that businesses would invest at each interest rate, as calculated from the data in Table 21-5. Each step represents a lump of investment: project A has such a high rate of return that it is off the figure; the highest visible step is project B, shown at the upper left. At each interest rate, all investments that have positive net profit will be undertaken.

projects A through G would be profitable. We would thus expect profit-maximizing firms to invest in all seven projects, which [from column (2)] total up to $55 million in investment. Thus at a 5 percent interest rate, investment demand would be $55 million.

However, suppose that the interest rate rises to 10 percent. Then the cost of financing these investments would double. We see from column (6) that investment projects F and G become unprofitable at an interest rate of 10 percent; investment demand would fall to $30 million.

We show the results of this analysis in Figure 21-8. This figure shows the *demand-for-investment schedule*, which is here a downward-sloping step function of the interest rate. This schedule shows the amount of investment that would be undertaken at each interest rate; it is obtained by adding up all the investments that would be profitable at each level of the interest rate.

Hence, if the market interest rate is 5 percent, the desired level of investment will occur at point *M*, which shows investment of $55 million. At this interest rate, projects A through G are undertaken. If interest rates were to rise to 10 percent, projects F and G would be squeezed out; in this situation, investment demand would lie at point *M′* with total investment of $30 million.[3]

## Shifts in the Investment Demand Curve

We have seen how interest rates affect the level of investment. Investment is affected by other forces as well. For example, an increase in the GDP will shift the investment demand curve out, as shown in Figure 21-9(*a*) on the next page.

An increase in business taxation would depress investment. Say that the government taxes away half the net yield in column (3) of Table 21-5, with interest costs in columns (4) and (5) not being deductible. The net profits in columns (6) and (7) would therefore decline. [Verify that at a 10 percent interest rate, a 50 percent tax on column (3) would raise the cutoff to between projects B and C, and the demand for investment would decline to $5 million.] The case of a tax increase on investment income is shown in Figure 21-9(*b*).

We can also see how expectations enter the picture from a historical example. In the late 1990s, investors became infatuated with the Internet and the "new economy." They poured money into now-defunct companies on the basis of wild projections. Some seasoned investors even succumbed to the "animal spirits," as, for example, when Time Warner paid $180 billion for the online company AOL. Figure 21-9(*c*) illustrates how a bout of business optimism would shift out the investment demand schedule in the 1990s. When the technology-stock bubble burst in 2000, the demand for investment in software and equipment fell sharply as well, and the curve in Figure 21-9(*c*) shifted sharply back to the left. These are but two examples of how expectations can have powerful effects on investment.

After learning about the factors affecting investment, you will not be surprised to discover that investment is the most volatile component of spending. Investment behaves unpredictably because it depends on such uncertain factors as the success or failure of new and untried products, changes in tax rates and interest rates, political attitudes and

[3] We will later see that when prices are changing, it is appropriate to use a real interest rate, which represents the nominal or money interest rate corrected for inflation.

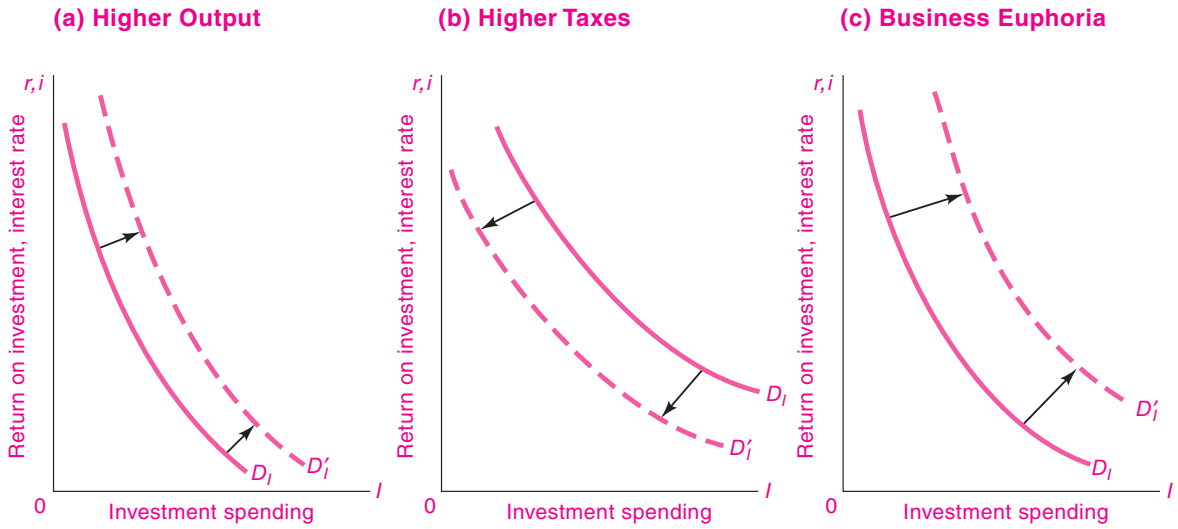


**FIGURE 21-9. Shifts in Investment Demand Function**

In the demand-for-investment ($D_I$) schedule, the arrows show the impact of **(a)** a higher level of GDP, **(b)** higher taxes on capital income, and **(c)** a burst of business euphoria.

approaches to stabilizing the economy, and similar changeable events of economic life. *In virtually every business cycle, investment fluctuations have been the driving force behind boom or bust.*

## ON TO THE THEORY OF AGGREGATE DEMAND

We have now completed our introduction to the basic concepts of macroeconomics. We have examined the determinants of consumption and investment and seen how they can fluctuate from year to year, sometimes quite sharply.

At this point, macroeconomics branches into two major subjects—business cycles and economic growth. We begin our survey in the next chapter with business cycles, which concern the short-term fluctuations in output, employment, and prices. Modern business-cycle theories rely primarily on the Keynesian approach. This analysis shows the impact of financial shocks and changes in investment, government spending and taxation, and foreign trade. These shocks are amplified through induced consumption effects and determine aggregate demand. We will learn that the wise application of government fiscal and monetary policies can reduce the severity of recessions and inflation, but also that poor policies can amplify shocks. The theories of consumption and investment surveyed in this chapter will be the major players in our business-cycle drama.

## SUMMARY

### A. Consumption and Saving

1. Disposable income is an important determinant of consumption and saving. The consumption function is the schedule relating total consumption to total disposable income. Because each dollar of disposable income is either saved or consumed, the saving function is the other side or mirror image of the consumption function.

2. Recall the major features of consumption and saving functions:
   a. The consumption (or saving) function relates the level of consumption (or saving) to the level of disposable income.
   b. The marginal propensity to consume (*MPC*) is the amount of extra consumption generated by an extra dollar of disposable income.
   c. The marginal propensity to save (*MPS*) is the extra saving generated by an extra dollar of disposable income.
   d. Graphically, the *MPC* and the *MPS* are the slopes of the consumption and saving schedules, respectively.
   e. $MPS \equiv 1 - MPC$.
3. Adding together individual consumption functions gives us the national consumption function. In simplest form, it shows total consumption expenditures as a function of disposable income. Other variables, such as permanent income or long-term income trends as well as wealth, also have a significant impact on consumption patterns.
4. The personal saving rate has declined sharply in the last three decades. To explain this decline, economists point to social security and government health programs, changes in financial markets, and wealth effects. Declining saving hurts the economy because personal saving is a major component of national saving and investment. While people feel richer because of the booming stock market, the nation's true wealth increases only when its productive tangible and intangible assets increase.

### B. Investment

5. The second major component of spending is gross private domestic investment in housing, plant, software, and equipment. Firms invest to earn profits. The major economic forces that determine investment are therefore the revenues produced by investment (primarily influenced by the state of the business cycle), the cost of investment (determined by interest rates and tax policy), and the state of expectations about the future. Because it depends on highly unpredictable future events, investment is the most volatile component of aggregate spending.
6. An important relationship is the investment demand schedule, which connects the level of investment spending to the interest rate. Because the profitability of investment varies inversely with the interest rate, which affects the cost of capital, we can derive a downward-sloping investment demand curve. As the interest rate declines, more investment projects become profitable.

## CONCEPTS FOR REVIEW

### Consumption and Saving

disposable income, consumption, saving
consumption and saving functions
personal saving rates
marginal propensity to consume (*MPC*)
marginal propensity to save (*MPS*)
$MPC + MPS \equiv 1$
break-even point
45° line
determinants of consumption:
  current disposable income
  permanent income
  wealth
  life-cycle effect

### Investment

determinants of investment:
  revenues
  costs
  expectations
role of interest rates in *I*
investment demand function
animal spirits

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

Economists have studied consumer expenditure patterns in order to improve predictions and aid economic policy. One of the most influential studies is Milton Friedman, *The Theory of the Consumption Function* (University of Chicago Press, 1957). A historical overview by an economic historian is Stanley Lebergott, *Pursuing Happiness: American Consumers in the Twentieth Century* (Princeton University Press, Princeton, N.J., 1993).

Firms devote much management time to deciding about investment strategies. A good survey can be found in Richard A. Brealey, Stewart C. Myers, and Franklin Allen,

*Principles of Corporate Finance* (McGraw-Hill, New York, 2009).

### Websites

Data on total personal consumption expenditures for the United States are provided at the website of the Bureau of Economic Analysis, *www.bea.gov*.

Data on family budgets are contained in Bureau of Labor Statistics, "Consumer Expenditures," available at *www.bls.gov*.

Data and analysis of investment for the U.S. economy are provided by the Bureau of Economic Analysis at *www.bea.gov*.

Milton Friedman and Franco Modigliani made major contributions to our understanding of the consumption function. Visit the Nobel website at *nobelprize.org/nobel_prizes/economics* to read about the importance of their contributions to macroeconomics.

## QUESTIONS FOR DISCUSSION

1. Summarize the budget patterns for food, clothing, luxuries and saving.
2. In working with the consumption function and the investment demand schedule, we need to distinguish between shifts of and movements along these schedules.
   a. Define carefully for both curves changes that would lead to shifts of and those that would produce movements along the schedules.
   b. For the following, explain verbally and show in a diagram whether they are shifts of or movements along the consumption function: increase in disposable income, decrease in wealth, fall in stock prices.
   c. For the following, explain in words and show in a diagram whether they are shifts of or movements along the investment demand curve: expectation of a decline in output next year, rise of interest rates, increase in taxes on profits.
3. Exactly how were the *MPC* and *MPS* in Table 21-4 computed? Illustrate by calculating *MPC* and *MPS* between points *A* and *B*. Explain why it must always be true that $MPC + MPS \equiv 1$.
4. I consume all my income at every level of income. Draw my consumption and saving functions. What are my *MPC* and *MPS*?
5. Estimate your income, consumption, and saving for last year. If you dissaved (consumed more than your income), how did you finance your dissaving? Estimate the composition of your consumption in terms of each of the major categories listed in Table 21-1.
6. "Along the consumption function, income changes more than consumption." What does this imply for the *MPC* and *MPS*?
7. "Changes in disposable income lead to movements along the consumption function; changes in wealth or other factors lead to a shift of the consumption function." Explain this statement with an illustration of each case.
8. What would be the effects of the following on the investment demand function illustrated in Table 21-5 and Figure 21-8?
   a. A doubling of the annual revenues per $1000 invested shown in column (3)
   b. A rise in interest rates to 15 percent per year
   c. The addition of a ninth project with data in the first three columns of ( J, 10, 70)
   d. A 50 percent tax on net profits shown in columns (6) and (7)
9. Using the augmented investment demand schedule from question 8(**c**) and assuming that the interest rate is 10 percent, calculate the level of investment for cases **a** through **d** in question 8.
10. **Advanced problem:** According to the life-cycle model, people consume each year an amount that depends upon their *lifetime* income rather than upon their current income. Assume that you expect to receive future income (in constant dollars) according to the schedule in Table 21-6.
    a. Assume that there is no interest paid on savings. You have no initial savings. Further assume that you want to "smooth" your consumption (enjoying equal consumption each year) because of diminishing extra satisfaction from extra consumption. Derive your best consumption trajectory for the 5 years, and write the figures in column (3). Then calculate your saving and enter the amounts in column (4); put your end-of-period wealth, or cumulative saving, for each year into column (5). What is your average saving rate in the first 4 years?
    b. Next, assume that a government social security program taxes you $2000 in each of your working

| (1) Year | (2) Income ($) | (3) Consumption ($) | (4) Saving ($) | (5) Cumulative saving (end of year) ($) |
|---|---|---|---|---|
| 1 | 30,000 | _____ | _____ | _____ |
| 2 | 30,000 | _____ | _____ | _____ |
| 3 | 25,000 | _____ | _____ | _____ |
| 4 | 15,000 | _____ | _____ | _____ |
| 5* | 0 | _____ | _____ | 0 |

*Retired.

**TABLE 21-6.**

years and provides you with an $8000 pension in year 5. If you still desire to smooth consumption, calculate your revised saving plan. How has the social security program affected your consumption? What is the effect on your average saving rate in the first 4 years? Can you see why some economists claim that social security can lower saving?

CHAPTER

# 22

# Business Cycles and Aggregate Demand

*The fault, dear Brutus, is not in our stars—but in ourselves.*

William Shakespeare
*Julius Caesar*

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The American economy has been subject to business cycles since the early days of the Republic. Sometimes, business conditions are healthy, with rapidly growing employment, factories working overtime, and robust profits. The "fabulous 1990s" was such a period for the American economy. The economy grew rapidly; employment and capacity utilization were exceptionally high, and unemployment was low. Yet, unlike the case in earlier long expansions, inflation remained low throughout the 1990s.

Such periods of prosperity often come to an unhappy end. In the nineteenth and early twentieth centuries, and again in 2007–2009, financial crises turned into waves of contagious pessimism, businesses failed, credit conditions tightened, and a downturn in the banking and financial sectors rippled through the rest of the economy. During business downturns, jobs are hard to find, factories are idle, and profits are low. These downturns are usually short and mild, as was the case in the recession that began in March 2001 and ended in November 2001. From time to time the contraction may persist for a decade and cause widespread economic hardships, as during the 1930s in the Great Depression of the 1930s or in Japan in the 1990s.

These short-term fluctuations in economic activity, known as *business cycles*, are the central topic of this chapter. Understanding business cycles has proved to be one of the most enduring issues in all of macroeconomics. What causes business fluctuations? How can government policies reduce their virulence? Economists were largely unable to answer these questions until the 1930s, when the revolutionary macroeconomic theories of John Maynard Keynes highlighted the importance of the forces of aggregate demand in determining business cycles. Keynesian economics emphasizes that *changes in aggregate demand can have powerful impacts on the overall levels of output, employment, and prices in the short run.*

This chapter describes the basic features of the business cycle and presents the simplest theories of output determination. The structure of this chapter is as follows:

- We begin with a description of the key elements of the business cycle.
- We then summarize the basics of aggregate demand and show how the modern business cycle fits into that framework.
- Next, we develop the multiplier model—the simplest Keynesian example of a model of aggregate demand.
- We close with an application of the multiplier model to the question of the impact of fiscal policy on output.

## A. WHAT ARE BUSINESS CYCLES?

Economic history shows that no economy grows in a smooth and even pattern. A country may enjoy several years of economic expansion and prosperity, with rapid increases in stock prices (as in the 1990s) or housing prices (as in the early 2000s). Then, the irrational exuberance may flip over to irrational pessimism as, during the 2007–2009 period, lenders stop issuing mortgages or car loans on favorable terms, banks slow their lending to businesses, and spending declines. Consequently, national output falls, unemployment rises, and profits and real incomes decline.

Eventually the bottom is reached and recovery begins. The recovery may be incomplete, or it may be so strong as to lead to a new boom. Prosperity may mean a long, sustained period of brisk demand, plentiful jobs, and rising living standards. Or it may be marked by a quick, inflationary flare-up in prices and speculation, followed by another slump.

Upward and downward movements in output, inflation, interest rates, and employment form the business cycle that characterizes all market economies.

## FEATURES OF THE BUSINESS CYCLE

What exactly do we mean by "business cycles"?

**Business cycles** are economywide fluctuations in total national output, income, and employment, usually lasting for a period of 2 to 10 years, marked by widespread expansion or contraction in most sectors of the economy.

Economists typically divide business cycles into two main phases: *recession* and *expansion*. Peaks and troughs mark the turning points of the cycle. Figure 22-1 shows the successive phases of the business cycle. The downturn of a business cycle is called a recession. A **recession** is a recurring period of decline in total output, income, and employment, usually lasting from 6 to 12 months and marked by contractions in many sectors of the economy. A recession that is large in both scale and duration is called a **depression.**

The semiofficial judge of the timing of contractions and expansions is the National Bureau of Economic Research (NBER), a private research organization. The NBER defines a recession as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment,

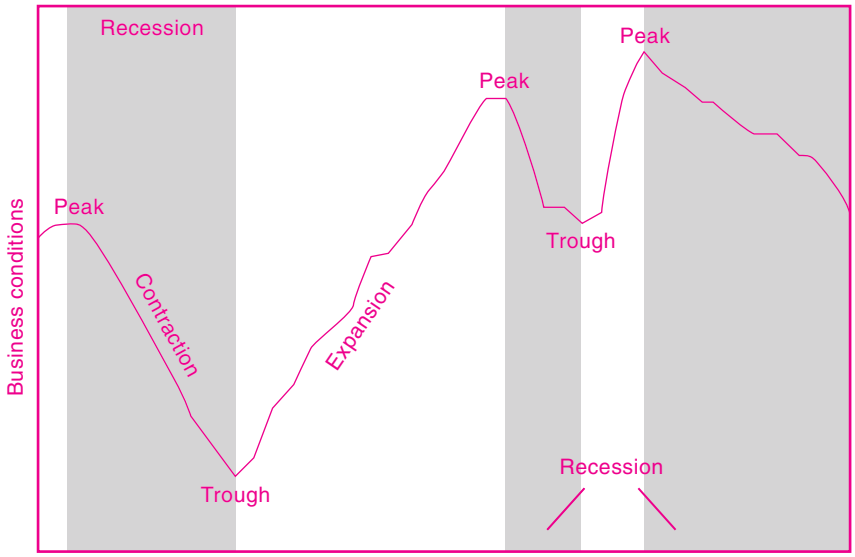


**FIGURE 22-1. A Business Cycle, like the Year, Has Its Seasons**

Business cycles are the irregular expansions and contractions in economic activity. (These are the actual monthly data on industrial production for a recent business-cycle period.)

industrial production, and wholesale-retail sales." (See "Websites" at the end of this chapter for further information on dating of recessions.)

An alternative definition sometimes used is that a recession occurs when real GDP has declined for two consecutive calendar quarters. (Question 12 at the end of the chapter reviews the difference between the two definitions.)

Although we call these short-term fluctuations "cycles," the actual pattern is irregular. No two business cycles are quite the same. No exact formula, such as might apply to the revolutions of the planets or the swings of a pendulum, can be used to predict the duration and timing of business cycles. Rather, business cycles more closely resemble the irregular fluctuations of the weather. Figure 22-2 shows the American business cycles throughout recent history. Here you can see that business cycles are like mountain ranges, with some valleys that are deep and broad, as in the Great Depression, and others that are shallow and narrow, as in the recession of 1991.

While individual business cycles are not identical, they often share a family similarity. If a reliable economic forecaster announces that a recession is about to arrive, what are the typical phenomena that you should expect? The following are a few of the *customary characteristics* of a recession:

- Investment usually falls sharply in recessions. Housing has generally been the first to decline, either because of a financial crisis or because the Federal Reserve has raised interest rates to slow inflation. Consumer purchases often decline sharply as well. As businesses slow production lines, real GDP falls.
- Employment usually falls sharply in the early stages of a recession. It sometimes is slow to recover in what are often called "jobless recoveries."


**FIGURE 22-2. Business Activity since 1919**

Industrial production has fluctuated irregularly around its long-run trend. Can you detect a more stable economy in recent years?

Source: Federal Reserve Board, detrended by authors.

- As output falls, inflation slows and the demand for crude materials declines, and materials' prices tumble. Wages and the prices of services are unlikely to face a similar decline, but they tend to rise less rapidly in economic downturns.
- Business profits fall sharply in recessions. In anticipation of this, common-stock prices usually fall as investors sniff the scent of a business downturn.
- Generally, as business conditions deteriorate and employment falls, the Federal Reserve begins to lower short-term interest rates to stimulate investment, and other interest rates decline as well.

## BUSINESS-CYCLE THEORIES

***Exogenous vs. Internal Cycles.*** Over the years, macroeconomists have engaged in vigorous debates about the reasons for business fluctuations. Some think they are caused by monetary fluctuations, others by productivity shocks, and still others by changes in exogenous spending.

There is certainly no end to possible explanations, but it is useful to classify the different theories into two categories: exogenous and internal. The *exogenous* theories find the sources of the business cycle in the fluctuations of factors outside the economic system—in wars, revolutions, and elections; in oil prices, gold discoveries, and population migrations; in discoveries of new lands and resources; in scientific breakthroughs and technological innovations; even in sunspots, climate change, and the weather.

An example of an exogenous cycle was the outbreak of World War II. When Germany and Japan launched wars on Europe and the United States, this led to a rapid military buildup, large increases in spending, and an increase in aggregate demand that propelled the United States out of the Great Depression. Here we saw an exogenous event—a major war—that led to a huge increase in military spending and to the biggest economic expansion of the twentieth century. (We will examine this episode later in this chapter.)

By contrast, the *internal* theories look for mechanisms within the economic system itself. In this approach, every expansion breeds recession and contraction, and every contraction breeds revival and expansion. Many business cycles in U.S. economic history were internal cycles that originated in the financial sector. It is for this reason that we devote much of our attention to monetary and financial economics.

### *Financial Crises and Business Cycles*

One common feature of capitalism around the world is the speculative booms and busts that occurred frequently in the nineteenth century, produced the upheaval of the Great Depression, and reappeared in the United States several times over the last two decades. Below are some important examples.

***Panics of Early Capitalism.*** The nineteenth century witnessed frenzies of investment speculation—notably in canals, land, and railroads. Inevitably, "animal spirits" would take over. Railroads would be overbuilt, land prices would rise too high, and people would take on too much debt. Bankruptcy would lead to bank failures, a run on the banks, and a banking crisis. Output and prices would fall sharply in the panic. Eventually, after the worst excesses were wrung out, the economy would begin to expand again.

***Hyperinflation.*** Sometimes, an overheated economy leads to high inflation, or even hyperinflation. Hyperinflation occurs when prices rise at 100 percent or more *per month*. The most famous hyperinflation in history occurred in Germany in 1923. The government was unable to meet its financial obligations through taxing and borrowing, so it turned to the monetary printing press. By the end of 1923, currency was printed with more and more digits, and the largest banknote in circulation was for 25 billion marks! Central banks today are vigilant in their defense against even the most moderate inflation.

***The New-Economy Bubble.*** The classic pattern of speculative boom was seen again in the late 1990s. The phenomenal pattern of growth and innovation in the "new-economy" sectors—including software, the Internet, and the newly invented dot.com companies—produced a speculative boom in new-economy stocks. Companies sold online dating services, gave away free electronic birthday cards, and issued stock for Flooz.com, which sold a worthless digital currency. College students dropped out of school to become instant millionaires (or so they dreamed). All of this spurred real investment in computers, software, and telecommunications. Investment in information-processing equipment rose by 70 percent from 1995 to 2000, representing one-fifth of the entire rise in real GDP during this period.

Eventually, investors became skeptical about the fundamental value of many of these firms. Losses piled up on top of losses. The urge to buy the stocks before prices rose higher was replaced by the panicky desire to sell before they collapsed. The stock price of a typical new-economy company fell from $100 per share to pennies by 2003. Many such companies went bankrupt. College dropouts went back to school wiser but seldom richer.

The changed expectations about the new economy and the resulting stock market decline contributed to the recession and slow growth in the 2000–2002 period. Investment in information-processing equipment fell by 10 percent, and investment in computers fell by twice as much. The impressive innovations of the new economy have become a staple feature of modern technology, but, with a few exceptions, investors have little or no profits to show for their efforts.

***The Housing Bubble.*** Less than a decade later, another financial crisis erupted, and this was again the result of rapid innovation. But in this case, the innovation was the process of financial "securitization." This occurs when a financial instrument, such as a simple home mortgage, is sliced and diced, repackaged, and then sold on securities markets. While securitization itself was not a new phenomenon, the scope of packaging and repackaging grew sharply. Rating agencies failed to provide accurate ratings of the riskiness of these new securities, and many people bought them thinking they were as good as gold. The worst examples were "subprime mortgages," mortgages provided to people for the entire value of a house on the basis of little or no documentation of their income and job status. By early 2007, the total value of these new securities was over $1 trillion.

All went well as long as housing prices were rising, as they did starting in 1995. But then in 2006 the housing bubble burst—echoing the end of the speculative dot.com stock-market bubble from a decade earlier. Many of the new securities lost value. It turned out they were not top-grade AAA securities but junk bonds. As banks and other financial institutions suffered large losses, they began to tighten credit, reduce loans, and cut back sharply on new mortgages. Risk premiums rose sharply.

The Federal Reserve took steps to ease monetary conditions—lowering interest rates and extending credit—but it was flying against powerful headwinds. As the value of stocks fell more sharply than at any time in a century, many financial institutions were on the verge of bankruptcy. Many of the large investment banking firms disappeared. The Federal Reserve and U.S. Treasury loaned massive amounts of federal money and bailed out several financial firms. Yet, even with the strong countercyclical activities, the economy went into a deep recession at the end of 2007.

You begin to see the theme running through all these events. The next few chapters survey our economic theories to explain them.

## B. AGGREGATE DEMAND AND BUSINESS CYCLES

We have now begun to understand the short-term changes in output, employment, and prices that characterize business fluctuations in market economies. Most explanations of business cycles rely upon the theory of aggregate demand. This section explains *AD* theory in greater detail.

### THE THEORY OF AGGREGATE DEMAND

What are the major components of aggregate demand? How do they interact with aggregate supply to determine output and prices? Exactly how do short-run fluctuations in *AD* affect GDP? We first examine aggregate demand in more detail in order to get a better understanding of the forces driving the economy. Then, in the following sections, we derive the simplest model of aggregate demand: the multiplier model.

**Aggregate demand** (or *AD*) is the total or aggregate quantity of output that is willingly bought at a given level of prices, other things held constant. *AD* is the desired spending in all product sectors: consumption, private domestic investment, government purchases of goods and services, and net exports. It has four components:

1. *Consumption.* As we saw in the last chapter, consumption (*C*) is primarily determined by

disposable income, which is personal income less taxes. Other factors affecting consumption are longer-term trends in income, household wealth, and the aggregate price level. Aggregate demand analysis focuses on the determinants of *real* consumption (that is, nominal or dollar consumption divided by the price index for consumption).

2. *Investment.* Investment ($I$) spending includes purchases of buildings, software, and equipment and accumulation of inventories. Our analysis in Chapter 21 showed that the major determinants of investment are the level of output, the cost of capital (as determined by tax policies along with interest rates and other financial conditions), and expectations about the future. The major channel by which economic policy can affect investment is monetary policy.
3. *Government purchases.* A third component of aggregate demand is government purchases of goods and services ($G$). This includes the purchases of goods like tanks and school books, as well as the services of judges and public-school teachers. Unlike private consumption and investment, this component of aggregate demand is determined directly by the government's spending decisions; when the Pentagon buys a new fighter aircraft, this output directly adds to the GDP.
4. *Net exports.* A final component of aggregate demand is net exports ($X$), which equal the value of exports minus the value of imports. Imports are determined by domestic income and output, by the ratio of domestic to foreign prices, and by the foreign exchange rate of the dollar. Exports (which are imports of other countries) are the mirror image of imports, and they are determined by foreign incomes and outputs, by relative prices, and by foreign exchange rates. Net exports, then, will be determined by domestic and foreign outputs, relative prices, and exchange rates.

Figure 22-3 shows the *AD* curve and its four major components. At price level *P*, we can read the levels of consumption, investment, government purchases, and net exports, which sum to GDP, or *Q*. The sum of the four spending streams at that price level is aggregate spending, or aggregate demand, at that price level.

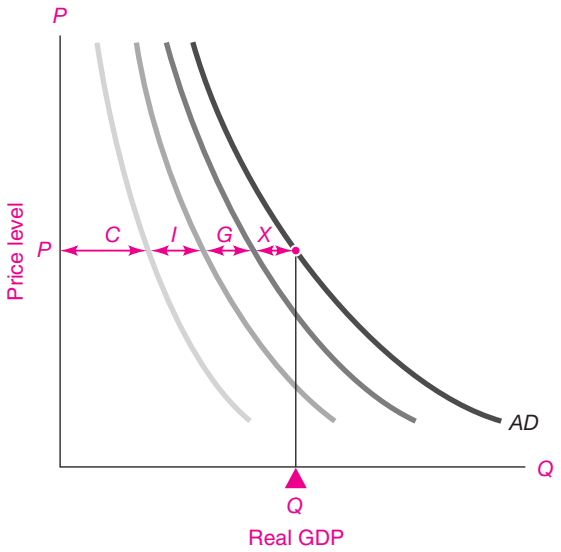


**FIGURE 22-3. Components of Aggregate Demand**

Aggregate demand (*AD*) consists of four components—consumption ($C$), domestic private investment ($I$), government spending on goods and services ($G$), and net exports ($X$).

Aggregate demand shifts when there are changes in macroeconomic policies (such as monetary-policy changes or changes in government expenditures or tax rates) or when exogenous events change spending (as would be the case with changes in foreign output, affecting $X$, or in business confidence, affecting $I$).

## THE DOWNWARD-SLOPING AGGREGATE DEMAND CURVE

One important point you should notice is that the aggregate demand curve in Figure 22-3 slopes downward. This means that, holding other things constant, the level of real spending declines as the overall price level in the economy rises.

What is the reason for the downward slope? The basic reason is that there are some elements of income or wealth that do not rise when the price level rises. For example, some items of personal income might be set in nominal dollar terms—some government transfer payments, the minimum wage, and company pensions are examples. When the price level goes up, therefore, real disposable income falls, leading to a decline in real consumption expenditures.

In addition, some elements of wealth may be fixed in nominal terms. Examples here would be holdings of money and bonds, which usually contain promises to pay a certain number of dollars in a given period. If the price level rises, therefore, the real value of wealth declines, and this would again lead to lower levels of real consumption.

We illustrate the impact of a higher price level graphically in Figure 22-4(*a*) on page 436. Say that the economy is in equilibrium at point *B*, with a price level of 100 and a real GDP of $3000 billion. Next assume that prices rise by 50 percent, so the price index *P* rises from 100 to 150. Suppose that at that higher price level, real spending declines because of lower real disposable income. Total real spending declines to $2000 billion, shown at point *C*. We see here how higher prices have reduced real spending.

To summarize:

The *AD* curve slopes downward. This downward slope implies that real spending declines as the price level rises, other things held constant. Real spending declines with a higher price level primarily because of the effect of higher prices on real incomes and real wealth.

## Shifts in Aggregate Demand

We have seen that total spending in the economy tends to decline as the price level rises, holding other things constant. But those other things do in fact tend to change, thereby producing changes in aggregate demand. What are the key determinants of changes in aggregate demand?

We can separate the determinants of *AD* into two categories, as shown in Table 22-1. One set includes

| Variable | Impact on aggregate demand |
|---|---|
| | **Policy Variables** |
| **Monetary policy** | Monetary expansion may lower interest rates and loosen credit conditions, inducing higher levels of investment and consumption of durable goods. In an open economy, monetary policy also affects the exchange rate and net exports. |
| **Fiscal policy** | Increases in government purchases of goods and services directly increase spending; tax reductions or increases in transfers raise disposable income and induce higher consumption. Tax incentives like an investment tax credit can induce higher spending in a particular sector. |
| | **Exogenous Variables** |
| **Foreign output** | Output growth abroad leads to an increase in net exports. |
| **Asset values** | Rise in stock market increases household wealth and thereby increases consumption; also, higher stock prices lower the cost of capital and thereby increase business investment. |
| **Advances in technology** | Technological advances can open up new opportunities for business investment. Important examples have been the railroad, the automobile, and computers. |
| **Other** | Defeat of a socialist government stimulates foreign investment; peace breaks out, with an increase in world oil production, and lowers oil prices; good weather leads to lower food prices. |

**TABLE 22-1. Many Factors Can Increase Aggregate Demand and Shift out the *AD* Curve**

The aggregate demand curve relates total spending to the price level. But numerous other influences affect aggregate demand—some policy variables, others exogenous factors. The table lists changes that would tend to increase aggregate demand and shift out the *AD* curve.

the macroeconomic *policy variables*, which are under government control. These are monetary policy (steps by which the central bank can affect interest rates and other financial conditions) and fiscal policy (taxes and government expenditures). Table 22-1 illustrates how these government policies can affect different components of aggregate demand.

The second set includes *exogenous variables,* or variables that are determined outside the *AS-AD* framework. As Table 22-1 shows, some of these variables (such as wars or revolutions) are outside the scope of macroeconomic analysis proper, some (such as foreign economic activity) are outside the control of domestic policy, and others (such as the stock market) have significant independent movement.

What are the effects of changes in the variables lying behind the *AD* curve? Consider the economic effects of a sharp increase in military spending, such as took place in World War II. The additional costs of the war included pay for the troops, purchases of ammunition and equipment, and costs of transportation. The effect of these purchases was an increase in *G*. Unless some other component of spending decreased to offset the increase in *G*, the total *AD* curve would shift out and to the right as *G* increased. Similarly, a radical new innovation that increased the profitability of new investment, or an increase in consumer wealth because of higher housing prices, would lead to an increase in aggregate demand and an outward shift of the *AD* curve.

Figure 22-4(*b*) on page 436 shows how the changes in the variables listed in Table 22-1 would affect the *AD* curve. To test your understanding, construct a similar table showing forces that would tend to decrease aggregate demand (see question 2 at the end of the chapter).

### Two Reminders

We pause for two important reminders.

**1.** We first emphasize the difference between macroeconomic and microeconomic demand curves. Recall from our study of supply and demand that the microeconomic demand curve has the price of an individual commodity on the vertical axis and production of that commodity on the horizontal axis, with all other prices and total consumer incomes held constant.

In the aggregate demand curve, the general price level is on the vertical axis, while total output and incomes vary along the horizontal axis. By contrast, total incomes and output are held constant for the microeconomic demand curve.

Finally, the negative slope of the microeconomic demand curve occurs because consumers substitute other goods for the good in question when its price rises. If the price of meat rises, the quantity demanded falls because consumers tend to substitute bread and potatoes for meat, using more of the relatively inexpensive commodities and less of the relatively expensive one.

The aggregate demand curve is downward-sloping for completely different reasons: Total spending falls when the overall price level rises because consumer real incomes and real wealth fall, reducing consumption, and interest rates rise, reducing investment spending.

**2.** Remember also the important distinction between the *movement along* a curve and the *shift of* a curve. Figure 22-4(*a*) shows a case of movement along the aggregate demand curve. This might occur when higher oil prices reduce real disposable income. Figure 22-4(*b*) shows a shift of the aggregate demand curve. This might occur because of a sharp increase in war spending. Always keep this distinction in mind as you analyze a particular policy or shock.

## Business Cycles and Aggregate Demand

One important source of business fluctuations is shocks to aggregate demand. A typical case is illustrated in Figure 22-5 on page 436, which shows how a decline in aggregate demand lowers output. Say that the economy begins in short-run equilibrium at point *B*. Then, perhaps because of a financial panic or a tax increase, the aggregate demand curve shifts leftward to *AD′*. If there is no change in aggregate supply, the economy will reach a new equilibrium at point *C*. Note that output declines from *Q* to *Q′*. In addition, prices are now lower than they were at the previous equilibrium, and the rate of inflation falls.

The case of an economic expansion is just the opposite. Suppose that a war leads to a sharp increase in government spending. As a result, the *AD* curve would shift to the right, output and employment would increase, and prices and inflation would rise.

Business-cycle fluctuations in output, employment, and prices are often caused by shifts in aggregate demand. These occur as consumers, businesses,

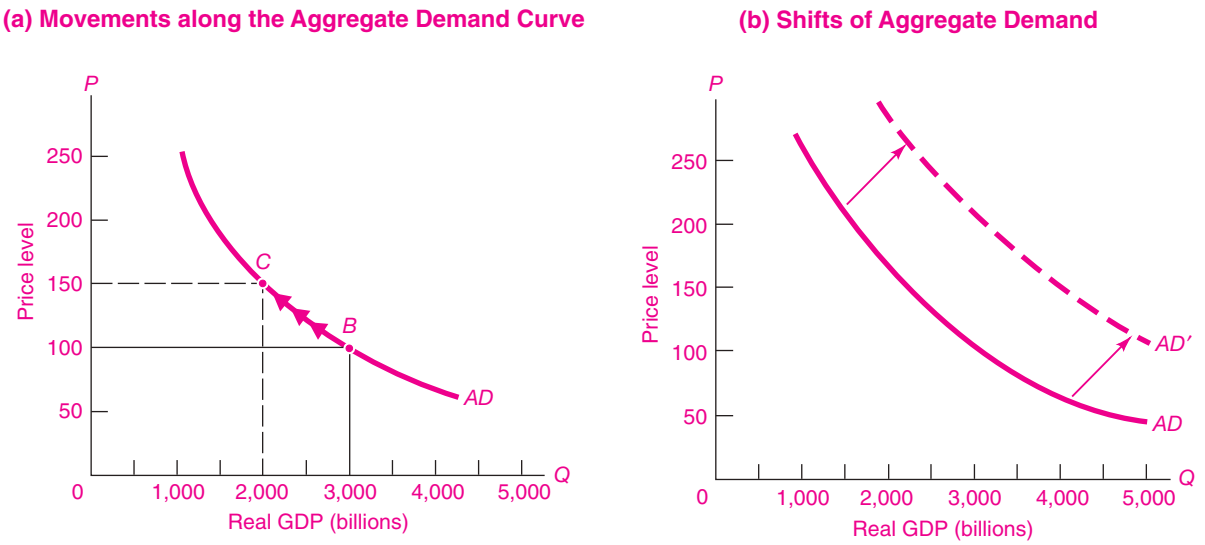


**FIGURE 22-4. Movement along vs. Shifts of the Aggregate Demand Curve**

In (**a**), a higher price level with given nominal money incomes lowers real disposable income; this leads to higher interest rates and declining spending on interest-sensitive investment and consumption. This illustrates a *movement along* the *AD* curve from *B* to *C* when other things are held constant.

In (**b**), other things are no longer constant. Changes in variables underlying *AD*—such as the money supply, tax policy, or military spending—lead to changes in total spending at a given price level. This leads to a *shift of* the *AD* curve.

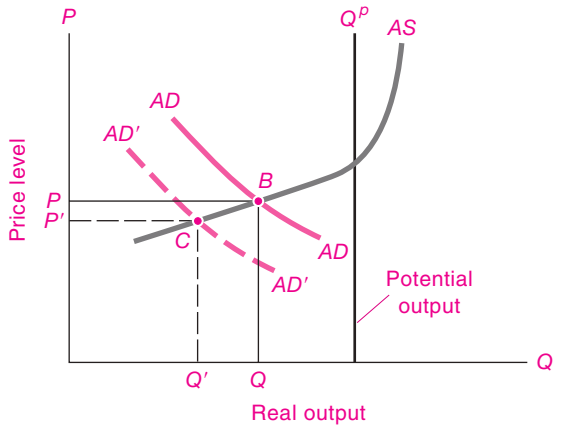


**FIGURE 22-5. A Decline in Aggregate Demand Leads to an Economic Downturn**

A downward shift in the *AD* curve along a relatively flat and unchanging *AS* curve leads to lower levels of output. Note that as a result of the leftward shift in the *AD* curve, actual output declines relative to potential output and makes a recession worse.

or governments change total spending relative to the economy's productive capacity. When these shifts in aggregate demand lead to sharp business downturns, the economy suffers recessions or even depressions. A sharp upturn in economic activity can lead to inflation.

### *Is the Business Cycle Avoidable?*

The history of business cycles in the United States shows a remarkable trend toward greater stability in the last quarter-century (look back at Figure 22-2). The period through 1940 witnessed numerous crises and depressions—prolonged, cumulative slumps like those of the 1870s, 1890s, and 1930s. Since 1945, business cycles have become less frequent and milder, and many Americans have never witnessed a real Depression.

What were the sources of the Great Moderation? Some believe that capitalism is inherently more stable now than it was in earlier times. Some of that stability comes from a larger and more predictable government sector. Equally important is a better

understanding of macroeconomics that now permits the government to conduct its monetary and fiscal policies so as to prevent shocks from turning into recessions and to keep recessions from snowballing into depressions.

During tranquil periods, people often declare that the business cycle has been vanquished. Is this a realistic possibility? While business cycles have moderated in America over the last quarter-century, they have actually become more prevalent in other economies. So take heed of the following prophetic words of the great macroeconomist Arthur Okun, which are particularly appropriate as the world economy heads into recession in 2007–2009:

> Recessions are now generally considered to be fundamentally preventable, like airplane crashes and unlike hurricanes. But we have not banished air crashes from the land, and it is not clear that we have the wisdom or the ability to eliminate recessions. The danger has not disappeared. The forces that produce recurrent recessions are still in the wings, merely waiting for their cue.

## C. THE MULTIPLIER MODEL

The basic macroeconomic theory of business cycles holds that shifts in aggregate demand produce the frequent and unpredictable fluctuations in output, prices, and employment known as business cycles. Economists try to understand the *mechanism* by which changes in spending get translated into changes in output and employment. The simplest approach to understanding business cycles is known as the *Keynesian multiplier model.*

When economists attempt to understand why major increases in military spending led to rapid increases in GDP, or why the tax cuts of the 1960s or 1980s ushered in long periods of business-cycle expansions, or why the investment boom of the late 1990s produced America's longest expansion, they often turn to the Keynesian multiplier model for the simplest explanation.

What exactly is the **multiplier model?** It is a macroeconomic theory used to explain how output is determined in the short run. The name "multiplier" comes from the finding that each dollar change in exogenous expenditures (such as investment) leads to more than a dollar change (or a multiplied change) in GDP. The key assumptions underlying the multiplier model are that wages and prices are fixed and that there are unemployed resources in the economy. In addition, in this introductory chapter, we are ignoring the role of monetary policy and assuming that financial markets do not react to changes in the economy. Additionally, we are for now assuming that there is no international trade and finance. These further elaborations will be introduced in later chapters.

### OUTPUT DETERMINED BY TOTAL EXPENDITURES

Our initial discussion of the multiplier model analyzes how investment and consumption spending interact with incomes to determine national output. This is called the *total expenditure approach* to determining national output.

Recall Chapter 21's picture of the national consumption function. We have drawn a reminder graph in Figure 22-6, where the consumption function is

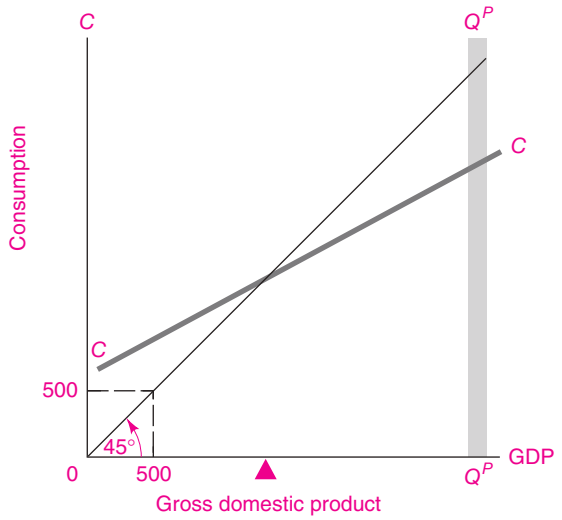


**FIGURE 22-6. National Income Determines the Level of Consumption**

Recall the consumption function, *CC*, that was described in Chapter 21. This shows the level of consumption expenditures corresponding to every level of income (where income equals GDP in this simple example). The two points marked "500" emphasize the important property of the 45° line. Any point on the 45° line depicts a vertical distance exactly equal to the horizontal distance. The blue band marked $Q_PQ_P$ shows the level of potential GDP.

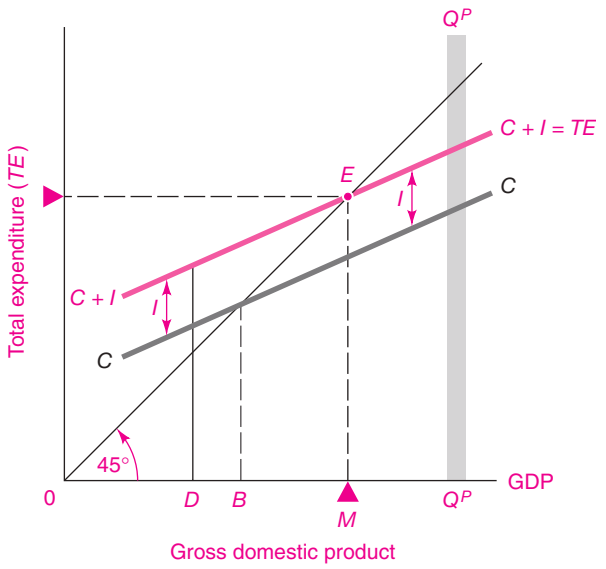


**FIGURE 22-7. The Equilibrium Level of National Output Is Determined When Total Expenditure (*TE*) Equals Output**

The blue *CC* line represents the consumption function (shown in Figure 22-6). The *II* arrows indicate constant investment. Adding *II* to *CC* gives the *TE* curve of total desired investment plus consumption spending. Along the 45° line, expenditures exactly equal GDP. Equilibrium GDP comes at point *E*, which is the intersection of the *TE* line and the 45° line. This is the only level of GDP at which the desired spending on $C + I$ exactly equals output.

the *CC* line. Recall that the consumption function shows the desired consumption corresponding to each level of income. We have omitted taxes, transfers, and other items, so that personal income equals national income, and national income equals GDP.

We now develop in Figure 22-7 an important new graph showing the total expenditure-output relationship. This graph is sometimes called the "Keynesian cross," because it shows how output equals expenditure when the expenditure curve crosses the 45° line. (If you are not sure about the significance of the 45° line, look back at Chapter 21's explanation.)

We begin by drawing the consumption function, *CC*. We then add total investment to consumption. Normally, investment depends on interest rates, tax policy, and business confidence. To simplify things, we treat investment as an *exogenous* variable, one whose level is determined outside the model. Say that investment opportunities are such that investment would be exactly $200 billion per year regardless of the level of GDP. The investment schedule is stacked on top of the consumption schedule in Figure 22-7. Note that the $C + I$ curve is higher than the *C* curve by exactly the constant amount of *I*. This parallel feature indicates that investment is constant.

This $C + I$ curve represents total expenditures (*TE*), which equals desired investment (which is at fixed level *I*) plus consumption. This is drawn in Figure 22-7 as the green $C + I$ or *TE* curve.

Finally, we draw in a 45° line along which expenditure on the vertical axis exactly equals output on the horizontal axis. At any point on the 45° line, total desired expenditure (measured vertically) exactly equals the total level of output (measured horizontally).

We can now calculate the equilibrium level of output in Figure 22-7. Where planned expenditure, represented by the *TE* curve, equals total output, the economy is in equilibrium.

The total expenditure curve (*TE*) shows the level of expenditure desired or planned by consumers and businesses corresponding to each level of output. The economy is in equilibrium at the point where the $TE = C + I$ curve crosses the 45° line—at point *E* in Figure 22-7. Point *E* is the macroeconomic equilibrium because at that point, the level of desired expenditure on consumption and investment exactly equals the level of total output.

### *Reminder on the Meaning of Equilibrium*

We often look for a macroeconomic "equilibrium" when analyzing business cycles or economic growth. What exactly does this term mean? An **equilibrium** is a situation where the different forces at work are in balance. For example, if you see a ball rolling down a hill, the ball is not in equilibrium because the forces at work are pulling the ball down. This is therefore a **disequilibrium.** When the ball comes to rest in a valley at the bottom of the hill, the forces operating on the ball are in balance. This is therefore an equilibrium.

Similarly, in macroeconomics, an equilibrium level of output is one where the different forces of spending and output are in balance; in equilibrium, the level of output tends to persist until there are changes in the forces affecting the economy.

Applying the equilibrium concept to Figure 22-7, we see that point *E* is an equilibrium. At point *E,* and only at point *E,* does *desired spending on* C + I *equal actual output.* At any other level of production, desired spending would differ from production. At any level other than *E,* businesses would find themselves producing too little or too much and would want to change the level of production back toward the equilibrium level.

### The Adjustment Mechanism

It is not enough to say that point *E* is an equilibrium. We need to understand *why* a certain output is an equilibrium and what would happen if output deviated from that equilibrium. Let's consider three cases: planned spending above output, planned spending below output, and planned spending equal to output.

In the first case, suppose that spending is above output. This is represented by point *D* in Figure 22-7. At this level of output, the $C + I$ spending line is above the 45° line, so planned $C + I$ spending would be greater than output. This means that consumers would be buying more goods than businesses had anticipated. Auto dealers would find their lots emptying, and the backlog for computers would be getting longer and longer.

In such a disequilibrium situation, auto dealers and computer stores would respond by increasing their orders. Automakers would recall workers from layoff and gear up their production lines, while computer makers would add additional shifts. As a result of this increased production, output would increase. *Therefore, a discrepancy between total planned expenditure and total output leads to an adjustment of output.*

You should also work through what happens in the second case, where output is below equilibrium.

Finally, take the third case, where planned expenditure exactly equals output. At equilibrium, firms will find that their sales are equal to their forecasts. Inventories will be at their planned levels. There will not be any unexpected orders. Firms cannot improve profits by changing output because planned consumption needs have been met. So production, employment, income, and spending will remain the same. In this case GDP stays at point *E,* and we can rightly call it an *equilibrium.*

The equilibrium level of GDP occurs at point *E,* where planned spending equals planned production. At any other output, the total desired spending on consumption and investment differs from the planned production. Any deviation of plans from actual levels will cause businesses to change their production and employment levels, thereby returning the system to the equilibrium GDP.

### A Numerical Analysis

An example may help show why the equilibrium level of output occurs where planned spending and planned output are equal.

Table 22-2 shows a simple example of consumption, saving, and output. The break-even level of income, where consumption equals income, is $3000 billion ($3 trillion). Each $300 billion change of income is assumed to lead to a $100 billion change in saving and a $200 billion change in consumption. In other words, the *MPC* is assumed to be constant and equal to ⅔.

We assume that investment is exogenous and always sustainable at $200 billion, as shown in column (4) of Table 22-2.

Columns (5) and (6) are the crucial ones. Column (5) shows the total GDP. It is simply column (1) copied again into column (5). The figures in column (6) represent total planned expenditures at each level of GDP; that is, it equals the planned consumption spending plus planned investment. It is the $C + I$ schedule from Figure 22-7 in numbers.

When businesses as a whole are producing too much output (higher than the sum of what consumers and businesses want to purchase), inventories of unsold goods will be piling up.

Reading from the top row of Table 22-2, we see that if firms are initially producing $4200 billion of GDP, planned or desired spending [shown in column (6)] is only $4000 billion. In this situation, excess inventories will be accumulating. Firms will respond by reducing their production levels, and GDP will fall. In the opposite case, represented in the bottom row of Table 22-2, total spending is $3000 billion but output is only $2700 billion. Inventories are being depleted and firms will expand operations, raising output.

We see, then, that when businesses as a whole are temporarily producing more than they can profitably sell, they will reduce production and GDP will fall. When they are selling more than their current production, they will increase their output, and GDP will rise.

**GDP Determination Where Output Equals Planned Spending (billions of dollars)**

| (1) Levels of GDP and *DI* | (2) Planned consumption | (3) Planned saving (3) = (1) − (2) | (4) Planned investment | (5) Level of GDP (5) = (1) | | (6) Total planned consumption and investment, *TE* (6) = (2) + (4) | (7) Resulting tendency of output |
|---|---|---|---|---|---|---|---|
| 4,200 | 3,800 | **400** | **200** | 4,200 | > | 4,000 ↓ | Contraction |
| 3,900 | 3,600 | **300** | **200** | 3,900 | > | 3,800 ↓ | Contraction |
| **3,600** | **3,400** | **200** | **200** | **3,600** | **=** | **3,600** | **Equilibrium** |
| 3,300 | 3,200 | **100** | **200** | 3,300 | < | 3,400 ↑ | Expansion |
| 3,000 | 3,000 | **0** | **200** | 3,000 | < | 3,200 ↑ | Expansion |
| 2,700 | 2,800 | **−100** | **200** | 2,700 | < | 3,000 ↑ | Expansion |

**TABLE 22-2. Equilibrium Output Can Be Found Arithmetically at the Level Where Planned Spending Equals GDP**

The darker green row depicts the equilibrium GDP level, where the $3600 that is being produced is just matched by the $3600 that households plan to consume and that firms plan to invest. In upper rows, firms will be forced into unintended inventory investment and will respond by cutting back production until equilibrium GDP is reached. Interpret the lower rows' tendency toward expansion of GDP toward equilibrium.

Only when the level of actual output in column (5) exactly equals planned expenditure (*TE*) in column (6) will the economy be in equilibrium. In equilibrium, and only in equilibrium, business sales will be exactly sufficient to justify the current level of aggregate output. In equilibrium, GDP will neither expand nor contract.

## THE MULTIPLIER

Where is the multiplier in all this? To answer this question, we need to examine how a change in exogenous investment spending affects GDP. It is logical that an increase in investment will raise the level of output and employment. But by how much? The multiplier model shows that an increase in investment will increase GDP by an amplified or multiplied amount—by an amount greater than itself.

The **multiplier** is the impact of a 1-dollar change in exogenous expenditures on total output. In the simple $C + I$ model, the multiplier is the ratio of the change in total output to the change in investment.

Note that the definition of the multiplier speaks of the change in output per unit change in *exogenous expenditures*. This indicates that we are taking certain components of spending as given outside the model. In the case in hand, the exogenous component is investment. Later, we will see that the same approach can be used to determine the effect of changes in government expenditures, exports, and other items on total output.

For example, suppose investment increases by $100 billion. If this causes an increase in output of $300 billion, the multiplier is 3. If, instead, the resulting increase in output is $400 billion, the multiplier is 4.

***Woodsheds and Carpenters.*** Why is it that the multiplier is greater than 1? Let's suppose that I hire unemployed workers to build a $1000 woodshed. My carpenters and lumber producers will get an extra $1000 of income. But that is not the end of the story. If they all have a marginal propensity to consume of ⅔, they will now spend $666.67 on new consumption goods. The producers of these goods will now have extra incomes of $666.67. If their *MPC* is also ⅔, they in turn will spend $444.44, or ⅔ of $666.67 (or ⅔ of ⅔ of $1000). The process will go on, with each new round of spending being ⅔ of the previous round.

Thus an endless chain of *secondary consumption spending* is set in motion by my *primary* investment of $1000. But, although an endless chain, it is an ever-diminishing one. Eventually it adds up to a finite amount.

Using straightforward arithmetic, we can find the total increase in spending in the following manner:

$$\begin{aligned} &\$1000.00 && 1 \times \$1000 \\ &+ && + \\ &666.67 && \tfrac{2}{3} \times \$1000 \\ &+ && + \\ &444.44 && (\tfrac{2}{3})^2 \times \$1000 \\ &+ && + \\ &296.30 && (\tfrac{2}{3})^3 \times \$1000 \\ &+ && + \\ &197.53 && (\tfrac{2}{3})^4 \times \$1000 \\ &+ && + \\ &\vdots && \vdots \\ &\$3000.00 && \frac{1}{1-\tfrac{2}{3}} \times \$1000, \text{ or } 3 \times \$1000 \end{aligned}$$

This shows that, with a *MPC* of ⅔, the multiplier is 3; it consists of the 1 of primary investment plus 2 extra of secondary consumption respending.

The same arithmetic would give a multiplier of 4 for a *MPC* of ¾, because $1 + \frac{3}{4} + (\frac{3}{4})^2 + (\frac{3}{4})^3 + \ldots$ eventually adds up to 4. For a *MPC* of ½, the multiplier would be 2.[1]

The size of the multiplier thus depends upon how large the *MPC* is. It can also be expressed in terms of the twin concept, the *MPS*. For a *MPS* of ¼, the *MPC* is ¾ and the multiplier is 4. For a *MPS* of ⅓, the multiplier is 3. If the *MPS* were $1/x$, the multiplier would be $x$.

By this time it should be clear that the simple multiplier is always the inverse, or reciprocal, of the marginal propensity to save. It is thus equal to $1/(1 - MPC)$. Our simple multiplier formula is

$$\begin{aligned} \text{Change in output} &= \frac{1}{MPS} \times \text{change in investment} \\ &= \frac{1}{1 - MPC} \times \text{change in investment} \end{aligned}$$

[1] The formula for an infinite geometric progression is

$$1 + r + r^2 + r^3 + \cdots + r^n + \cdots = \frac{1}{1 - r}$$

as long as *MPC* ($r$) is less than 1 in absolute value.

### The Multiplier Model Compared with the AS-AD Model

As you study the multiplier model, you might begin to wonder how this model fits in with the *AS-AD* model of Chapter 19. These are not, in fact, different approaches. Rather, the multiplier model is a special case of the aggregate demand-and-supply model. It explains how *AD* is affected by consumption and investment spending under certain precise assumptions.

One of the key assumptions in the multiplier analysis is that prices and wages are fixed in the short run. This is an oversimplification, for many prices adjust quickly in the real world. But this assumption captures the point that if some wages and prices are sticky—which is most definitely the case—then some of the adjustment to *AD* shifts will come through output adjustments. We will return to this important point in later chapters.

We can show the relationship between the multiplier analysis and the *AS-AD* approach in Figure 22-8. Part (*b*) displays an *AS* curve that becomes completely vertical when output equals potential output. However, when there are unemployed resources—to the left of potential output in the graph—output will be determined primarily by the strength of aggregate demand. As investment increases, this increases *AD,* and equilibrium output rises.

The same economy can be described by the multiplier diagram in the top panel of Figure 22-8. The multiplier equilibrium gives the same level of output as the *AS-AD* equilibrium—both lead to a real GDP of *Q*. They simply stress different features of output determination.

This discussion again points to a crucial feature of the multiplier model. While it is a useful model for describing recessions or even depressions, it cannot apply to periods of full employment. Once factories are operating at full capacity and all workers are employed, the economy simply cannot produce more output.

## D. FISCAL POLICY IN THE MULTIPLIER MODEL

For centuries, economists have understood the *allocational* role of fiscal policy (government tax and spending programs). It has long been known that

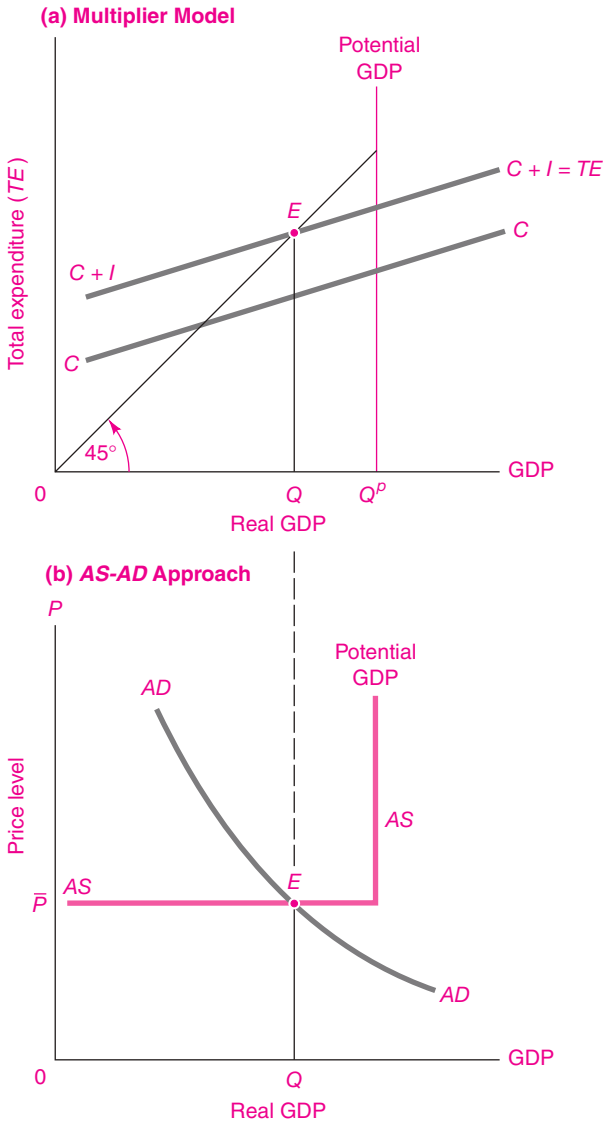


**FIGURE 22-8. How the Multiplier Model Relates to the *AS-AD* Approach**

The multiplier model is a way of understanding the workings of the *AS-AD* equilibrium.

**(a)** The top panel shows the output-expenditure equilibrium in the multiplier model. At point *E*, the spending line just cuts the 45° line, leading to equilibrium output of *Q*.

**(b)** The equilibrium can also be seen in the bottom panel, where the *AD* curve cuts the *AS* curve at point *E*. In this simplest business-cycle model wages and prices are assumed to be fixed, so the *AS* curve is horizontal until full employment is reached. Both approaches lead to exactly the same equilibrium output, *Q*.

fiscal programs are instrumental in deciding how the nation's output should be divided between collective and private consumption and how the burden of payment for collective goods should be divided among the population.

Only with the development of modern macroeconomic theory has a surprising fact been uncovered: Government fiscal powers also have a major *macroeconomic* impact upon the short-run movements of output, employment, and prices. The knowledge that fiscal policy has powerful effects upon economic activity led to the *Keynesian approach to macroeconomic policy,* which is the active use of government action to moderate business cycles. This approach was described by the Nobel Prize–winning macroeconomist James Tobin as follows:

> Keynesian policies are, first, the explicit dedication of macroeconomic policy instruments to real economic goals, in particular full employment and real growth of national income. Second, Keynesian demand management is activist. Third, Keynesians have wished to put both fiscal and monetary policies in consistent and coordinated harness in the pursuit of macroeconomic objectives.

In this section we use the multiplier model to show how government purchases affect output.

## HOW GOVERNMENT FISCAL POLICIES AFFECT OUTPUT

To understand the role of government in economic activity, we need to look at government purchases and taxation, along with the effects of those activities on private-sector spending. We now modify our earlier analysis by adding $G$ to $C + I$ to get a new total expenditure curve $TE = C + I + G$. This new schedule can describe the macroeconomic equilibrium when government, with its spending and taxing, is in the picture.

It will simplify our task in the beginning if we analyze the effects of government purchases with total taxes collected held constant (taxes that do not change with income or other economic variables are called *lump-sum taxes*). But even with a fixed dollar value of taxes, we can no longer ignore the distinction between disposable income and gross domestic product. Under simplified conditions (including no foreign trade, transfers, or depreciation), we know

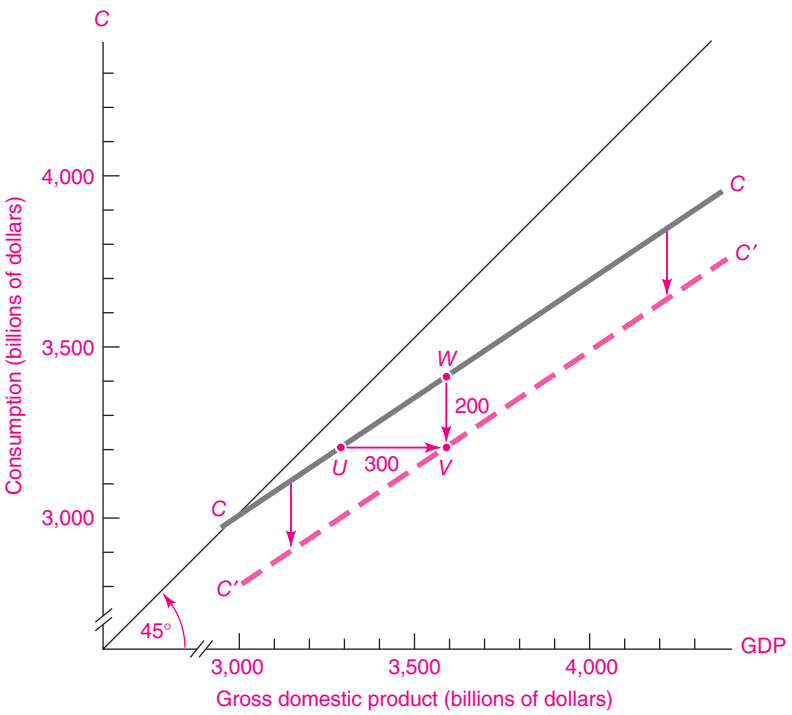


**FIGURE 22-9. Taxes Reduce Disposable Income and Shift *CC* Schedule to the Right and Down**

Each dollar of taxes paid shifts the *CC* schedule to the right by the amount of the tax. A rightward *CC* shift also means a downward *CC* shift, but the downward *CC* shift is less than the rightward shift. Why? Because the downward shift is equal to the rightward shift times the *MPC*. Thus, if the *MPC* is ⅔, the downward shift is ⅔ times \$300 billion = \$200 billion. Verify that $WV = \frac{2}{3}\ UV$.

from Chapter 20 that GDP equals disposable income plus taxes. But with tax revenues held constant, GDP and *DI* will always differ by the same amount; thus, after taking account of such taxes, we can still plot the *CC* consumption schedule against GDP rather than against *DI*.

Figure 22-9 shows how the consumption function changes when taxes are present. This figure draws the original no-tax consumption function as the blue *CC* line. In this case, GDP equals disposable income. We use the same consumption function as in Table 22-2 on page 440. Therefore, consumption is 3000 when GDP (and *DI*) is 3000, and so forth.

Now introduce taxes of 300. At a *DI* of 3000, GDP must equal 3300 = 300 + 3000. Consumption is still 3000 when GDP is 3300 because *DI* is 3000. We can therefore plot consumption as a function of GDP by shifting the consumption function rightward to the green *C′C′* curve. The amount of the rightward shift is *UV*, which is exactly equal to the amount of taxes, 300.

Alternatively, we can plot the new consumption function as a parallel *downward* shift by 200. As Figure 22-9 shows, 200 is the result of multiplying a decrease in income of 300 times the *MPC* of ⅔.

Turning next to the different components of aggregate demand, recall from Chapter 20 that GDP consists of four elements:

$$\begin{aligned}\text{GDP} = {} & \text{consumption expenditure} \\ & + \text{gross private domestic investment} \\ & + \text{government purchases of goods and services} \\ & + \text{net exports} \\ = {} & C + I + G + X\end{aligned}$$

For now, we consider a closed economy with no foreign trade, so our GDP consists of the first three components, $C + I + G$. (We add the final component, net exports, when we consider open-economy macroeconomics.)

Figure 22-10 shows the effect of including government purchases. This diagram is very similar to the one used earlier in this chapter (see Figure 22-7). Here, we have added a new expenditure stream, *G*, to the consumption and investment amounts. Diagrammatically, we place the new variable, *G* (government

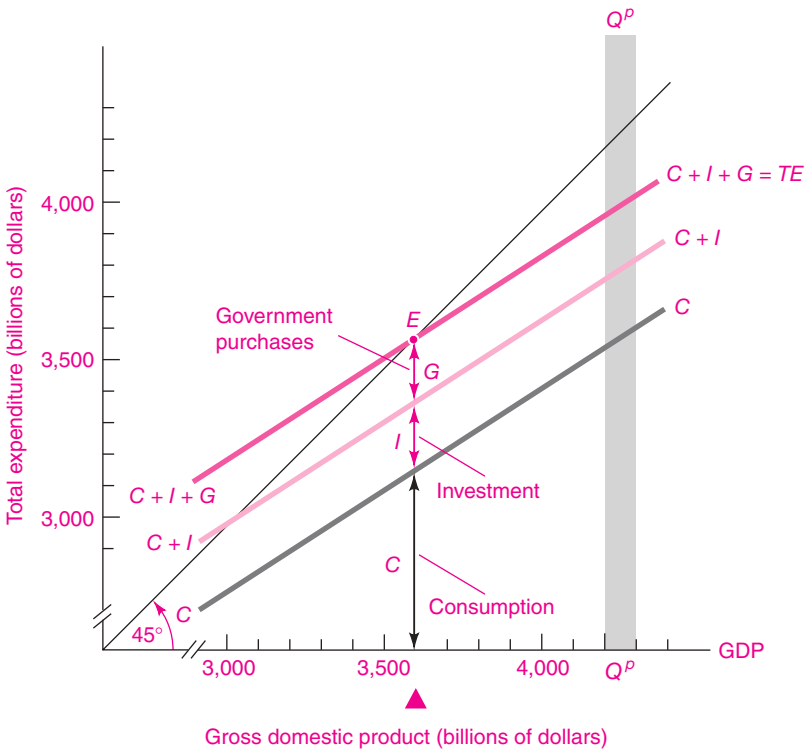


**FIGURE 22-10. Government Purchases Add On Just like Investment to Determine Equilibrium GDP**

We now add government purchases on top of consumption and investment spending. This gives us the new total planned expenditure schedule, $TE = C + I + G$. At $E$, where the $TE$ schedule intersects the 45° line, we find the equilibrium level of GDP.

purchases of goods and services), on top of the consumption function and the fixed amount of investment. The vertical distance between the $C + I$ line and the new $TE = C + I + G$ line is just the quantity of $G$.

Why do we simply add $G$ on the top? Because spending on government buildings ($G$) has the same macroeconomic impact as spending on private buildings ($I$); the collective expenditure involved in buying a government vehicle ($G$) has the same effect on jobs as private consumption expenditures on automobiles ($C$).

We end up with the three-layer cake of $TE = C + I + G$, calculating the amount of total spending forthcoming at each level of GDP. We now must locate the point of intersection of the $TE$ line with the 45° line to find the equilibrium level of GDP. At this equilibrium GDP level, denoted by point $E$ in Figure 22-10, total planned spending exactly equals total planned output. Point $E$ thus indicates the equilibrium level of output when we add government purchases to the multiplier model.

## *Impact of Taxation on Aggregate Demand*

How does government taxation tend to reduce aggregate demand and the level of GDP? Extra taxes lower our disposable incomes, and lower disposable incomes tend to reduce our consumption spending. Clearly, if investment and government purchases remain unchanged a reduction in consumption spending will then reduce GDP and employment. Thus, in the multiplier model, higher taxes without increases in government purchases will tend to reduce real GDP.[2]

A look back at Figure 22-9 confirms this reasoning. In this figure, the upper $CC$ curve represents the level of the consumption function with no taxes. But the upper curve cannot be the consumption function because consumers definitely pay taxes on their incomes. Suppose that consumers pay $300 billion in taxes at every level of income; thus, $DI$ is exactly $300 billion less than GDP at every level of output.

[2] Strictly speaking, by "taxes" in this chapter we mean net taxes, or taxes minus transfer payments.

As shown in Figure 22-9, this level of taxes can be represented by a rightward shift in the consumption function of $300 billion. This rightward shift will also appear as a downward shift; if the *MPC* is ⅔, the rightward shift of $300 billion will be seen as a downward shift of $200 billion.

Without a doubt, taxes lower output in our multiplier model, and Figure 22-10 shows why. When taxes rise, $I + G$ does not change, but the increase in taxes will lower disposable income, thereby shifting the *CC* consumption schedule downward. Hence, the $C + I + G$ schedule shifts downward. You can pencil in a new, lower $C + I + G$ schedule in Figure 22-10. Confirm that its new intersection with the 45° line must be at a lower equilibrium level of GDP.

Keep in mind that $G$ is government purchases of goods and services. It excludes spending on transfers such as unemployment insurance or social security payments. These transfers are treated as negative taxes, so the taxes ($T$) considered here can best be thought of as taxes less transfers. Therefore, if direct and indirect taxes total $400 billion, while all transfer payments are $100 billion, then net taxes, *T*, are $400 − $100 = $300 billion. (Can you see why an increase in social security benefits lowers *T*, raises *DI*, shifts the $C + I + G$ curve upward, and raises equilibrium GDP?)

## A Numerical Example

The points made up to now are illustrated in Table 22-3. This table is very similar to Table 22-2, which illustrated output determination in the simplest multiplier model. The first column shows a reference level of GDP, while the second shows a fixed level of taxes, $300 billion. Disposable income in column (3) is GDP less taxes. Planned consumption, taken as a function of *DI*, is shown in column (4). Column (5) shows the fixed level of planned investment, while column (6) exhibits the level of government purchases. To find total planned expenditures, *TE*, in column (7), we add together the *C*, *I*, and *G* in columns (4) through (6).

Finally, we compare total desired expenditures *TE* in column (7) with the initial level of GDP in column (1). If desired spending is above GDP, firms raise production to meet the level of spending, and output consequently rises; if desired spending is below GDP, output falls. This tendency, shown in the last column, assures us that output will tend toward its equilibrium level at $3600 billion.

**Output Determination with Government Spending (billions of dollars)**

| (1) Initial level of GDP | (2) Taxes *T* | (3) Disposable income *DI* | (4) Planned consumption *C* | (5) Planned investment *I* | (6) Government expenditure *G* | (7) Total planned expenditure, *TE* ($C + I + G$) | (8) Resulting tendency of economy |
|---|---|---|---|---|---|---|---|
| 4,200 | 300 | 3,900 | 3,600 | 200 | 200 | 4,000 ↓ | Contraction |
| 3,900 | 300 | 3,600 | 3,400 | 200 | 200 | 3,800 ↓ | Contraction |
| **3,600** | **300** | **3,300** | **3,200** | **200** | **200** | **3,600** | **Equilibrium** |
| 3,300 | 300 | 3,000 | 3,000 | 200 | 200 | 3,400 ↑ | Expansion |
| 3,000 | 300 | 2,700 | 2,800 | 200 | 200 | 3,200 ↑ | Expansion |

**TABLE 22-3. Government Purchases, Taxes, and Investment Also Determine Equilibrium GDP**

This table shows how output is determined when government purchases of goods and services are added to the multiplier model. In this example, taxes are "lump-sum" or independent of the level of income. Disposable income is thus GDP minus $300 billion. Total spending is $I + G +$ the consumption determined by the consumption function.

At levels of output less than $3600 billion, planned spending is greater than output, so output expands. Levels of output greater than $3600 are unsustainable and lead to contraction. Only at output of $3600 is output in equilibrium—that is, planned spending equals output.

## FISCAL-POLICY MULTIPLIERS

The multiplier analysis shows that government fiscal policy is high-powered spending much like investment. The parallel suggests that fiscal policy should also have multiplier effects upon output. And this is exactly right.

The **government expenditure multiplier** is the increase in GDP resulting from an increase of $1 in government purchases of goods and services. An initial government purchase of a good or service will set in motion a chain of spending: if the government builds a road, the road-builders will spend some of their incomes on consumption goods, which in turn will generate additional incomes, some of which will be spent. In the simple model examined here, the ultimate effect on GDP of an extra dollar of *G* will be the same as the effect of an extra dollar of *I:* the multipliers are both equal to $1/(1 - MPC)$. Figure 22-11 shows how a change in *G* will result in a higher level of GDP, with the increase being a multiple of the increase in government purchases.

To show the effects of an extra $100 billion of *G,* the $C + I + G$ curve in Figure 22-11 has been shifted up by $100 billion. The ultimate increase in GDP is equal to the $100 billion of primary spending times the expenditure multiplier. In this case, because the *MPC* is ⅔, the multiplier is 3, so the equilibrium level of GDP rises by $300 billion.

This example, as well as common sense, tells us that the government expenditure multiplier is exactly the same number as the investment multiplier. They are both called **expenditure multipliers.**

Also, note that the multiplier horse can be ridden in both directions. If government purchases were to fall, with taxes and other influences held constant, GDP would decline by the change in *G* times the multiplier.

The effect of *G* on output can be seen as well in the numerical example of Table 22-3. You can pencil in a different level of *G*—say, $300 billion—and find the equilibrium level of GDP. It should give the same answer as Figure 22-11.

We can sum up:

Government purchases of goods and services (*G*) are an important force in determining output and employment. In the multiplier model, if *G* increases, output will rise by the increase in *G* times the expenditure multiplier. Government purchases therefore have the potential to increase or decrease output over the business cycle.

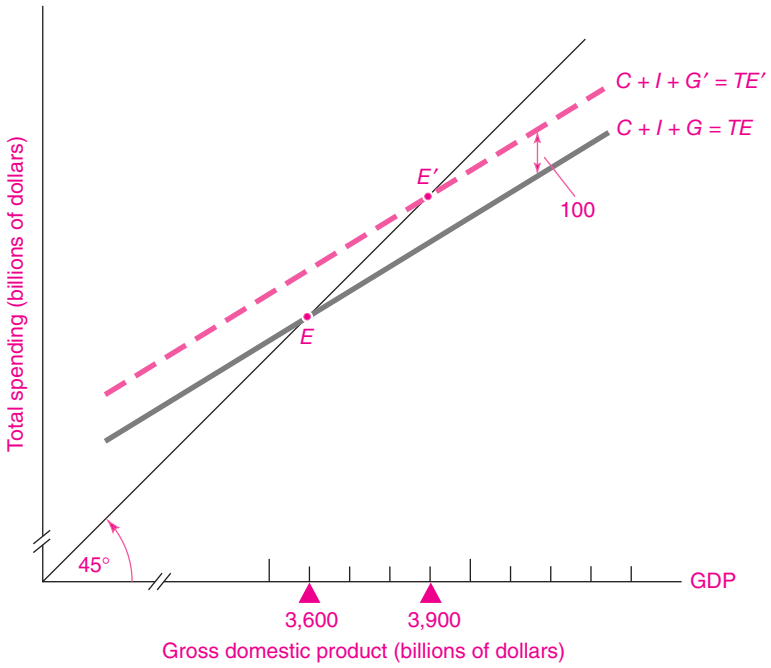


**FIGURE 22-11. The Effect of Higher *G* on Output**

Suppose that the government raises defense purchases by $100 billion in response to a threat to Mideast oil fields. This shifts upward the $C + I + G$ line by $100 billion to $C + I + G'$.

The new equilibrium level of GDP is thus read off the 45° line at $E'$ rather than at *E.* Because the *MPC* is ⅔, the new level of output is $300 billion higher. That is, the government expenditure multiplier is

$$3 = \frac{1}{1 - \frac{2}{3}}$$

(What would the government expenditure multiplier be if the *MPC* were ¾? ⁹⁄₁₀?)

**Economic Stimulus from Defense Spending**

| War | Period of war or buildup | Increase in defense spending as percent of GDP | Real GDP growth over buildup period (%) |
|---|---|---|---|
| World War I | 1916–1918 | 10.2 | 13.0 |
| World War II | | | |
| Before Pearl Harbor | 1939–1941 | 9.7 | 26.7 |
| All years | 1939–1944 | 41.4 | 69.1 |
| Korean War | 1950:3–1951:3 | 8.0 | 10.5 |
| Vietnam War | 1965:3–1967:1 | 1.9 | 9.7 |
| Persian Gulf War | 1990:3–1991:1 | 0.3 | −1.3 |
| Iraq War | 2003:1–2003:2 | 0.1 | 0.5 |

**TABLE 22-4. Economic Booms Accompany Large Increases in Military Spending**

This table shows the period of the war or buildup, the size of the military buildup, and the resulting increase in real GDP. Major wars have produced sustained economic booms, but the last two wars, with relatively little growth in military spending, had only a small impact on the economy.

Source: Department of Commerce, National Income and Product Accounts, available at *www.bea.gov,* and estimates by authors. The dates are year and quarter. Hence, 1950:3 is the third quarter of 1950.

Are Wars Necessary for Full Employment?

Historically, economic expansions were the constant companions of war. As can be seen in Table 22-4, major wars in the past were often accompanied by large increases in military spending. In World War II, for example, defense outlays rose by almost 10 percent of total GDP before Pearl Harbor was bombed in December 1941. Indeed, many scholars believe that the United States emerged from the Great Depression largely because of the buildup for World War II. Similar but smaller military buildups accompanied economic expansions in the Korean and Vietnam Wars.

By contrast, the Persian Gulf War of the early 1990s triggered a recession. The reason for this anomaly was that there was but a small increase in military spending and psychological factors triggered by the war more than offset the increase in *G*.

What were these psychological factors? After Iraq invaded Kuwait in August 1990, consumers and investors became frightened and reduced spending. Additionally, oil prices shot up, lowering real incomes. These factors then reversed after the U.S. victory in February 1991.

What was the impact of the war in Iraq in early 2003? This war resembled the Persian Gulf War more than it did major wars. There was little increase in defense spending, while cautious consumers and businesses, along with high oil prices, produced a strong headwind that slowed the economy.

The role of wartime spending in economic expansions is one of the most direct and persuasive examples of the functioning of the multiplier model. Make sure you understand the underlying mechanism as well as why the sizes of the economic expansions shown in Table 22-4 vary so much.

## *Impact of Taxes*

Taxes also have an impact upon equilibrium GDP, although the size of tax multipliers is smaller than that of expenditure multipliers. Consider the following example: Suppose the economy is at its potential GDP and the nation raises defense spending by $200 billion. Such sudden increases have occurred at many points in the history of the United States—in the early 1940s for World War II, in 1951 for the Korean war, in the mid-1960s for the Vietnam war, and in the early 1980s during the Reagan administration's military buildup. Furthermore, say that economic planners wish to raise taxes just enough to offset the effect on GDP of the $200 billion increase in *G*. How much would taxes have to be raised?

We are in for a surprise. To offset the $200 billion increase in *G*, we need to increase tax collections by more than $200 billion. In our numerical example, we can find the exact size of the tax, or *T*, increase from Figure 22-9. That figure shows that a $300 billion increase in *T* reduces disposable income by just enough to produce a consumption decline of $200 billion when the *MPC* is ⅔. Put differently, a tax increase of $300 billion will shift the *CC* curve down by $200 billion. Hence, while a $1 billion increase in defense spending shifts up the $C + I + G$ line by $1 billion, a $1 billion tax increase shifts down the $C + I + G$ line by only $⅔ billion (when the *MPC* is ⅔). Thus offsetting an increase in government purchases requires an increase in *T* larger than the increase in *G*.

Tax changes are a powerful weapon in affecting output. But the tax multiplier is smaller than the expenditure multiplier by a factor equal to the *MPC:*

Tax multiplier = *MPC* × expenditure multiplier

The reason the tax multiplier is smaller than the expenditure multiplier is straightforward. When government spends $1 on *G*, that $1 gets spent directly on GDP. On the other hand, when government cuts taxes by a dollar, only part of that dollar is spent on *C*, while a fraction of that $1 tax cut is saved. The difference in the responses to a dollar of *G* and to a dollar of *T* is enough to lower the tax multiplier below the expenditure multiplier.[3]

### The Multiplier Model and the Business Cycle

The multiplier model is the simplest model of the business cycle. It can show how changes in investment due to innovation or pessimism, or fluctuations in government spending due to war, can lead to sharp changes in output. Suppose that war breaks out and the country increases military spending (as illustrated by the many cases in Table 22-4). *G* increases, and this leads to a multiplied increase in output, as seen in Figure 22-11. If you look back at Figure 22-2 on page 430, you can see how large wars were accompanied by large increases in output relative to potential output. Similarly, suppose that a burst of innovation leads to rapid growth in investment, as occurred with the new-economy boom of the 1990s. This would lead to an upward shift in the $C + I + G$ curve and to higher output. Again, you can see the results in Figure 22-2. Make sure you can graph each of these examples using the $C + I + G$ apparatus. Also, make sure you can explain why a revolution in a country that led to sharp decline in investment might lead to a recession.

Economists often combine the multiplier model with the accelerator principle of investment as an internal theory of the business cycle. In this approach, every expansion breeds recession and contraction, and every contraction breeds revival and expansion—in a quasi-regular, repeating chain. According to the accelerator principle, rapid output growth stimulates investment, which is amplified by the multiplier on investment. High investment, in turn, stimulates more output growth, and the process continues until the capacity of the economy is reached, at which point the economic growth rate slows. The slower growth, in turn, reduces investment spending, and this, working through the multiplier, tends to send the economy into a recession. The process then works in reverse until the trough is reached, and the economy then stabilizes and turns up again. This internal theory of the business cycle shows a mechanism, like the rise and fall of the tides in which an exogenous shock tends to propagate itself through the economy in a cyclical fashion. (See question 11 at the end of the chapter for a numerical example.)

The multiplier model, working together with the dynamics of investment, shows how alternating bouts of investment optimism and pessimism, along with changes in other exogenous expenditures, can lead to the fluctuations that we call business cycles.

[3] For simplicity, we take the absolute value of the tax multiplier (since the multiplier is actually negative). The different multipliers can be seen using the device of the "expenditure rounds" shown on page 441. Let the *MPC* be *r*. Then if *G* goes up by 1 unit, the total increase in spending is the sum of secondary responding rounds:

$$1 + r + r^2 + r^3 + \cdots = \frac{1}{1 - r}$$

Now, if taxes are reduced by $1, consumers save $(1 - r)$ of the increased disposable income and spend *r* dollars on the first round. With the further rounds, the total spending is thus

$$r + r^2 + r^3 + \cdots = \frac{r}{1 - r}$$

Thus the tax multiplier is *r* times the expenditure multiplier, where *r* is the *MPC*.

### The Multiplier Model in Perspective

We have completed our introductory survey of the Keynesian multiplier model. It will be useful to put all this in perspective and see how the multiplier model fits into a broader view of the macroeconomy. Our goal is to understand what determines the level of national output in a country. In the long run, a country's production and living standards are largely determined by its potential output. But in the short run, business conditions will push the economy above or below its long-term trend. It is this deviation of output and employment from the long-term trend that we analyze with the multiplier model.

The multiplier model has been enormously influential in business-cycle theory over the last half-century. However, it gives an oversimplified picture of the economy. One of the most significant omissions is the impact of financial markets and monetary policy on the economy. Changes in output tend to affect interest rates, which in turn affect the economy. Additionally, the simplest multiplier model omits the interactions between the domestic economy and the rest of the world. Finally, the model omits the supply side of the economy as represented by the interaction of spending with aggregate supply and prices. All of these shortcomings will be remedied in later chapters, and it is useful to keep in mind that this first model is simply a stepping stone on the path to understanding the economy in all its complexity.

The multiplier analysis focuses primarily on spending changes as the factors behind short-run output movements. In this approach, fiscal policy is often used as a tool to stabilize the economy. But the government has another equally powerful weapon in monetary policy. Although monetary policy works quite differently, it has many advantages as a means of combating unemployment and inflation.

The next two chapters survey one of the most fascinating parts of all economics: money and financial markets. Once we understand how the central bank helps determine interest rates and credit conditions, we will have a fuller appreciation of how governments can tame the business cycles that have run wild through much of the history of capitalism.

## SUMMARY

### A. What are Business Cycles?

1. Business cycles or fluctuations are swings in total national output, income, and employment, marked by widespread expansion or contraction in many sectors of the economy. They occur in all advanced market economies. We distinguish the phases of expansion, peak, recession, and trough.
2. Most business cycles occur when shifts in aggregate demand cause changes in output, employment, and prices. Aggregate demand shifts when changes in spending by consumers, businesses, or governments change total spending relative to the economy's productive capacity. A decline in aggregate demand leads to recessions or even depressions. An upturn in economic activity can lead to inflation.
3. Business-cycle theories differ in their emphasis on exogenous and internal factors. Importance is often attached to fluctuations in such exogenous factors as technology, elections, wars, exchange-rate movements, and oil-price shocks. Most theories emphasize that these exogenous shocks interact with internal mechanisms, such as financial market bubbles and busts.

### B. Aggregate Demand and Business Cycles

4. Ancient societies suffered when harvest failures produced famines. The modern market economy can suffer from poverty amidst plenty when insufficient aggregate demand leads to deteriorating business conditions and high unemployment. At other times, excessive government spending and reliance on the monetary printing press can lead to runaway inflation. Understanding the forces that affect aggregate demand, including government fiscal and monetary policies, can help economists and policymakers smooth out the cycle of boom and bust.
5. Aggregate demand represents the total quantity of output willingly bought at a given price level, other things held constant. Components of spending include ($a$) consumption, which depends primarily upon disposable income; ($b$) investment, which depends upon present and expected future output and upon interest rates and taxes; ($c$) government purchases of goods and services; and ($d$) net exports, which depend upon foreign and domestic outputs and prices and upon foreign exchange rates.

6. Aggregate demand curves differ from demand curves used in microeconomic analysis. The *AD* curves relate overall spending on all components of output to the overall price level, with policy and exogenous variables held constant. The aggregate demand curve is downward-sloping because a higher price level reduces real income and real wealth.
7. Factors that change aggregate demand include (*a*) macroeconomic policies, such as fiscal and monetary policies, and (*b*) exogenous variables, such as foreign economic activity, technological advances, and shifts in asset markets. When these variables change, they shift the *AD* curve.

### C. The Multiplier Model

8. The multiplier model provides a simple way to understand the impact of aggregate demand on the level of output. In the simplest approach, household consumption is a function of disposable income, while investment is fixed. People's desire to consume and the willingness of businesses to invest are brought into balance by adjustments in output. The equilibrium level of national output occurs when planned spending equals planned output. Using the expenditure-output approach, equilibrium output comes at the intersection of the total expenditure (*TE*) consumption-plus-investment schedule and the 45° line.
9. If output is temporarily above its equilibrium level, businesses find output higher than sales, with inventories piling up involuntarily and profits plummeting. Firms therefore cut production and employment back toward the equilibrium level. The only sustainable level of output comes when buyers desire to purchase exactly as much as businesses desire to produce. Thus, for the simplified Keynesian multiplier model, investment calls the tune and consumption dances to the music.
10. Investment has a *multiplied effect* on output. When investment changes, output will initially rise by an equal amount. But that output increase is also an income increase for consumers. As consumers spend a part of their additional income, this sets in motion a whole chain of additional consumption spending and employment.
11. If people always spend *r* of each extra dollar of income on consumption, the total of the multiplier chain will be

$$1 + r + r^2 + \cdots = \frac{1}{1 - r} = \frac{1}{1 - MPC} = \frac{1}{MPS}$$

The simplest multiplier is numerically equal to $1/(1 - MPC)$.
12. Key points to remember are (*a*) the basic multiplier model emphasizes the importance of shifts in aggregate demand in affecting output and income and (*b*) it is primarily applicable for situations with unemployed resources.

### D. Fiscal Policy in the Multiplier Model

13. The analysis of fiscal policy elaborates the Keynesian multiplier model. It shows that an increase in government purchases—taken by itself, with taxes and investment unchanged—has an expansionary effect on national output much like that of investment. The total expenditure $TE = C + I + G$ schedule shifts upward to a higher equilibrium intersection with the 45° line.
14. A decrease in taxes—taken by itself, with investment and government purchases unchanged—raises the equilibrium level of national output. The *CC* schedule of consumption plotted against GDP is shifted upward and leftward by a tax cut. But since the extra dollars of disposable income go partly into saving, the dollar increase in consumption will not be quite as great as the increase in new disposable income. Therefore, the tax multiplier is smaller than the government-expenditure multiplier.

## CONCEPTS FOR REVIEW

**Business Fluctuations or Cycles**

business cycle or business fluctuation
business-cycle phases: peak, trough, expansion, contraction
recession
exogenous and internal cycle theories

**Aggregate Demand**

aggregate demand shifts and business fluctuations
aggregate demand, *AD* curve
major components of aggregate demand: *C*, *I*, *G*, *X*
downward-sloping *AD* curve
factors underlying and shifting the *AD* curve

**The Basic Multiplier Model**

$TE = C + I + G$ schedule
output and spending: planned vs. actual levels
multiplier effect of investment

multiplier

$$= 1 + MPC + (MPC)^2 + \cdots$$
$$= \frac{1}{1 - MPC} = \frac{1}{MPS}$$

### Government Purchases and Taxation

fiscal policy:
- $G$ effect on equilibrium GDP
- $T$ effect on $CC$ and on GDP

multiplier effects of government purchases ($G$) and taxes ($T$)

$C + I + G$ curve

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

The quotation from Okun is Arthur M. Okun, *The Political Economy of Prosperity* (Norton, New York, 1970), pp. 33 ff. This is a fascinating book on the economic history of the 1960s written by one of America's great macroeconomists.

The classic study of business cycles by leading scholars at the National Bureau of Economic Research (NBER) is Arthur F. Burns and Wesley Clair Mitchell, *Measuring Business Cycles* (Columbia University Press, New York, 1946). This is available from the NBER at *www.nber.org/books/burn46-1*. The multiplier model was developed by John Maynard Keynes in *The General Theory of Employment, Interest and Money* (Harcourt, New York, first published in 1935). Advanced treatments can be found in the intermediate textbooks listed in the Further Reading section in Chapter 19. One of Keynes's most influential books, *The Economic Consequences of the Peace* (1919), predicted with uncanny accuracy that the Treaty of Versailles would lead to disastrous consequences for Europe.

### Websites

A consortium of macroeconomists participates in the NBER program on economic fluctuations and growth. You can sample the writings and data at *www.nber.org/programs/efg/efg.html*. The NBER also dates business cycles for the United States. You can see the recessions and expansions along with a discussion at *www.nber.org/cycles.html*.

Business-cycle data and discussion can be found at the site of the Bureau of Economic Analysis, *www.bea.gov*. The first few pages of the *Survey of Current Business,* available at *www.bea.gov/bea/pubs.htm,* contain a discussion of recent business-cycle developments.

## QUESTIONS FOR DISCUSSION

1. Define carefully the difference between movements along the *AD* curve and shifts of the *AD* curve. Explain why an increase in potential output would shift out the *AS* curve and lead to a movement along the *AD* curve. Explain why a tax cut would shift the *AD* curve outward (increase aggregate demand).
2. Construct a table parallel to Table 22-1, listing events that would lead to a *decrease* in aggregate demand. (Your table should provide different examples rather than simply changing the direction of the factors mentioned in Table 22-1.)
3. In recent years, a new theory of real business cycles (or RBCs) has been proposed (this approach is further analyzed in Chapter 31). RBC theory suggests that business fluctuations are caused by shocks to productivity, which then propagate through the economy.
   a. Show the RBC theory in the *AS-AD* framework.
   b. Discuss whether the RBC theory can explain the customary characteristics of business fluctuations described on pages 430–431.
4. In the simple multiplier model, assume that investment is always zero. Show that equilibrium output in this special case would come at the break-even point of the consumption function. Why would equilibrium output come *above* the break-even point when investment is positive?
5. Define carefully what is meant by equilibrium in the multiplier model. For each of the following, state why the situation is *not* an equilibrium. Also describe how the economy would react to each of the situations to restore equilibrium.
   a. In Table 22-2, GDP is $3300 billion.
   b. In Figure 22-7, actual investment is zero and output is at *M*.
   c. Car dealers find that their inventories of new cars are rising unexpectedly.
6. Reconstruct Table 22-2 assuming that planned investment is equal to (*a*) $300 billion and (*b*) $400 billion. What is the resulting difference in GDP? Is this difference greater or smaller than the change in *I*? Why?

When $I$ drops from $200 billion to $100 billion, how much must GDP drop?

7. Give (*a*) the common sense, (*b*) the arithmetic, and (*c*) the geometry of the multiplier. What are the multipliers for $MPC = 0.9$? 0.8? 0.5?
8. Explain in words and using the notion of expenditure rounds why the tax multiplier is smaller than the expenditure multiplier.
9. "Even if the government spends billions on wasteful military armaments, this action can create jobs in a recession." Discuss.
10. **Advanced problem:** The growth of nations depends crucially on saving and investment. And from youth we are taught that thrift is important and that "a penny saved is a penny earned." But will higher saving necessarily benefit the economy? In a striking argument called *the paradox of thrift,* Keynes pointed out that when people attempt to save more, this will not necessarily result in more saving for the nation as a whole.

    To see this point, assume that people decide to save more. Higher desired saving means lower desired consumption, or a downward shift in the consumption function. Illustrate how an increase in desired saving shifts down the *TE* curve in the multiplier model of Figure 22-7. Explain why this will *decrease output with no increase in saving!* Provide the intuition here that if people try to increase their saving and lower their consumption for a given level of business investment, sales will fall and businesses will cut back on production. Explain how far output will fall.

    Here then is the paradox of thrift: When the community desires to save more, the effect may actually be a lowering of income and output with no increase of saving.

11. **Advanced problem illustrating the multiplier-accelerator mechanism:** Find two dice and use the following technique to see if you can generate something that looks like a business cycle: Record the numbers from 20 or more rolls of the dice. Take five-period moving averages of the successive numbers. Then plot these averages. They will look very much like movements in GDP, unemployment, or inflation.

    One sequence thus obtained was 7, 4, 10, 3, 7, 11, 7, 2, 9, 10, . . . The averages were $(7 + 4 + 10 + 3 + 7)/5 = 6.2$; $(11 + 7 + 2 + 9 + 10)/5 = 7$, and so forth. Why does this look like a business cycle?

    [*Hint:* The random numbers generated by the dice are like exogenous shocks of investment or wars. The moving average is like the economic system's (or a rocking chair's) internal multiplier or smoothing mechanism. Taken together, they produce what looks like a cycle.]

12. **Data problem:** Some economists prefer an objective, quantitative definition of a recession to the more subjective approach used by the NBER. These economists define a recession as any period during which real GDP declined for at least two quarters in a row. Note from the text that this is *not* the way the NBER defines a recession.
    a. Get quarterly data on real GDP for the United States for the period since 1948. This can be obtained from the website of the Bureau of Economic Analysis, *www.bea.gov.* Put the data in a column of a spreadsheet, along with the corresponding date in another column.
    b. Calculate in a spreadsheet the percent growth rate of real GDP for each quarter at an annual rate. This is calculated as follows:

$$g_t = 400 \times \frac{x_t - x_{t-1}}{x_{t-1}}$$

    c. Under this alternative definition, which periods would you identify as recessions? For which years does this alternative objective procedure reach a conclusion different from that of the NBER?

CHAPTER

# Money and the Financial System

23

*Over all history, money has oppressed people in one of two ways: either it has been abundant and very unreliable, or reliable and very scarce.*

John Kenneth Galbraith
*The Age of Uncertainty* (1977)

The financial system is one of the most important and innovative sectors of a modern economy. It forms the vital circulatory system that channels resources from savers to investors. Whereas finance in an earlier era consisted of banks and the country store, finance today involves a vast, worldwide banking system, securities markets, pension funds, and a wide array of financial instruments. When the financial system functions smoothly, as was the case for most of the period since World War II, it contributes greatly to healthy economic growth. However, when banks fail and people lose confidence in the financial system, as happened in the world financial crisis of 2007–2009, credit becomes scarce, investment is curbed, and economic growth slows.

## Overview of the Monetary Transmission Mechanism

One of the most important topics in macroeconomics is the *monetary transmission mechanism*. This refers to the process by which monetary policy undertaken by the central bank (in the case of the U.S., the Federal Reserve), interacts with banks and the rest of the economy to determine interest rates, financial conditions, aggregate demand, output, and inflation.

We can provide an overview of the monetary transmission mechanism as a series of five logical steps:

1. The central bank announces a target short-term interest rate that depends upon its objectives and the state of the economy.
2. The central bank undertakes daily open-market operations to meet its interest-rate target.
3. The central bank's new interest-rate target and market expectations about future financial conditions help determine the entire spectrum of short- and long-term interest rates, asset prices, and exchange rates.
4. The changes in interest rates, credit conditions, asset prices, and exchange rates affect investment, consumption, and net exports.
5. Changes in investment, consumption, and net exports affect the path of output and inflation through the *AS-AD* mechanism.

We survey the different elements of this mechanism in the three chapters on money, finance, and central banking. Chapter 15 examined the major elements of interest rates and capital. The present chapter focuses on the private financial sector, including the structure of the financial system (Section A), the

demand for money (Section B), banks (Section C), and the stock market (Section D). The next chapter surveys central banking as well as the way in which financial markets interact with the real economy to determine output and inflation. When you have completed these chapters, you will understand the different steps in the monetary transmission mechanism. It is one of the most important parts of all of macroeconomics.

## A. THE MODERN FINANCIAL SYSTEM

### The Role of the Financial System

The financial sector of an economy is the circulatory system that links together goods, services, and finance in domestic and international markets. It is through money and finance that households and firms borrow from and lend to each other in order to consume and invest. People may borrow or lend because their cash incomes do not match their desired spending. For example, students generally have spending needs for tuition and living expenses that exceed their current incomes. They often finance their excess spending with student loans. Similarly, working couples will generally save some of their current incomes for retirement, perhaps by buying stocks or bonds. They are thereby financing their retirement.

The activities involved in finance take place in the **financial system.** This encompasses the markets, firms, and other institutions which carry out the financial decisions of households, businesses, and governments. Important parts of the financial system include the money market (discussed later in this chapter), markets for fixed-interest assets like bonds or mortgages, stock markets for the ownership of firms, and foreign exchange markets which trade the monies of different countries. Most of the financial system in the United States is composed of for-profit entities, but government institutions such as the Federal Reserve System and other regulatory bodies are particularly important for ensuring an efficient and stable financial system.

Borrowing and lending take place in financial markets and through financial intermediaries. **Financial markets** are like other markets except that their products and services consist of financial instruments like stocks and bonds. Important financial markets are stock markets, bond markets, and foreign exchange markets.

Institutions which provide financial services and products are called **financial intermediaries.** Financial institutions differ from other businesses because their assets are largely financial, rather than real assets like plant and equipment. Many retail financial transactions (such as banking or purchase of insurance) take place through financial intermediaries rather than directly in financial markets.

The most important financial intermediaries are commercial banks, which take deposits of funds from households and other groups and lend these funds to businesses and others who need funds; banks also "create" the special product known as money. Other important financial intermediaries are insurance companies and pension funds; these firms provide specialized services such as insurance policies and investments held until people retire.

Yet another group of intermediaries pools and subdivides securities. These intermediaries include mutual funds (which hold bonds and corporate stocks on behalf of small investors), government-sponsored mortgage buyers (which buy mortgages from banks and sell them to other financial institutions), and "derivative" firms (which buy assets and then subdivide them into various parts).

Table 23-1 shows the growth and composition of the assets of financial institutions in the United States. There has been substantial growth and innovation in this area, such that the ratio of all assets to GDP grew from 1.5 in 1965 to 4.5 in 2007. This growth took place because of increased *financial intermediation*, which is a process in which assets are bought, repackaged, and resold several times. The purpose of financial intermediation is to transform illiquid assets into liquid assets that small investors can buy. By the end of 2007, financial intermediaries had total assets of $61 trillion, or around $530,000 per American household. Clearly, given the investments people have in this sector, a careful study is important not only for good policy but also for wise household financial decision making.

### The Functions of the Financial System

Because the financial system is such a critical part of a modern economy, let's consider its major functions:

| | 1965 | | 2007 | |
|---|---|---|---|---|
| | Total assets ($, billion) | Percent of total | Total assets ($, billion) | Percent of total |
| Federal Reserve | 112 | 11 | 2,863 | 5 |
| Commercial banks | 342 | 33 | 11,195 | 18 |
| Other credit institutions | 198 | 19 | 2,575 | 4 |
| Insurance and pension funds | 325 | 31 | 16,557 | 27 |
| Money market and mutual funds | 43 | 4 | 11,509 | 19 |
| Government-sponsored mortgage firms | 20 | 2 | 9,322 | 15 |
| Asset-backed securities | 0 | 0 | 4,221 | 7 |
| Security brokers, dealers, and miscellaneous | 10 | 1 | 3,095 | 5 |
| Total | 1050 | 100 | 61,337 | 100 |
| Percent of GDP | 146% | | 450% | |

**TABLE 23-1. Assets of Major Financial Institutions in the United States**

The financial sector has evolved rapidly over the last four decades. The table shows the total assets of all financial institutions, the grand total of which increased from 146 to 450 percent of GDP. Banks and other credit institutions declined in importance as secondary institutions like mutual funds and government-sponsored mortgage guarantors expanded sharply. Some important new areas, such as asset-backed securities, did not even exist in the 1960s.

Source: Federal Reserve Board, Flow of Funds, available at *www.federalreserve.gov/releases/z1/*, level tables.

- The financial system *transfers resources* across time, sectors, and regions. This function allows investments to be devoted to their most productive uses rather than being bottled up where they are least needed. We provided the examples above of student loans and retirement saving. Another example is found in international finance. Japan, which has a high saving rate, transfers resources to China, which has robust investment opportunities; this transfer occurs through both loans and direct foreign investments in China.
- The financial system *manages risks* for the economy. In one sense, risk management is like resource transfer: it moves risks from those people or sectors that most need to reduce their risks and transfers or spreads the risks to others who are better able to weather them. For example, fire insurance on your house takes a risk that you may lose a $200,000 investment and spreads that risk among hundreds or thousands of stockholders of the insurance company.
- The financial system *pools and subdivides funds* depending upon the need of the individual saver or investor. As an investor, you might want to invest $10,000 in a diversified portfolio of common stocks. To buy efficiently a portfolio of 100 companies might require $10 million of funds. Here is where a stock mutual fund comes in: by having 1000 investors, it can buy the portfolio, subdivide it, and manage it for you. In return, a well-run mutual fund might charge $30 per year on your $10,000 portfolio. Additionally, a modern economy requires large-scale firms which have billions of dollars of invested plant and equipment. No single person is likely to be able to afford that—and if someone could, that person would not want all his or her eggs in one basket. The modern corporation can and does undertake this task because of its ability to sell shares of stock to many people and pool these funds to make large and risky investments.
- The financial system performs an important *clearinghouse function,* which facilitates transactions between payers (purchasers) and payees (sellers). For example, when you write a check to buy a new computer, a clearinghouse will debit your bank and credit the bank of the company selling the computer. This function allows rapid transfers of funds around the world.

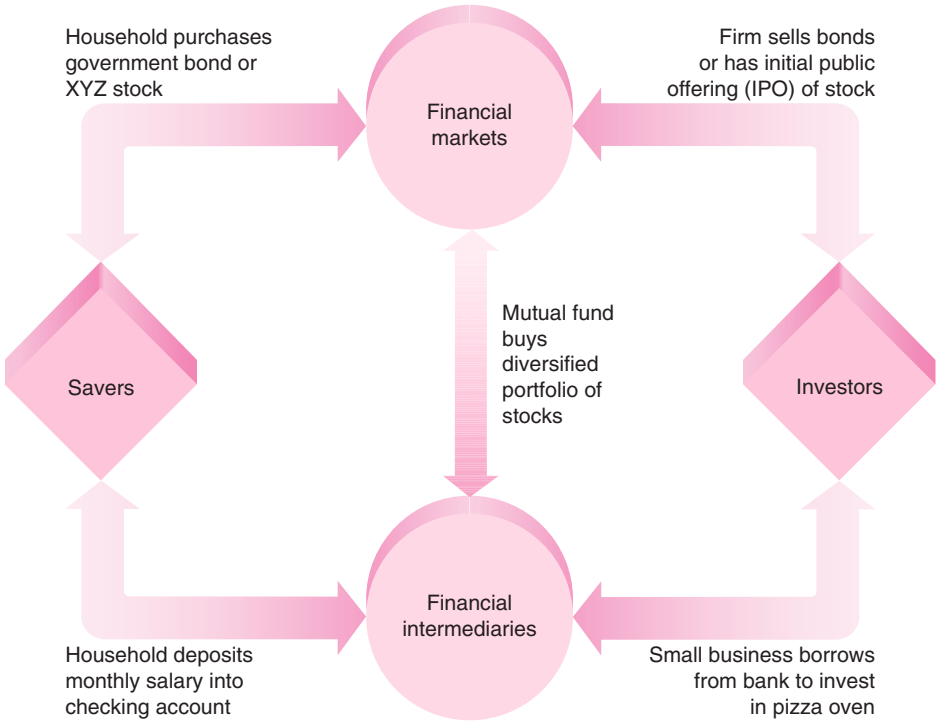


**FIGURE 23-1. The Flow of Funds Tracks Financial Flows in the Economy**

Savers and investors transfer funds across time, space, and sectors through financial markets and financial intermediaries. Some flows (such as buying 100 shares of XYZ) go directly through financial markets, while others (such as purchasing shares of mutual funds or depositing money in your checking account) go through financial intermediaries.

### *The Flow of Funds*

We can illustrate a simplified account of financial markets through a picture of the **flow of funds,** shown in Figure 23-1. This shows two sets of economic agents—savers and investors—and representative examples of saving and investing through financial markets and financial intermediaries.

This picture is simplified, for there are many different kinds of financial assets or instruments, as we will see in the next section.

## A MENU OF FINANCIAL ASSETS

**Financial assets** are claims by one party against another party. In the United States, they consist primarily of *dollar-denominated assets* (whose payments are fixed in dollar terms) and *equities* (which are claims on residual flows such as profits or on real assets). Table 23-2 shows the major financial instruments for the United States at the end of 2007. The total value of financial assets was $142 trillion, which totals an enormous $1.2 million per American household. Of course, many of these assets are offseting items, but these huge numbers show how vast the financial system has become.

Here are the major financial instruments or assets:

- *Money* and its two components are very special assets, and they will be defined carefully later in this chapter.
- *Savings accounts* are deposits with banks or credit institutions, usually guaranteed by governments, that have a fixed-dollar principal value and interest rates determined by short-term market interest rates.

| Financial instrument | Total ($, billion) | Percent of total |
|---|---|---|
| Money ($M_1$) | | |
| Currency | 774 | 0.5 |
| Checking deposits | 745 | 0.5 |
| Savings deposits | 7,605 | 5.4 |
| Money market and mutual funds | 10,852 | 7.6 |
| Credit market instruments | | |
| Government and government-sponsored | 12,475 | 8.8 |
| Private | 38,660 | 27.2 |
| Corporate and noncorporate equity | 29,355 | 20.7 |
| Insurance and pension reserves | 13,984 | 9.9 |
| Miscellaneous credit and other | 27,470 | 19.4 |
| **Total, all financial instruments** | **141,921** | **100.0** |

**TABLE 23-2. Major Financial Instruments in the United States, 2007**

This table shows the wide range of financial assets owned by households, firms, and businesses in the United States. The total value is larger than the amount issued by financial institutions alone because many assets are issued by other entities, such as governments.

Source: Federal Reserve Board, Flow of Funds, available at *www.federalreserve.gov/releases/z1/*, level tables.

- *Credit market instruments* are dollar-denominated obligations of governments or private entities. Federal securities are generally thought to be risk-free assets. Other credit market instruments, which have varying degrees of risk, are mortgages, corporate securities, and junk bonds.
- *Common stocks* (which are a kind of equity) are ownership rights to companies. They yield dividends, which are payments drawn from company profits. Publicly traded stocks, which are priced on stock markets, are discussed later in this chapter. Noncorporate equities are the values of partnerships, farms, and small businesses.
- *Money market funds* and *mutual funds* are funds that hold millions or billions of dollars in either short-term assets or stocks and can be subdivided into fractional shares to be bought by small investors.
- *Pension funds* represent ownership in the assets that are held by companies or pension plans. Workers and companies contribute to these funds during working years. These funds are then drawn down to support people during their retirement years.
- *Financial derivatives* are included in the credit market instruments. These are new forms of financial instruments whose values are based on or derived from the values of other assets. One important example is a stock option, whose value depends upon the value of the stock to which it is benchmarked.

Note that this list of financial assets excludes the single most important asset owned by most people—their houses, which are tangible as opposed to financial assets.

## Review of Interest Rates

Chapter 15 presented a full survey of rates of return, present value, and interest rates. You should review these concepts carefully. Below are the main points.

The interest rate is the price paid for borrowing money. We usually calculate interest as percent per year on the amount of borrowed funds. There are many interest rates, depending upon the maturity, risk, tax status, and other attributes of the loan.

Some examples will illustrate how interest works:

- When you graduate from college, you have only $500. You decide to keep it in the form of currency in a jar. If you don't spend any, you will still have $500 at the end of 1 year because currency has a zero interest rate.

- A little later, you deposit $2000 in a savings account at your local bank, where the interest rate on savings accounts is 4 percent per year. At the end of 1 year, the bank will have paid $80 in interest into your account, so the account will now be worth $2080.
- You start your first job and decide to buy a small house that costs $100,000. You go to your local bank and find that a 30-year, fixed-rate mortgage has an interest rate of 5 percent per year. Each month you must make a mortgage payment of $536.83. Note that this payment is a little bit more than the pro-rated monthly interest charge of 0.417 (= 5/12) percent per month. Why? Because the monthly payment includes not only interest but also *amortization* (the repayment of principal, the amount borrowed). By the time you have made your 360 monthly payments, you will have completely paid off the loan.

## B. THE SPECIAL CASE OF MONEY

Let's now turn to the special case of money. If you think about it for a moment, you will realize that money is a strange thing. We study for years so that we can earn a good living, yet each dollar bill is just paper, with minimal intrinsic value. Money is useless until we get rid of it.

However, money is anything but useless from a macroeconomic point of view. Monetary policy is today one of the two important tools (along with fiscal policy) the government has to stabilize the business cycle. The central bank uses its control over money, credit, and interest rates to encourage growth when the economy slows and to slow growth when inflationary pressures rise.

When the financial system is well managed, output grows smoothly and prices are stable. But an unstable financial system, as seen in many countries torn apart by war or revolution, can lead to inflation or depression. Many of the world's major macroeconomic traumas of the twentieth century can be traced to mismanaged monetary systems.

We now turn to a careful analysis of the definition of and demand for money.

## THE EVOLUTION OF MONEY

### *The History of Money*

What is money? **Money** *is anything that serves as a commonly accepted medium of exchange.* Because money has a long and fascinating history, we will begin with a description of money's evolution.

***Barter.*** In an early textbook on money, when Stanley Jevons wanted to illustrate the tremendous leap forward that occurred as societies introduced money, he used the following experience:

> Some years since, Mademoiselle Zélie, a singer of the Théâtre Lyrique at Paris, . . . gave a concert in the Society Islands. In exchange for an air from Norma and a few other songs, she was to receive a third part of the receipts.
>
> When counted, her share was found to consist of three pigs, twenty-three turkeys, forty-four chickens, five thousand cocoa-nuts, besides considerable quantities of bananas, lemons, and oranges. . . . [I]n Paris . . . this amount of live stock and vegetables might have brought four thousand francs, which would have been good remuneration for five songs. In the Society Islands, however, pieces of money were scarce; and as Mademoiselle could not consume any considerable portion of the receipts herself, it became necessary in the mean time to feed the pigs and poultry with the fruit.

This example describes **barter,** which consists of the exchange of goods for other goods. Exchange through barter contrasts with exchange through money because pigs, turkeys, and lemons are not generally acceptable monies that we or Mademoiselle Zélie can use for buying things. Although barter is better than no trade at all, it operates under grave disadvantages because an elaborate division of labor would be unthinkable without the introduction of the great social invention of money.

As economies develop, people no longer barter one good for another. Instead, they sell goods for money and then use money to buy other goods they wish to have. At first glance this seems to complicate rather than simplify matters, as it replaces one transaction with two. If you have apples and want nuts, would it not be simpler to trade one for the other rather than to sell the apples for money and then use the money to buy nuts?

Actually, the reverse is true: two monetary transactions are simpler than one barter transaction. For example, some people may want to buy apples, and some may want to sell nuts. But it would be a most unusual circumstance to find a person whose desires exactly complement your own—eager to sell nuts and buy apples. To use a classic economics phrase, instead of there being a "double coincidence of wants," there is likely to be a "want of coincidence." So, unless a hungry tailor happens to find an unclothed farmer who has both food and a desire for a pair of pants, under barter neither can make a direct trade.

Societies that want to trade extensively simply cannot overcome the overwhelming handicaps of barter. The use of a commonly accepted medium of exchange, money, permits the farmer to buy pants from the tailor, who buys shoes from the cobbler, who buys leather from the farmer.

***Commodity Money.*** Money as a medium of exchange first came into human history in the form of commodities. A great variety of items have served as money at one time or another: cattle, olive oil, beer or wine, copper, iron, gold, silver, rings, diamonds, and cigarettes.

Each of the above has advantages and disadvantages. Cattle are not divisible into small change. Beer does not improve with keeping, although wine may. Olive oil provides a nice liquid currency that is as minutely divisible as one wishes, but it is rather messy to handle. And so forth.

By the eighteenth century, commodity money was almost exclusively limited to metals like silver and gold. These forms of money had *intrinsic value,* meaning that they had use value in themselves. Because money had intrinsic value, there was no need for the government to guarantee its value, and the quantity of money was regulated by the market through the supply and demand for gold or silver. But metallic money has shortcomings because scarce resources are required to dig it out of the ground; moreover, it might become abundant simply because of accidental discoveries of ore deposits.

The advent of monetary control by central banks has led to a much more stable currency system. The intrinsic value of money is now its least important feature.

***Modern Money.*** The age of commodity money gave way to the age of *paper money.* The essence of money is now laid bare. Money is wanted not for its own sake but for the things it will buy. We do not wish to consume money directly; rather, we use it by getting rid of it. Even when we choose to keep money, it is valuable only because we can spend it later on.

The use of paper currency has become widespread because it is a convenient medium of exchange. Paper currency is easily carried and stored. The value of money can be protected from counterfeiting by careful engraving. The fact that private individuals cannot legally create money keeps it scarce. Given this limitation on supply, currency has value. It can buy things. As long as people can pay their bills with currency, as long as it is accepted as a means of payment, it serves the function of money.

Paper money issued by governments was gradually overtaken by *bank money*—the checking accounts that we will discuss shortly.

A few years ago, many people predicted that we would soon move to a cashless society. They foresaw that cash and checking accounts would be replaced by electronic money, such as the stored-value cards found in many stores today. But, in fact, consumers have been reluctant to adopt electronic money in substantial amounts. They trust and prefer government money and checks. To some extent electronic transfers, debit cards, and e-banking have replaced paper checks, but these should be seen as different ways of *using* a checking account rather than as different *kinds* of money.

## Components of the Money Supply

Let us now look more carefully at the different kinds of money, focusing on the United States. The main *monetary aggregate* studied in macroeconomics is known as $M_1$. This is also called *transactions money*. In earlier times, economists examined other concepts of money, such as $M_2$. These concepts included further assets and were often useful for looking at broad trends, but they are little used in monetary policy today. The following are the components of $M_1$:

- *Currency.* Currency is defined as coins and paper money held outside the banking system. Most of us know little more about a $1 or $5 bill than that each is inscribed with the picture of an American

statesman, bears some official signatures, and has a number showing its face value. Examine a $10 bill or some other paper bill. You will find that it says "Federal Reserve Note." But what "backs" our paper currency? Many years ago, paper money was backed by gold or silver. There is no such pretense today. Today, all U.S. coins and paper currency are *fiat money*. This term signifies something declared to be money by the government even if it has no intrinsic value. Paper currency and coins are *legal tender*, which must be accepted for all debts, public and private. Currency is approximately one-half of total $M_1$.

- *Checking deposits*. The other component of $M_1$ is bank money. This consists of funds, deposited in banks and other financial institutions, on which you can write checks and withdraw your money on demand. The technical name for this component of the money supply is "demand deposits and other checkable deposits." If I have $1000 in my checking account at the Albuquerque National Bank, that deposit can be regarded as money. Why? For the simple reason that I can pay for purchases with checks drawn on it. The funds in my account are a medium of exchange, and it is therefore counted as money.

Students often wonder if credit cards are money. Actually, they are not. The reason is that a credit card is actually an easy (but not cheap!) way to *borrow* money. When paying with a credit card, you are promising to pay the credit card company—with money—at a later date.

Figure 23-2 shows the trend in the ratio of $M_1$ to GDP. This ratio has declined by a factor of 3 over the last half-century. At the same time, all other financial assets have grown sharply.

Money is anything that serves as a commonly accepted medium of exchange. Today, we define transactions money as $M_1$, which is the sum of currency held by the public and checking deposits.

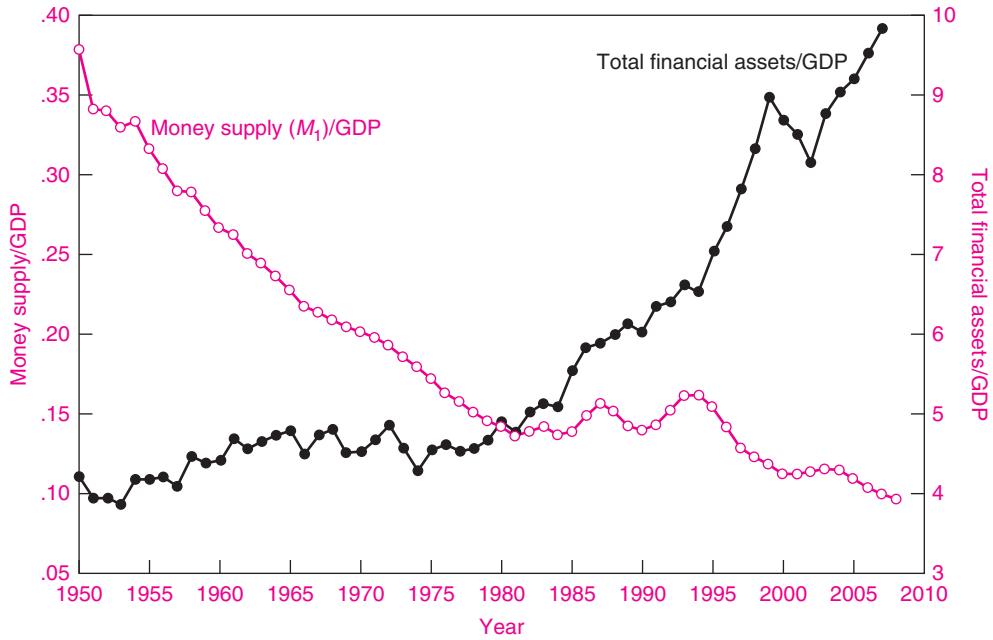


**FIGURE 23-2. Money Holdings and Total Financial Assets per Unit of GDP**

Total financial assets have risen sharply relative to GDP, while the ratio of the money supply to GDP has gradually declined. Note the vast difference in scale. Total financial assets are defined similarly here as in Table 23-1.

Source: Financial data from the Federal Reserve Board; GDP from the Bureau of Economic Analysis.

## THE DEMAND FOR MONEY

The demand for money is different from the demand for ice cream or movies. Money is not desired for its own sake; you cannot eat nickels, and we seldom hang $100 bills on the wall for the artistic quality of their engraving. Rather, we demand money because it serves us indirectly as a lubricant to trade and exchange.

### Money's Functions

Before we analyze the demand for money, let's note money's functions:

- The central function emphasized here is that money serves as a *medium of exchange*. Without money, we would be constantly roving around looking for someone to barter with. Money's value is often shown when the monetary system malfunctions. After Russia abandoned its central-planning system in the early 1990s, for example, people spent hours waiting in line for goods and tried to get dollars or other foreign currencies because the ruble had ceased to function as an acceptable means of exchange.
- Money is also used as the *unit of account*, the unit by which we measure the value of things. Just as we measure weight in kilograms, we measure value in money. The use of a common unit of account simplifies economic life enormously.
- Money is sometimes used as a *store of value*. In comparison with risky assets like stocks or real estate or gold, money is relatively riskless. In earlier days, people held currency as a safe form of wealth. Today, when people seek a safe haven for their wealth, the vast preponderance of their wealth is held in nonmonetary assets, such as savings accounts, stocks, bonds, and real estate.

### The Costs of Holding Money

What is the *cost* of holding money? Money is costly because it has a lower yield than do other safe assets. Currency has a nominal interest rate of exactly zero percent per year. Checking deposits sometimes have a small interest rate, but that rate is usually well below the rate on savings accounts or money market mutual funds. For example, over the period 2000–2007, currency had a yield of 0 percent per year, checking accounts had an average yield of around 0.2 percent per year, and short-term money funds had a yield of around 4.6 percent per year. If the weighted yield on money (currency and checking accounts) was 0.1 percent per year, then the *cost of holding money* was 4.5 = 4.6 − 0.1 percent per year. Figure 23-3 on page 462 shows the interest rate on money as compared to that on safe short-term assets.

The cost of holding money is the interest forgone from not holding other assets. That cost is usually very close to the short-term interest rate.

### Two Sources of Money Demand

***Transactions Demand for Money.*** People need money primarily because their incomes and expenditures do not come at the same time. For example, I might be paid on the last day of the month, but I buy food, newspapers, gasoline, and clothing throughout the month. The need to have money to pay for purchases, or transactions, of goods, services, and other items constitutes the *transactions demand for money*.

For example, suppose that a family earns $3000 per month, keeps it in money, and spends it evenly throughout the month. A calculation will show that the family holds $1500 on average in money balances.

This example can help us see how the demand for money responds to different economic influences. If all prices and incomes double, the nominal demand for $M$ doubles. Thus the transactions demand for money doubles if nominal GDP doubles with no change in real GDP or other real variables.

How does the demand for money vary with interest rates? As interest rates rise, the family might say, "Let's put only half of our money in the checking account at the beginning of the month and put the other half in a savings account earning 8 percent per year. Then on day 15, we'll take that $1500 out of the savings account and put it into our checking account to pay the next 2 weeks' bills."

This means that as interest rates rose and the family decided to put half its earnings in a savings account, the average money balance of our family fell from $1500 to $750. This shows how money holdings (or the demand for money) may be sensitive to interest rates: other things equal, as interest rates rise, the quantity of money demanded declines.

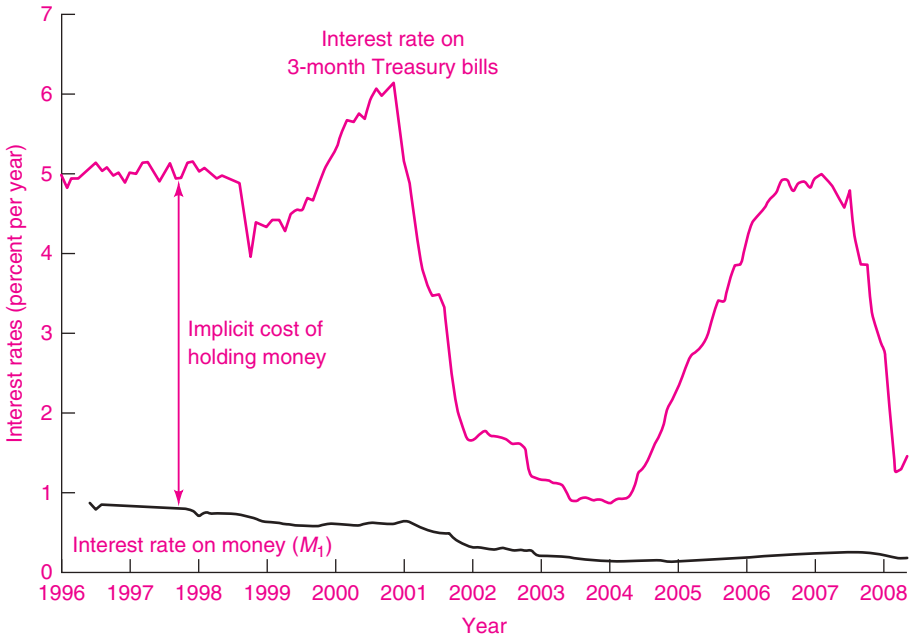


**FIGURE 23-3. Interest Rates on Money and Safe Short-Term Assets**

This figure shows the interest rate on money (which is the average of zero on currency and the rate on checking accounts) as compared to the interest rate on short-term Treasury securities. The difference between these two interest rates is the implicit cost of holding money.

Source: Treasury interest rate from Federal Reserve; interest rate on checking accounts from Informa Research Services, Inc.

***Asset Demand.*** In addition to its use for transaction needs, you might wonder if money itself would ever be used as a store of value. The answer today is, not often. In a modern economy in normal times, people prefer to keep their nontransaction assets in safe, interest-bearing assets such as savings accounts or money funds. Suppose you need $2000 a month in your checking account for your transactions, and you have another $50,000 in savings. Surely, you would be better off putting the $50,000 in a money market fund earning 4.6 percent per year than in a checking account earning 0.2 percent per year. After a decade, the latter would be worth only $51,009 while the former would be worth $78,394. (Make sure you can reproduce these numbers.)

There are some important exceptions, however, where money itself might be used as a store of value. Money might be an attractive asset in primitive financial systems where there are no other reliable assets. U.S. currency is widely held abroad as a safe asset in countries where hyperinflation occurs, or where a currency might be devalued, or where the financial system is unreliable. Additionally, in advanced countries, people might hold money as an asset when interest rates are near zero. This situation, known as a liquidity trap, terrifies central bankers because they lose the ability to affect interest rates. We will review this syndrome in the next chapter.

The main reason people hold money ($M_1$) is to meet their transactions demand. This means that money is an acceptable medium of exchange that we can use to buy our goods and pay our bills. As our incomes rise, the dollar value of the goods we buy tends to go up as well, and we therefore need more money for transactions, raising our demand for money. In a modern financial system, there is generally little or no asset demand for $M_1$.

## C. BANKS AND THE SUPPLY OF MONEY

Now that we have described the basic structure of the financial system, we turn to commercial banks and the supply of money. If you look back at the description of the monetary transmission mechanism at the beginning of this chapter, you will see that the activities of banks are the critical third step. While money constitutes a relatively small fraction of all financial assets, the interaction between the central bank and commercial banks turns out to play a central role in the setting of interest rates, and ultimately in influencing macroeconomic behavior.

Banks are fundamentally businesses organized to earn profits for their owners. A commercial bank provides certain services for its customers and in return receives payments from them.

Table 23-3 shows the consolidated balance sheet of all U.S. commercial banks. A *balance sheet* is a statement of a firm's financial position at a point in time. It lists *assets* (items that the firm owns) and *liabilities* (items that the firm owes). Each entry in a balance sheet is valued at its actual market value or its historical cost.[1] The difference between the total value of assets and total liabilities is called *net worth.*

Except for the details, a bank balance sheet looks much like a balance sheet for any other business. The unique feature of a bank balance sheet is an asset called **reserves.** This is a technical term used in banking to refer to a special category of bank assets that are regulated by the central bank. Reserves equal currency held by the bank ("vault cash") plus deposits with Federal Reserve Banks. In earlier days, reserves were held to pay depositors, but today they serve primarily to meet legal reserve requirements. We will discuss reserves in detail in the next chapter.

### How Banks Developed from Goldsmith Establishments

Commercial banking began in England with the goldsmiths, who developed the practice of storing people's gold and valuables for safekeeping. At first, such establishments simply functioned as secure warehouses. Depositors left their gold for safekeeping and were given a receipt. Later they presented their receipt, paid a fee, and got back their gold.

What would the balance sheet of a typical goldsmith establishment look like? Perhaps like Table 23-4. A total of $1 million has been deposited in its vaults, and this whole sum is held as a cash asset (this is the item "Reserves" in the balance sheet). To balance this

[1] Balance sheets, assets, and liabilities are extensively discussed in Chapter 7 of the full textbook.

**Balance Sheet of All Commercial Banking Institutions, 2008 (billions of dollars)**

| Assets | | Liabilities and Net Worth | |
|---|---|---|---|
| Reserves | 43 | Checking deposits | 629 |
| Loans | 6,250 | Savings and time deposits | 5,634 |
| Investments and securities | 2,265 | Other liabilities | 2,643 |
| Other assets | 1,404 | Net worth (capital) | 1,056 |
| Total | 9,961 | Total | 9,961 |

**TABLE 23-3. Balance Sheet of All U.S. Commercial Banks**

Commercial banks are diversified financial institutions and are the major providers of checking deposits, which is an important component of $M_1$. Checking accounts are payable on demand and thus can be used as a medium of exchange. Reserves are held primarily to meet legal requirements, rather than to provide against possible unexpected withdrawals. (Note that banks have a small amount of net worth or capital relative to their total assets and liabilities. The ratio of liabilities to net worth is called the "leverage ratio." Highly leveraged financial institutions produce systemic risk if the values of their assets all deteriorate at the same time, as occurred in 2007–2009.)

Source: Federal Reserve Board, available at *www.federalreserve.gov/releases/*.

**Goldsmith Balance Sheet with 100% Reserves**

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | 1,000,000 | Demand deposits | 1,000,000 |
| Total | 1,000,000 | Total | 1,000,000 |

**TABLE 23-4. First Goldsmith Bank Held 100 Percent Cash Reserves against Demand Deposits**

In a primitive banking system, with 100 percent backing of deposits, no creation of money out of reserves is possible.

asset, there is a demand deposit of the same amount. Reserves are therefore 100 percent of deposits.

In today's language, the goldsmiths' demand deposits would be part of the money supply; they would be "bank money." However, the bank money just offsets the amount of ordinary money (gold or currency) placed in the bank's vaults and withdrawn from active circulation. No money creation has taken place. The process is of no more interest than if the public decided to convert nickels into dimes. *A 100 percent-reserve banking system has a neutral effect on money and the macroeconomy because it has no effect on the money supply.*

We can go a step further and ask what would happen if there were paper money issued under a gold standard with 100 percent backing by gold. In this case, you can create a new Table 23-4 by writing "gold notes" instead of "demand deposits." The gold notes would be currency and part of $M_1$. Again, the money supply would be unchanged because the currency has 100 percent backing.

## Fractional-Reserve Banking

Let's take another step toward today's banking system by introducing *fractional-reserve banking*. Banks soon learned that they did not need to keep 100 percent of their gold or silver as reserves against their notes and deposits. People did not all come to redeem their notes at the same time. A bank might be safe if it kept only fractional reserves to back its notes and deposits. This was a tiny first step on the road to today's vast financial system.

We explore the implications of fractional-reserve banking starting with a situation where a system of banks operates with a customary or legal requirement that it keep reserves equal to at least 10 percent

**Goldsmith Balance Sheet with Fractional Reserves**

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | 100,000 | Demand deposits | |
| Investments | 900,000 | and gold notes | 1,000,000 |
| Total | 1,000,000 | Total | 1,000,000 |

**TABLE 23-5. Goldsmith Bank Keeps 10 Percent Reserves against Deposits and Gold Notes**

Later, Goldsmith Bank learns that it does not need to keep 100 percent reserves. Here, it has decided to invest 90 percent and keep only 10 percent in reserves against deposits and notes.

of deposits. Suppose that the president of Goldsmith Bank wakes up and says, "We do not need to keep all this sterile gold as reserves. In fact, we can lend out 90 percent of it and still have sufficient gold to meet the demands of depositors."

So Goldsmith Bank lends out $900,000 and keeps the remaining $100,000 as gold reserves. The initial result is shown in Table 23-5. The bank has invested $900,000—perhaps lending money to Duck.com, which is building a toy factory.

But that is not the end of the process. Duck.com will take the $900,000 loan and deposit it in its own checking account to pay the bills for the factory. Suppose, for simplicity, that the firm has a checking account in Goldsmith Bank. The interesting result here, shown in Table 23-6, is that Goldsmith Bank

**Goldsmith Balance Sheet after Deposit of Loan by Duck.com**

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | 1,000,000 | Demand deposits | |
| Investments | 900,000 | and gold notes | 1,900,000 |
| Total | 1,900,000 | Total | 1,900,000 |

**TABLE 23-6. After the Firm Deposits Its Loan, the Banking System Has Excess Reserves to Lend Out Again**

The Duck firm deposits its $900,000 loan into its account. This increases Goldsmith Bank's reserves of gold back to $1,000,000. Soon the excess will be lent out again.

has recovered the $900,000 of reserves. In essence, Duck.com took the loan of gold and then lent it back to the bank. (The process would be exactly the same if Duck.com went to another bank: that bank would have excess reserves of $900,000.)

But now the bank needs to keep only 10 percent × $1.9 million = $190,000 for reserves, so it can lend out the excess $810,000. Soon the $810,000 will show up in a bank deposit. This process of deposit, relending, and redeposit continues in a chain of dwindling expansions.

### Final System Equilibrium

Now let's sum up the total of all deposits. We started with $1,000,000 in deposits, then added $900,000, then $810,000 and so on. The total is given by the sum:

$$\begin{aligned}\text{Total deposits} &= 1{,}000{,}000 + 1{,}000{,}000 \times 0.9 + 1{,}000{,}000 \times 0.9^2 + \cdots \\ &= 1{,}000{,}000[1 + 0.9 + 0.9^2 + \cdots + (0.9)^n + \cdots] \\ &= 1{,}000{,}000\left(\frac{1}{1 - 0.9}\right) = 1{,}000{,}000\left(\frac{1}{0.1}\right) = 10{,}000{,}000\end{aligned}$$

At the end of the process, the total amount of deposits and money is $10 million, which is 10 times the total amount of reserves. Assuming that Goldsmith is the only bank, or that we are looking at the consolidated banking system, we can show the final balance sheet in Table 23-7. The point here is that once banks require only fractional reserves, the total money supply is a multiple of the reserves.

This can be seen intuitively. The cumulative process just described must come to an end when every bank in the system has reserves equal to 10 percent of deposits. In other words, the final equilibrium of the banking system will be the point at which 10 percent of deposits ($D$) equals total reserves. What level of $D$ satisfies this condition? The answer is $D$ = $10 million.

When banks hold fractional reserves against their deposits, they actually create money. The total bank money is generally equal to total reserves multiplied by the inverse of the reserve ratio:

$$\text{Bank money} = \text{total reserves} \times \left(\frac{1}{\text{reserve ratio}}\right)$$

**Consolidated Balance Sheet of All Banks in Equilibrium**

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | 1,000,000 | Demand deposits | |
| Investments | 9,000,000 | and gold notes | 10,000,000 |
| Total | 10,000,000 | Total | 10,000,000 |

**TABLE 23-7. Final Equilibrium Balance Sheet When Banking System Has No Excess Reserves**

We aggregate the banking system together assuming that there are $1,000,000 of total reserves. When banks have lent out all excess reserves, so reserves are just 10 percent of deposits and notes, total money is 1/0.1 = 10 times reserves.

### A Modern Banking System

It is time to put our fable of goldsmiths behind us. How does all this relate to the actual banking system today? The surprising answer is that with some additional details, the process we just described fits today's banking system exactly. Here are the key elements of the modern banking system:

- Banks are required to hold at least 10 percent of their checking deposits as reserves, in the form of either currency or deposits with the Federal Reserve (more on this in the next chapter).
- The Federal Reserve buys and sells reserves at a target interest rate set by the Fed (again, more on this in the next chapter).
- The checking-deposit component of $M_1$ is therefore determined by the amount of reserves along with the required reserve ratio.

A few qualifications need to be mentioned before closing this section. First, commercial banks do much more than simply provide checking accounts, as we saw in Table 23-3. This fact may complicate the task of the regulatory authorities, but it does not change the basic operation of monetary policy.

A second complication arises if nominal interest rates approach zero. This is referred to as the liquidity trap. We will discuss this syndrome in the next chapter.

## D. THE STOCK MARKET

We close this chapter with a tour through one of the most exciting parts of a capitalist system: the stock market. A **stock market** is a place where shares

in publicly owned companies—the titles to business firms—are bought and sold. In 2008, the value of corporate equities in the United States was estimated at $21 trillion. The stock market is the hub of our corporate economy.

The New York Stock Exchange is America's main stock market, listing more than a thousand securities. Another important market is the NASDAQ, which had a meteoric rise and subsequent collapse in stock prices after 2000. Every large financial center has a stock exchange. Major ones are located in Tokyo, London, Frankfurt, Shanghai, and, of course, New York.

### Risk and Return on Different Assets

Before discussing major issues in stock market analysis, we need to introduce some basic concepts in financial economics. We noted earlier in this chapter that different assets have different characteristics. Two important characteristics are the rate of return and the risk.

The *rate of return* is the total dollar gain from a security (measured as a percent of the price at the beginning of the period). For savings accounts and short-term bonds, the return would simply be the interest rate. For most other assets, the return combines an income item (such as dividends) with a *capital gain* or *loss,* which represents the increase or decrease in the value of the asset between two periods.

We can illustrate the rate of return using data on stocks. (For this example, we ignore taxes and commissions.) Say that you bought a representative portfolio of $10,000 worth of stocks in U.S. companies at the end of 1996. Over the next 3 years, your fund would have had a total real return (including dividends plus capital gains and correcting for inflation) of 32 percent per year.

However, before you get too excited about these fantastic gains, be forewarned that the stock market also goes down. In the 3 years after 1999, real stock prices declined by 19 percent per year. An even worse experience came in 2008, when stock prices declined 38 percent during the year.

The fact that some assets have predictable rates of return while others are quite risky leads to the next important characteristic of investments. **Risk** refers to the variability of the returns on an investment. If I buy a 1-year Treasury bond with a 6 percent return, the bond is a riskless investment because I am sure to get my expected dollar return. On the other hand, if I buy $10,000 worth of stocks, I am uncertain about their year-end value.

Economists often measure risk as the standard deviation of returns; this is a measure of dispersion whose range encompasses about two-thirds of the variation.[2] For example, from 1908 to 2008, common stocks had an average annual real return of 6 percent per year with an annual standard deviation of return of 16 percent. This implies that the real return was between 22(= 6 + 16) percent and −10(= 6 − 16) percent about two-thirds of the time.

Individuals generally prefer higher return, but they also prefer lower risk because they are *risk-averse.* This means that they must be rewarded by higher returns to induce them to hold investments with higher risks. We would not be surprised, therefore, to learn that over the long run safe investments like bonds have lower average returns than risky investments like stocks.

Table 15-1 on page 289 showed the historical returns or interest rates on a number of important investments. We show the most important assets in the *risk-return diagram* in Figure 23-4. This diagram shows the average real (or inflation-corrected) return on the vertical axis and the historical risk (measured as a standard deviation) on the horizontal axis. Note the positive relationship between risk and return.

### Bubbles and Crashes

The history of finance is one of the most exciting parts of economics. Sometimes, sound judgments get put aside as markets engage in frenzies of speculation, often followed by moods of pessimism and falling prices.

Investors are sometimes divided into those who invest on firm foundations and those who try to

[2] The standard deviation is a measure of variability that can be found in any elementary statistics textbook. It is roughly equal to the average deviation of a series from its mean. The precise definition of standard deviation is the square root of the squared deviations of a variable from its mean. As an example, if a variable takes the values of 1, 3, 1, 3, the mean or expected value is 2 while the standard deviation is 1.

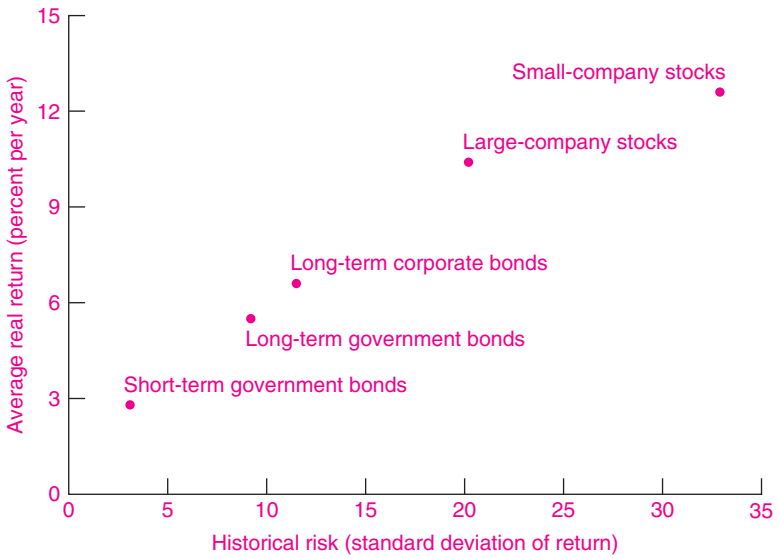


**FIGURE 23-4. Risk and Return on Major Investments, 1926–2005**

Investments vary in their average returns and riskiness. Bonds tend to be safe with low returns, while stocks have much higher returns but face higher risks. This diagram shows the *historical* risk and return on different financial assets. Depending upon market sentiments, the *expected* risk and return may differ markedly from the historical experience.

Source: Ibbotson Associates, 2006.

outguess the market psychology. The firm-foundation approach holds that assets should be valued on the basis of their intrinsic value. For common stocks, the intrinsic value is the expected present value of the dividends. If a stock has a constant dividend of $2 per year and the appropriate interest rate with which to discount dividends is 5 percent per year, the intrinsic value would be $2/.05 = $40 per share. The firm-foundation approach is the slow but safe way of getting rich.

Impatient souls might share the view of Keynes, who argued that investors are more likely to worry about market psychology and to speculate on the future value of assets rather than wait patiently for stocks to prove their intrinsic value. He argued, "It is not sensible to pay 25 for an investment which is worth 30, if you also believe that the market will value it at 20 three months hence." The market psychologist tries to guess what the average investor thinks, which requires considering what the average investor thinks about the average investor, and so on, ad infinitum.

When a psychological frenzy seizes the market, it can result in speculative bubbles and crashes. A *speculative bubble* occurs when prices rise because people think they are going to rise even further in the future—it is the reverse of Keynes's just-cited dictum. A piece of land may be worth only $1000, but if you see a land-price boom driving prices up 50 percent each year, you might buy it for $2000 hoping you can sell it to someone else next year for $3000.

A speculative bubble fulfills its own promises for a while. If people buy because they think stocks will rise, their act of buying sends up the price of stocks. This causes other people to buy even more and sends the dizzy dance off on another round. But, unlike people who play cards or dice, no one apparently loses what the winners gain. Of course, the prizes are all on paper and would disappear if everyone tried to cash them in. But why should anyone want to sell such lucrative securities? Prices rise because of hopes and dreams, not because the profits and dividends of companies are soaring.

History is marked by bubbles in which speculative prices were driven up far beyond the intrinsic value of the asset. In seventeenth-century Holland, a tulip mania drove tulip prices to levels higher than the price of a house. In the eighteenth century, the stock of the South Sea Company rose to fantastic levels on empty promises that the firm would enrich its stockholders. In more recent times, similar bubbles have been found in biotechnology, Japanese land, "emerging markets," and a vacuum-cleaning company called

ZZZZ Best, whose business was laundering money for the Mafia.

The most famous bubble of them all occurred in the American stock market in the 1920s. The "roaring twenties" saw a fabulous stock market boom, when everyone bought and sold stocks. Most purchases in this wild bull market were on margin. This means that a buyer of $10,000 worth of stocks put up only part of the price in cash and borrowed the difference, pledging the newly bought stocks as collateral for the loan. What did it matter that you had to pay the broker 6, 10, or 15 percent per year on the loan when Auburn Motors or Bethlehem Steel might jump 10 percent in value overnight?

Speculative bubbles always produce crashes and sometimes lead to economic panics. The speculation of the 1920s was soon followed by the 1929 panic and crash. This event ushered in the long and painful Great Depression of the 1930s. By the trough of the Depression in 1933, the market had declined 85 percent.

Trends in the stock market are tracked using *stock-price indexes,* which are weighted averages of the prices of a basket of company stocks. Commonly followed averages include the Dow-Jones Industrial Average (DJIA) of 30 large companies; Standard and Poor's index of 500 companies (the S&P 500), which is a weighted average of the stock prices of 500 large American corporations; and the NASDAQ Composite Index, which includes more than 3000 stocks listed on that market.

Figure 23-5 shows the history of the Standard and Poor's 500 price index over the last century. The lower curve shows the nominal stock-price average, which records the actual average during a particular month. The upper line shows the real price of stocks;

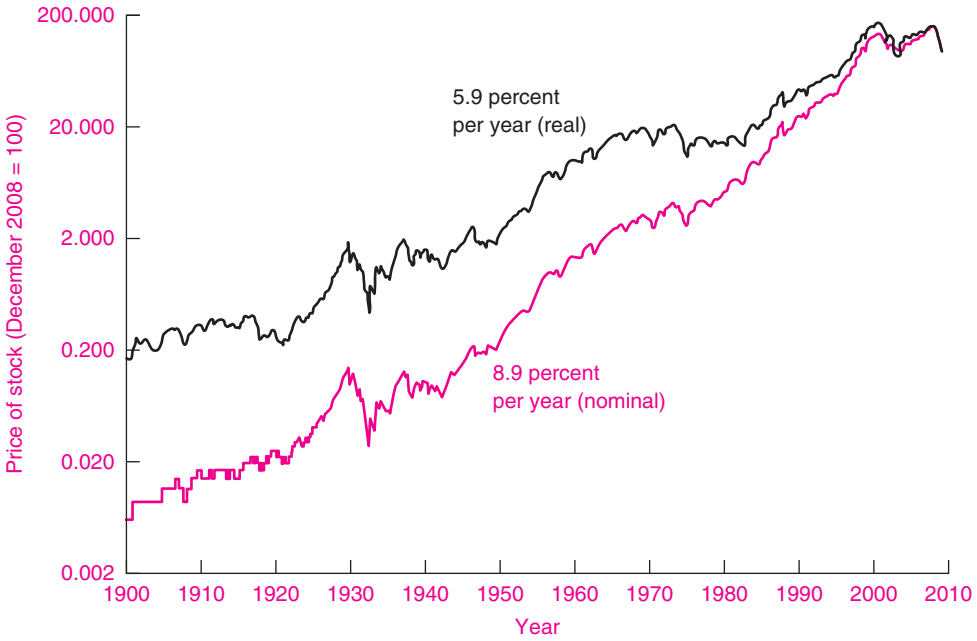


**FIGURE 23-5. The Only Guarantee about Stock Prices Is That They Will Fluctuate**

The Standard and Poor's index (the S&P 500) tracks the value-weighted average of the stock prices of 500 large companies traded in the U.S. It is shown here including reinvested dividends. Stock prices in nominal terms are shown by the bottom line; these averaged a growth of 8.9 percent per year from 1900 to 2008. The top line shows the "real" S&P 500, which is the S&P 500 corrected for movements in the consumer price index. It rose 5.9 percent per year on average.

Source: Standard and Poor, Bureau of Labor Statistics.

this equals the nominal price divided by an index of consumer prices. Both curves are indexed to equal 100 in December 2008. The average growth rate of stocks over the period was 8.9 percent per year in dollar terms but only 5.9 percent per year after correcting for inflation.

Stocks have proven to be a good investment over the long term. But they are also extremely risky in the short run, as people learned when stock prices declined 52 percent from the peak in October 2007 to the trough in November 2008. Is there a crystal ball that can foretell the movement of stock prices? This is the subject of modern finance theory.

## Efficient Markets and the Random Walk

Economists and finance professors have long studied prices in speculative markets such as the stock market and the foreign exchange market. One important hypothesis is that speculative markets tend to be "efficient." This finding has stirred great controversy in the economics profession and with financial analysts.

What is the essence of the **efficient-market theory?** A summary statement is the following:

> Securities markets are extremely efficient in absorbing information about individual stocks and about the stock market as a whole. When new information arrives, the news is quickly incorporated into stock prices. Systems which attempt to forecast prices on the basis of the past or of fundamentals cannot produce returns greater than those that could be obtained by holding a randomly selected portfolio of individual stocks of comparable risk.[3]

A colorful story illustrates the basic message. A finance professor and a student are walking across the campus when they see what looks like a $100 bill lying on the ground. The professor tells the student, "Don't bother to pick it up. If it were really a $100 bill, it wouldn't be there." In other words, you can't get rich simply by bending down on a public thoroughfare!

This paradoxical view has been generally confirmed in hundreds of studies over the last half-century. Their lesson is not that you will never become rich by following a rule or formula but that, on average, such rules do not outperform a diversified portfolio of stocks.

***Rationale for the Efficient-Market View.*** Finance theorists have spent many years analyzing stock and bond markets in order to understand why well-functioning financial markets rule out persistent excess profits. The theory of efficient markets explains this.

An **efficient financial market** is one where all new information is quickly understood by market participants and becomes immediately incorporated into market prices. For example, say that Lazy-T Oil Company has just struck oil in the Gulf of Alaska. This event is announced at 11:30 A.M. on Tuesday. When will the price of Lazy-T's shares rise? The efficient-market theory holds that market participants will react at once, bidding the price of Lazy-T up by the correct amount. In short, at every point in time, markets have already digested and included all available information in asset prices.

The theory of efficient markets holds that market prices contain all available information. It is not possible to make profits by acting on old information or at patterns of past price changes. Returns on stocks will be primarily determined by their riskiness relative to the market.

***A Random Walk.*** The efficient-market view provides an important way of analyzing price movements in organized markets. Under this approach, the price movements of stocks should look highly erratic, like a random walk, when charted over a period of time.

A price follows a **random walk** when its movements over time are completely unpredictable. For example, toss a coin for heads or tails. Call a head "plus 1" and a tail "minus 1." Then keep track of the running score of 100 coin tosses. Draw it on graph paper. This curve is a random walk. Now, for comparison, also graph 100 days' movement of Microsoft stock and of Standard and Poor's 500 index. Note how similar all three figures appear.

Why do speculative prices resemble a random walk? Economists, on reflection, have arrived at the following truths: In an efficient market all predictable things have already been built into the prices. It

[3] This definition is adopted from Malkiel's 2003 article; see Further Readings. Note that "efficiency" is used differently in finance theory than in other parts of economics. Here, "efficiency" means that information is quickly absorbed, not that resources produce the maximal outputs.

is the arrival of *new* information that affects stock or commodity prices. Moreover, the news must be random and unpredictable (or else it would be predictable and therefore not truly news).

To summarize:

The efficient-market theory explains why movements in stock prices look so erratic. Prices respond to news, to surprises. But surprises are unpredictable events—like the flip of a coin or next month's rainstorm—that may move in any direction. Because stock prices move in response to erratic events, stock prices themselves move erratically, like a random walk.

***Qualifications to the Efficient-Market View.*** Although the efficient-market view has been the canon of finance in economics and business, many believe that it is oversimplified and misleading. Here are some of the reservations:

1. Researchers have uncovered many "anomalies" in stock-price movements that lead to some predictability. For example, stocks with high dividends or earnings relative to prices appear to perform better in subsequent periods. Similarly, sharp upward or downward movements tend to be followed by "reversals" in movements. To some, these anomalies are persuasive indicators of market inefficiencies; to others, they simply reflect the tendency of analysts to mine the data looking for patterns that are in fact spurious correlations.
2. Economists who look at the historical record ask whether it is plausible that sharp movements in stock prices could actually reflect new information. Consider the 30 percent drop in stock prices that occurred from October 15 to October 19, 1987. Efficient-market theories imply that this drop was caused by economic events that depressed the expected present value of future corporate earnings. Critics of the efficient-market view argue that there was no news that could make a 30 percent difference in the value of stock prices over those 4 days. Efficient-market theorists fall silent before this criticism.
3. Finally, the efficient-market view applies to individual stocks but not necessarily to the market as a whole. There is persuasive evidence of long, self-reversing swings in stock market prices. These swings tend to reflect changes in the general mood of the financial community. Periods like the 1920s and 1990s saw investor optimism and rising stock prices, while the 1930s and 2007–2008 were periods of investor pessimism when stock prices declined sharply. However, say that we believed that the market reflected an "irrational exuberance" and was overvalued. What could we do? We could not individually buy or sell enough stocks to overcome the entire national mood. In addition, we might get wiped out if we bet against the market a year or two before the peak. So, from a macroeconomic perspective, speculative markets can exhibit waves of pessimism and optimism without powerful economic forces moving in to correct these mood swings.

## PERSONAL FINANCIAL STRATEGIES

While taking a course in economics is no guarantee of great wealth, the principles of modern finance can definitely help you invest your nest egg wisely and avoid the worst financial blunders. What lessons does economics teach about personal investment decisions? We have culled the following five rules from the wisdom of the best brains on the street:

*Lesson 1: Know thy investments.* The absolute bedrock of a sound investment strategy is to be realistic and prudent in your investment decisions. For important investments, study the materials and get expert advice. Be skeptical of approaches that claim to have found the quick route to success. You can't get rich by listening to your barber or consulting the stars (although, unbelievably, some financial advisers push astrology to their clients). Hunches work out to nothing in the long run. Moreover, the best brains on Wall Street do not, on average, beat the averages (Dow-Jones, Standard and Poor's, etc.).

*Lesson 2: Diversify, diversify—that is the law of the prophets of finance.* One of the major lessons of finance is the advantage of diversifying your investments. "Don't put all your eggs in one basket" is one way of expressing this rule. By putting funds in a number of different investments, you can continue to average a high yield while reducing the risk. Calculations show that by diversifying their wealth among a broad array of investments—different

common stocks, conventional and inflation-indexed bonds, real estate, domestic and foreign securities—people can attain a good return while minimizing the downside risk on their investments.

*Lesson 3: Consider common-stock index funds.* Investors who want to invest in the stock market can achieve a good return with the least possible risk by holding a broadly diversified portfolio of common stocks. A good vehicle for diversifying is an *index fund.* This is a portfolio of the stocks of many companies, weighting each company in proportion to its market value and often tracking a major stock index like the S&P 500. One major advantage of index funds is that they have low expenses and low turnover-induced taxes.

*Lesson 4: Minimize unnecessary expenses and taxes.* People often find that a substantial amount of their investment earnings is nibbled away by taxes and expenses. For example, some mutual funds charge a high initial fee when you purchase the fund. Others might charge a management fee of 1 or even 2 percent of assets each year. Additionally, heavily "managed" funds have high turnover and may lead to large taxes on capital gains. Day traders may find great enjoyment in lightning movements in and out, and they may strike it rich, but they *definitely* will pay heavy brokerage and investment charges. By choosing your investments carefully, you can avoid these unnecessary drains on your investment income.

*Lesson 5: Match your investments with your risk preference.* You can increase your expected return by picking riskier investments (see Figure 23-4). But always consider how much risk you can afford—financially *and psychologically.* As one sage put it, investments are a tradeoff between eating well and sleeping well. If you get insomnia worrying about the ups and downs of the market, you can maximize your sleep by keeping your assets in inflation-indexed U.S. Treasury bonds. But in the long run, you might be snoozing soundly on a cot! If you want to eat well and can tolerate disappointments, you might invest more heavily in stocks, including ones in foreign countries and emerging markets, and incorporate more volatile small companies into your portfolio—rather than concentrating on short-term bonds and bank deposits.

Such are the lessons of history and economics. If, after reading all this, you still want to try your hand in the stock market, do not be daunted. But take to heart the caution of one of America's great financiers, Bernard Baruch:

> If you are ready to give up everything else—to study the whole history and background of the market and all the principal companies whose stocks are on the board as carefully as a medical student studies anatomy—if you can do all that, and, in addition, you have the cool nerves of a great gambler, the sixth sense of a kind of clairvoyant, and the courage of a lion, you have a ghost of a chance.

## SUMMARY

### A. The Modern Financial System

1. Financial systems in a modern economy transfer resources over space, time, and sectors. The flow of funds in financial systems occurs through financial markets and financial intermediaries. The major functions of a financial system are to transfer resources, to manage risk, to subdivide and pool funds, and to clear transactions.
2. Interest rates are the prices paid for borrowing funds; they are measured in dollars paid back per year per dollar borrowed. The standard way we quote interest rates is in percent per year. People willingly pay interest because borrowed funds allow them to buy goods and services to satisfy current consumption needs or make profitable investments.
3. Recall the menu of financial assets, especially money, bonds, and equities.
4. Study the *monetary transmission mechanism.* This refers to the process by which monetary policy undertaken by the central bank, our Federal Reserve, interacts with banks and the rest of the economy to determine interest rates, other financial conditions, aggregate

demand, output, and inflation. Make sure you understand each of the five steps (page 453).

### B. The Special Case of Money

5. Money is anything that serves as a commonly accepted medium of exchange, or a means of payment. Money also functions as a unit of account. Unlike other economic goods, money is valued because of social convention. We value money indirectly for what it buys, rather than for its direct utility. Money today is composed of currency and checking deposits and is denoted $M_1$.
6. People hold money primarily because they need it to pay their bills or buy goods; this is known as the transactions demand. But people keep only a small fraction of their assets in money because money has an opportunity cost: we sacrifice interest earnings when we hold money. Therefore, the asset demand for money is limited.

### C. Banks and the Supply of Money

7. Banks are commercial enterprises that seek to earn profits for their owners. One major function of banks is to provide checking accounts to their customers. Banks are legally required to keep reserves on their checking deposits. These can be in the form of either vault cash or deposits at the Federal Reserve.
8. Under 100 percent reserves, banks cannot create money, as seen in the simplest goldsmith bank example. For illustrative purposes, we then examined a required reserve ratio of 10 percent. In this case, the banking system as a whole creates bank money in a ratio of 10 to 1 for each dollar of reserves. With fractional-reserve banking, the total value of checking deposits is a multiple of reserves. Remember the formula

$$\text{Bank money} = \text{total reserves} \times \left(\frac{1}{\text{reserve ratio}}\right)$$

### D. The Stock Market

9. The most important factors about assets are the rate of return and the risk. The rate of return is the total dollar gain from a security over a specified period of time. Risk refers to the variability of the returns on an investment, often measured by the statistical standard deviation. Because people are risk-averse, they require higher returns to induce them to buy riskier assets.
10. Stock markets, of which the New York Stock Exchange is the most important, are places where titles of ownership to the largest companies are bought and sold. The history of stock prices is filled with violent gyrations, such as the Great Crash of 1929 or the sharp bear market of 2008. Trends are tracked using stock-price indexes, such as the Standard and Poor's 500 and the familiar Dow-Jones Industrial Average.
11. Modern economic theories of stock prices generally focus on the efficient-market theory. An "efficient" financial market is one in which all information is immediately absorbed by speculators and built into market prices. In efficient markets, there are no easy profits; looking at yesterday's news or at past patterns of prices or business cycles will not help predict future price movements. Thus, in efficient markets, prices respond to surprises. Because surprises are inherently random, stock prices and other speculative prices move erratically, as in a random walk.
12. Plant the five rules of personal finance firmly in your long-term memory: (*a*) Know thy investments. (*b*) Diversify, diversify—that is the law of the prophets of finance. (*c*) Consider common-stock index funds. (*d*) Minimize unnecessary expenses and taxes. And (*e*) Match your investments with your risk preference.

## CONCEPTS FOR REVIEW

### The Modern Financial System

financial system, financial markets, financial intermediaries
functions of the financial system
major financial assets or instruments
interest forgone as the cost of holding money

### The Special Case of Money

Money ($M_1$) = currency outside the banks plus checking deposits
commodity *M*, paper *M*, bank *M*
motives for money demand:
  transactions demand (today)
  asset demand (in a fragile financial system)

### Banking and the Money Supply

bank reserves = vault cash plus deposits with the Fed
fractional-reserve banking
bank money = reserves/required reserve ratio

### The Stock Market

common stocks (corporate equities)
efficient market, random walk of stock prices
index fund
five rules for personal investing

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

There are many fine histories of money. A good one is John Kenneth Galbraith, *Money, Whence It Came, Where It Went* (Houghton, Boston, 1975). There are many good textbooks on monetary economics. The standard reference on U.S. monetary history is Milton Friedman and Anna Jacobson Schwartz, *Monetary History of the United States 1867–1960* (Princeton University Press, Princeton, N.J., 1963).

Modern capital and finance theory are very popular subjects often covered in the macroeconomics part of an introductory course or in special courses. Good books on the subject are Burton Malkiel, *A Random Walk down Wall Street,* 9th ed. (Norton, New York, 2007). A recent book surveying financial history and theory and arguing that the stock market was extraordinarily overvalued in the bull market of 1981–2000 is Robert Shiller, *Irrational Exuberance*, 2d ed. (Princeton University Press, Princeton, N.J., 2005). A recent summary of evidence on the efficient-market theory by Burton Malkiel and Robert Shiller is found in the *Journal of Economic Perspectives,* Winter 2003.

### Websites

Review our list of good blogs in Chapter 19.

Basic data on money, interest rates, and monetary policy can be found at the website of the Federal Reserve, *www.federalreserve.gov.* Interesting articles on monetary policy can be found in the *Federal Reserve Bulletin* at *www.federalreserve.gov/publications.htm.* The best comprehensive data on finance are from the Federal Reserve flow of funds at *www.federalreserve.gov/releases/z1/.*

A good source for data on financial markets is *finance.yahoo.com.* If you are interested in the latest buzz on stocks, you might visit the Motley Fool at *www.fool.com.*

## QUESTIONS FOR DISCUSSION

1. Suppose that banks hold 20 percent of deposits as reserves rather than 10 percent. Assuming that reserves are unchanged, redo the balance sheet in Table 23-7. What is the new ratio of bank deposits to reserves?
2. What would be the effect of each of the following on the money demand, $M_1$ (with other things held equal)?
   a. An increase in real GDP
   b. An increase in the price level
   c. A rise in the interest rate on savings accounts and Treasury securities
   d. A doubling of all prices, wages, and incomes (Calculate the exact effect on the money demand.)
   e. An increase in the interest rate banks pay on checking accounts
3. The implicit cost of checking accounts is equal to the difference between the yield on safe short-term assets (such as Treasury bills) and the interest rate on checking accounts. What are the impacts of the following on the opportunity cost of holding money in checking deposits?
   a. Before 1980 (when checking deposits had a zero interest rate under law), market interest rates increased from 8 to 9 percent.
   b. In 2007 (when interest rates on money were one-quarter of market interest rates), interest rates declined from 4 to 2 percent.
   c. How would you expect the demand for checking deposits to respond to the change in market interest rates under **a** and **b** if the elasticity of demand for money with respect to the implicit cost of money is $-1$?
4. Explain whether you think that each of the following should be counted as part of the money supply ($M_1$) of the United States: savings accounts, subway tokens, postage stamps, credit cards, debit cards, Starbucks cash cards, and $20 bills used by Russians in Moscow.
5. Explain why the best portfolio should not contain any money (use information from Section D of this chapter). How does the notion of the cost of holding money fit into your answer? Would your answer change if your checking account earned a return equal to that of risk-free investments?
6. According to the efficient-market theory, what effect would the following events have on the price of GM's stock?
   a. A surprise announcement that the government is going to lower business taxes next July 1
   b. A decrease in business taxes on July 1, 6 months after Congress passed the legislation

**c.** An announcement, unexpected by experts, that the United States will impose quotas on imports of Chinese cars during the coming year

**d.** Implementation of **c** by issuing regulations on December 31

**7.** The Federal Reserve is scheduled to pay interest on bank reserves.

**a.** Suppose that the interest rate on reserves is 1 percentage point below market rates. Would banks still desire to minimize excess reserves? Would this affect the bank money equation in Summary point 8 above?

**b.** Suppose that the interest rate on reserves is equal to the market rate. How would your answer to **a** change?

**c.** Using your answer to **b,** can you see why the relationship between reserves and bank money becomes very loose when market interest rates are zero (the "liquidity trap")?

**8.** Suppose that one giant bank, the Humongous Bank of America, held all the checking deposits of all the people, subject to a 10 percent legal reserve requirement. If reserves increased by $1 billion, could the Humongous Bank expect to lend out more than 90 percent of the reserve increase, knowing that the new deposit must come back to it? Would this change the ultimate money-supply multiplier? Explain both answers.

**9.** **Advanced problem:** An *option* is the right to buy or sell an asset (stocks, bonds, foreign exchange, land, etc.) for a specified price on or before a specific date. A *call option* is the right to buy the stock, while a *put option* is the right to sell the stock. Suppose you have a call option to buy 100 shares in a highly volatile stock, Fantasia.com, at any time in the next 3 months at $10 per share. Fantasia currently sells at $9 per share.

**a.** Explain why the value of the option is more than $1 per share.

**b.** Suppose the option were to expire tomorrow and the price of Fantasia.com had an even chance of rising $5 or falling $5 before then. What would be the value of the option today?

**c.** Replace the figure "$5" with "$10" in **b**. What would happen to the value of the option? Explain why an increase in volatility *increases* the value of an option (other things unchanged).

**10.** This problem will illustrate the point that the prices of many speculative financial assets look like a random walk.

**a.** Flip a coin 100 times. Count a head as "plus 1" and a tail as "minus 1." Keep a running score of the total. Plot your results. This is a random walk. (This is easily accomplished on a computer with a program such as Excel, which contains a random-number generator and a graphics function.)

**b.** Next, keep track of the closing price of the stock of your favorite company for a few weeks, or get it online. Plot the price against time for each day. Compare the random numbers in **a** with your stock prices, or show them to a friend and ask the friend to spot the difference. If they look the same, this illustrates that stocks behave like a random walk.

CHAPTER

# 24

# Monetary Policy and the Economy

*There have been three great inventions since the beginning of time: fire, the wheel, and central banking.*

Will Rogers

Where would you look to find the most important macroeconomic policymakers today? In the White House? In Congress? Perhaps in the United Nations or the World Bank? Surprisingly, the answer is that you would look in an obscure marble building in Washington that houses the Federal Reserve System. It is here that you will find the Federal Reserve (or "the Fed," as it is often called). The Fed determines the level of short-term interest rates and lends money to financial institutions, thereby profoundly affecting financial markets, wealth, output, employment, and prices. Indeed, the Fed's influence spreads not only throughout the 50 states but to virtually every corner of the world through financial and trade linkages.

The Federal Reserve's central goals are to ensure low inflation, steady growth in national output, low unemployment, and orderly financial markets. If output is growing rapidly and inflation is rising, the Federal Reserve Board is likely to raise interest rates, putting a brake on the economy and reducing price pressures.

The period 2007–2009 was a particularly challenging time for the Federal Reserve and other central banks. During this period, unsound investments and excessive leverage led to the deteriorating financial health of banks and other financial institutions. This in turn produced huge declines in stock and bond prices, "bank runs," and the failures of several large banks. The Federal Reserve, the European Central Bank, and U.S. and foreign governments provided *trillions* of dollars of loans, loan guarantees, nationalizations, and bailouts. All of these were designed to prevent the seizing up of financial markets and to reduce the severity of the ensuing recession.

Every country has a central bank that is responsible for managing the country's monetary affairs. This chapter begins by explaining the objectives and organization of central banks, focusing on the U.S. Federal Reserve System. It explains how the Fed operates and describes the monetary transmission mechanism. The second section of the chapter then surveys some of the major issues in monetary policy.

## A. CENTRAL BANKING AND THE FEDERAL RESERVE SYSTEM

We begin this section by providing an overview of central banking. The next section provides the details about the different tools employed by the central bank and explains how they can be used to affect short-term interest rates.

## THE ESSENTIAL ELEMENTS OF CENTRAL BANKING

A central bank is a government organization that is primarily responsible for the monetary affairs of a country. In this section, we focus on the U.S. Federal Reserve System. We describe its history, objectives, and functions.

### History

During the nineteenth century, the United States was plagued by banking panics. These occurred when large numbers of people attempted to convert their bank deposits into currency all at the same time. When people arrived at the banks, they found that there was insufficient currency to cover everybody's deposits because of the system of fractional reserves. Bank failures and economic downturns often ensued. After the severe panic of 1907, agitation and discussion led to the Federal Reserve Act of 1913, whose purpose was "to provide for the establishment of Federal reserve banks, to furnish an elastic currency, to afford means of rediscounting commercial paper, to establish a more effective supervision of banking in the United States, and for other purposes." That was the beginning of the Fed.

### Structure

As currently constituted, the **Federal Reserve System** consists of the Board of Governors in Washington, D.C., and the regional Reserve Banks. The core of the Federal Reserve is the *Board of Governors,* which consists of seven members nominated by the president and confirmed by the Senate to serve overlapping terms of 14 years. Members of the board are generally economists or bankers who work full time at the job.

Additionally, there are 12 regional Federal Reserve Banks, located in New York, Chicago, Richmond, Dallas, San Francisco, and other major cities. The regional structure was originally designed in the populist age to ensure that different areas of the country would have an equal voice in banking matters and to avoid a great concentration of central-banking powers in Washington or in the hands of the Eastern bankers. Today, the Federal Reserve Banks supervise banks in their districts, operate the national payments system, and participate in the making of national monetary policy.

The key decision-making body in the Federal Reserve System is the *Federal Open Market Committee* (FOMC). The 12 voting members of the FOMC include the seven governors plus five of the presidents of the regional Federal Reserve Banks who serve as voting members on a rotating basis. This key group controls the most important tool used in monetary policy: the setting of the short-term interest rate.

At the pinnacle of the entire system is the *chair of the Board of Governors.* The chair is nominated by the president and confirmed by the Senate for renewable four-year terms. The chair presides over the Board of Governors and the FOMC, acts as the public spokesperson for the Fed, and exercises enormous power over monetary policy. The current chair is Ben Bernanke, who was a distinguished academic economist, a professor of economics at Princeton University, as well as a former Fed governor before he was appointed chair in 2006. Bernanke succeeded Alan Greenspan, a conservative business economist who became an iconic figure in American economic affairs during his long term as Fed chair (1987–2006).

In spite of the geographically dispersed structure of the Fed, the Fed's power is actually quite centralized. The Federal Reserve Board, joined at meetings by the presidents of the 12 regional Federal Reserve Banks, operates under the Fed chair to formulate and carry out monetary policy. The structure of the Federal Reserve System is shown in Figure 24-1.

### Goals of Central Banks

Before focusing primarily on the U.S. system, we discuss briefly the goals of central banks around the world. We can distinguish three different general approaches of central banks:

- *Multiple objectives.* Many central banks have general goals, such as to maintain economic stability. Among the specific objectives pursued might be low and stable inflation, low unemployment, rapid economic growth, coordination with fiscal policy, and a stable exchange rate.
- *Inflation targeting.* In recent years, many countries have adopted explicit inflation targets. Under such a mandate, the central bank is directed to undertake its policies so as to ensure that inflation stays within a range that is generally low but positive. For example, the Bank of England has

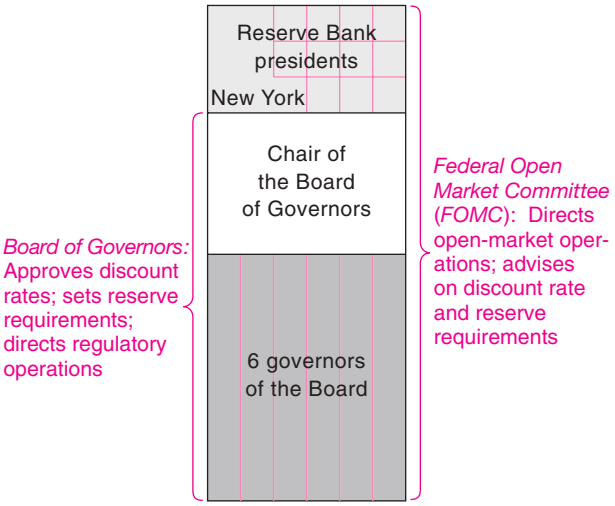


**FIGURE 24-1. The Major Players in Monetary Policy**

Two important committees are at the center of monetary policy. The seven-member Board of Governors approves changes in discount rates and sets reserve requirements. The FOMC directs the setting of bank reserves. The chair of the Board of Governors heads both committees. The size of each box indicates that person's or group's relative power; note the size of the chair's box.

been directed to set monetary policy to maintain a 2 percent annual inflation rate.

- *Exchange-rate targeting.* In a situation where a country has a fixed exchange rate and open financial markets, it can no longer conduct an independent monetary policy, as we will see in our chapters on open-economy macroeconomics. In such a case, the central bank can be described as setting its monetary policy to attain an exchange-rate target.

The Federal Reserve falls into the first category, that of "multiple objectives." Under the Federal Reserve Act, the Fed is directed "to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates." Today this is interpreted as a dual mandate to maintain low and stable inflation along with a healthy real economy. This is how the Fed sees its role today:

> [The Federal Reserve's] objectives include economic growth in line with the economy's potential to expand; a high level of employment; stable prices (that is, stability in the purchasing power of the dollar); and moderate long-term interest rates.[1]

## Functions of the Federal Reserve

The Federal Reserve has four major functions:

- Conducting monetary policy by setting short-term interest rates
- Maintaining the stability of the financial system and containing systemic risk as the lender of last resort
- Supervising and regulating banking institutions
- Providing financial services to banks and the government

We will primarily examine the first two of these functions because they have the most important impact on macroeconomic activity.

## Central-Bank Independence

On examining the structure of the Fed, you might naturally ask, "In which of the three branches of government does the Fed lie?" The answer is interesting. Although nominally a corporation owned by the commercial banks that are members of the Federal Reserve System, the Federal Reserve is in practice a public agency. It is directly responsible to Congress; it attends to the advice of the president; and whenever any conflict arises between making a profit and promoting the public interest, it acts unswervingly in the public interest.

Above all, the Federal Reserve is an *independent* agency. While it consults with Congress and the president, in the end the Fed decides monetary policy according to its own views about the nation's economic interests. As a result, the Fed sometimes comes into conflict with the executive branch. Almost every president has words of advice for the Fed. When Fed policies clash with the administration's goals, presidents occasionally use harsh words. The Fed listens politely but generally chooses the path it deems best for the country, for its decisions do not have to be approved by anybody.

From time to time, critics argue that the Fed is too independent—that it is undemocratic for a small group of unelected people to govern the nation's

[1] See *The Federal Reserve System: Purposes and Functions*, p. 2, under "Websites" in this chapter's Further Reading section.

financial markets. This is a sobering thought, for unelected bodies sometimes lose touch with social and economic realities.

Defenders of the Fed's independence respond that an independent central bank is the guardian of a nation's currency and the best protector against rampant inflation. Moreover, independence ensures that monetary policy is not subverted for partisan political objectives, as sometimes happens in countries where the executive branch controls the central bank. Historical studies show that countries with independent central banks have generally been more successful in keeping inflation down than have those whose central banks are under the control of elected officials.

To summarize:

Every modern country has a central bank. The U.S. central bank is composed of the Federal Reserve Board in Washington, together with the 12 regional Federal Reserve Banks. The Fed's primary mission is to conduct the nation's monetary policy by influencing monetary and credit conditions in pursuit of low inflation, high employment, and stable financial markets.

## HOW THE CENTRAL BANK DETERMINES SHORT-TERM INTEREST RATES

Central banks are at the center stage of macroeconomics because they largely determine short-term interest rates. We now turn to an explanation of this function.

### Overview of the Fed's Operations

The Federal Reserve conducts its policy through changes in an important short-term interest rate called the **federal funds rate.** This is the interest rate that banks charge each other to trade reserve balances at the Fed. It is a short-term (overnight) risk-free interest rate in U.S. dollars. The Fed controls the federal funds rate by exercising control over the following important instruments of monetary policy:

- *Open-market operations*—buying or selling U.S. government securities in the open market to influence the level of bank reserves
- *Discount-window lending*—setting the interest rate, called the *discount rate,* and the collateral requirements with which commercial banks, other depository institutions, and, more recently, primary dealers can borrow from the Fed
- *Reserve-requirements policy*—setting and changing the legal reserve-ratio requirements on deposits with banks and other financial institutions

The basic description of monetary policy is this: When economic conditions change, the Fed determines whether the economy is departing from the desired path of inflation, output, and other goals. If so, the Fed announces a change in its target interest rate, the federal funds rate. To implement this change, the Fed undertakes open-market operations and changes the discount rate. These changes then cascade through the entire spectrum of interest rates and asset prices, and eventually change the overall direction of the economy.

### Balance Sheet of the Federal Reserve Banks

To understand how the Fed conducts monetary policy, we first need to describe the consolidated balance sheet of the Federal Reserve System, shown in Table 24-1. U.S. government securities (e.g., bonds) have historically been the bulk of the Fed's assets. Starting in 2007, the Fed extended its operations to include term auctions, dealer credit, and loan guarantees, which by 2008 constituted a substantial fraction of its assets. The exact composition of the balance sheet is not essential for our understanding of how the Fed normally determines interest rates.

There are two unique items among the Fed's liabilities: currency and reserves. *Currency* is the Fed's principal liability. This item comprises the coins and the paper bills we use every day. The other major liability is reserve balances of banks, which are balances kept on deposit by commercial banks. These deposits, along with the banks' vault cash, are designated as **bank reserves.**

The following is our plan for the remainder of this section: First, we explain in more detail the three instruments that the Fed uses to conduct monetary policy. We will show how the supply of reserves is determined through a combination of announcements, open-market operations, and

**Combined Balance Sheet of 12 Federal Reserve Banks, September 2008 (billions of dollars)**

| Assets | | Liabilities and Net Worth | |
|---|---|---|---|
| U.S. government securities | $479.8 | Federal Reserve currency | $832.4 |
| Loans, auction credits, and repurchase agreements | 322.5 | Deposits: | |
| | | **Reserve balances of banks** | **47.0** |
| Miscellaneous other assets | 181.0 | Other deposits | 14.4 |
| | | Miscellaneous liabilities | 89.5 |
| Total | $983.3 | Total | $983.3 |

**TABLE 24-1. By Changing Its Balance Sheet, the Fed Determines Short-Term Interest Rates and Credit Conditions**

By buying and selling its assets (government securities and repurchase agreements), the Fed controls its liabilities (bank deposits and Federal Reserve notes). The Fed determines the federal funds interest rate by changing the volume of reserves and thereby affects GDP, unemployment, and inflation.

Source: Federal Reserve Board, at *www.federalreserve.gov/releases/h41.*

discount-window policy. Then, we show how short-term interest rates are determined, with the most important factor being the Fed's control over the supply of reserves.

### *Operating Procedures*

The FOMC meets eight times a year to decide upon monetary policy and give operating instructions to the Federal Reserve Bank of New York, which conducts open-market operations on a day-to-day basis.

Today, the Fed operates primarily by setting a short-term target for the *federal funds rate,* which is the interest rate that banks pay each other for the overnight use of bank reserves. Figure 24-2 shows the federal funds rate for recent years along with shaded areas for recessions. You can see how the Fed tends to lower interest rates before recessions and raise them as the economy enters expansions. If you look back to Figure 15-2 on p. 289, you can see how other interest rates tend to move along with the federal funds rate. The linkage is not a tight one, however. While the Fed sets the general level and trend in interest rates, there are many other factors at work in determining interest rates and financial conditions, as evidenced by the fact that interest rates sometime move in different directions.

## HOW THE FEDERAL RESERVE AFFECTS BANK RESERVES

The most important element of monetary policy is the determination of bank reserves through Fed policy. This is an intricate process and requires careful study. Through the combination of reserve requirements, open-market operations, and discount-window policy, the Fed can normally determine the quantity of bank reserves within very narrow limits. We start with a review of the nuts and bolts of these major policy instruments.

### *Open-Market Operations*

**Open-market operations** are a central bank's primary tool for implementing monetary policy. These are activities whereby the Fed affects bank reserves by buying or selling government securities on the open market.

How does the Fed decide how much to buy or sell? The Fed looks at the factors underlying reserve demand and supply and determines whether those trends are consistent with its target for the federal funds rate. On the basis of this forecast, the Fed will buy or sell a quantity of government securities that will help keep the funds rate near the target.

Suppose that, on the basis of its forecasts, the Fed desires to sell $1 billion worth of securities. The Fed

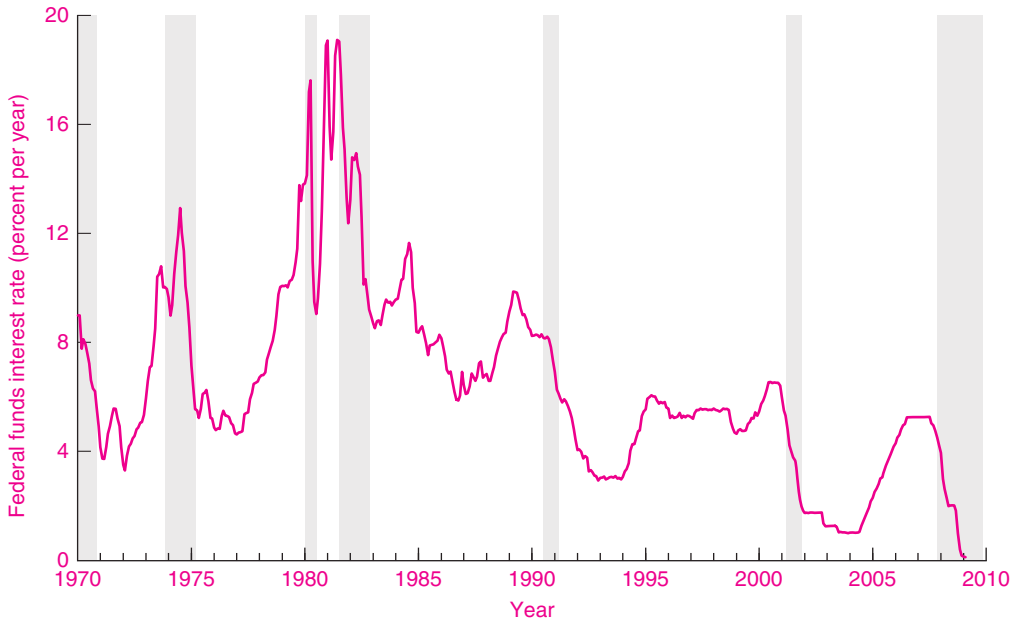


**FIGURE 24-2. Federal Reserve Determines the Federal Funds Rate**

The Fed sets a target for the federal funds rate, which is the interest rate charged by banks for lending reserves to each other. This rate then affects all other interest rates, although the linkage is variable and is affected by expectations of future interest rates as well as by overall financial conditions. (Look at Figure 15-2 for a graph of other major interest rates.) Note how the federal funds rate approached zero at the end of 2008 as the economy entered a liquidity trap.

Source: Federal Reserve Board.

conducts open-market operations with primary dealers, which include about 20 large banks and securities broker-dealers such as Goldman-Sachs and J.P. Morgan. The dealers would buy the securities, drawing upon accounts at the Federal Reserve. After the sale, the total deposits at the Fed would decline by $1 billion. *The net effect would be that the banking system loses $1 billion in reserves.*

Table 24-2(*a*) shows the effect of a $1 billion open-market sale on a hypothetical Federal Reserve balance sheet. The blue entries show the Fed balance sheet before the open-market operation. The green entries show the effect of the open-market sale. The net effect is a $1 billion reduction in both assets and liabilities. The Fed's assets decreased with the $1 billion sale of government bonds, and its liabilities decreased by exactly the same amount, with the corresponding $1 billion decrease in bank reserves.

Now focus on the impact this has on commercial banks, whose consolidated balance sheet is shown in Table 24-2(*b*). We assume that commercial banks hold 10 percent of their deposits as reserves with the central bank. After the open-market operation, banks see that they are short of reserves because they have lost $1 billion of reserves but only lost $1 billion of deposits. The banks must then sell some of their investments and call in some short-term loans to meet the legal reserve requirement. This sets off a multiple contraction of deposits. When the entire chain of impacts has unfolded, deposits are down by $10 billion, with corresponding changes on the asset

**Federal Reserve Balance Sheet (billions of dollars)**

| Assets | | Liabilities | |
|---|---|---|---|
| Securities | 500 –1 | Currency held by public | 410 |
| Loans | 10 | Bank reserves | 100 –1 |
| **Total assets** | **510 –1** | **Total liabilities** | **510 –1** |

**TABLE 24-2(a). Open-Market Sale by Fed Cuts Bank Reserves**

**Balance Sheet of Commercial Banks (billions of dollars)**

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | 100 –1 | Demand deposits | 1000 –10 |
| Loans and investments | 900 –9 | | |
| **Total assets** | **1000 –10** | **Total liabilities** | **1000 –10** |

**TABLE 24-2(b). Decline in Reserves Leads Banks to Reduce Loans and Investments until Money Supply Is Cut by 10-to-1 Ratio**

The central bank sells securities to reduce reserves in order to raise interest rates toward its target.

In **(a),** the Fed sells $1 billion worth of securities on the open market. When dealers pay for the securities, this reduces reserves by $1 billion.

Then, in **(b),** we see the effect of the open-market operation on the balance sheet of the commercial banks. With a reserve-requirement ratio of 10 percent of deposits, banks must reduce loans and investments. The net effect will be to tighten money and raise interest rates.

side of the banks' balance sheet [look carefully at the green entries in Table 24-2(*b*)].

This contraction of loans and investments will tend to raise interest rates. If the Fed has forecast correctly, the interest rate will move to the Fed's new target.

But if it has forecast incorrectly, what should the Fed do? Simply make another adjustment by buying or selling reserves the next day!

## *Discount-Window Policy: A Backstop for Open-Market Operations*

The Fed has a second set of instruments that it can use to meet its targets. The discount window is a facility from which banks, and more recently primary dealers, can borrow when they need additional funds. The Fed charges a "discount rate" on borrowed funds, although the discount rate will vary slightly among different uses and institutions. Generally, the primary discount rate is ¼ to ½ of a percentage point above the target federal funds rate.

The discount window serves two purposes. It complements open-market operations by making reserves available when they are needed on short notice. It also serves as a backstop source of liquidity for institutions when credit conditions may suddenly become tight.

Until very recently, the discount window was seldom used. In the credit crisis of 2007–2009, the Federal Reserve opened the discount window so that banks could borrow when their customers became nervous and demanded immediate withdrawals. During this period, in order to provide more liquidity to a nervous financial market, the Fed enlarged the scope of its lending capacities in several ways. The Fed broadened its definition of allowable collateral, added primary dealers to the list of institutions eligible to borrow at the discount window, put guarantees on shaky securities to help prop up failing banks, and purchased private commercial paper from nonbank entities. All these steps were intended to reduce fears that financial institutions would be unable to pay off their obligations and that the financial system would freeze up and credit would become unavailable to businesses and households.

***Lender of Last Resort.*** Financial intermediaries like banks are inherently unstable because, as we have seen, their liabilities are short-term and subject to

rapid withdrawal while their assets are often long-term and even illiquid. From time to time, banks and other financial institutions cannot meet their obligations to their customers. Perhaps there are seasonal needs for cash, or perhaps, even more ominously, depositors may lose faith in their banks and withdraw their deposits all at once. In this situation, when the bank has run out of liquid assets and lines of credit, a central bank may step in to be the *lender of last resort.* This function was well described by former Fed chair Alan Greenspan:

> [If] we choose to enjoy the advantages of a system of leveraged financial intermediaries, the burden of managing risk in the financial system will not lie with the private sector alone. Leveraging always carries with it the remote possibility of a chain reaction, a cascading sequence of defaults that will culminate in financial implosion if it proceeds unchecked. Only a central bank, with its unlimited power to create money, can with a high probability thwart such a process before it becomes destructive. Hence, central banks have, of necessity, been drawn into becoming lenders of last resort.

Today the discount window is used primarily to ensure that money markets are operating smoothly. It provides additional liquidity, and it is also the place to which banks can turn when they need a lender of last resort.

## The Role of Reserve Requirements

***The Nature of Reserves.*** The previous chapter showed the relationship between bank reserves and bank money. In a free-market banking system, prudent bankers would always need to hold some reserves on hand. They would need to keep a small fraction of their deposits in cash to pay out to depositors who desired to convert their deposits to currency or who wrote checks drawn on their accounts.

Many years ago, bankers recognized that, although deposits are payable on demand, they are seldom all withdrawn together. It would be necessary to hold reserves equal to total deposits if all depositors suddenly wanted to be paid off in full at the same time, but this almost never occurred. On any given day, some people made withdrawals while others made deposits. These two kinds of transactions generally canceled each other out.

Early bankers did not need to keep 100 percent of deposits as sterile reserves; reserves earned no interest when they were sitting in a vault. Banks quickly hit upon the idea of finding profitable investments for their excess deposits. By putting most of the money deposited with them into interest-bearing assets and keeping only fractional cash reserves, banks could maximize their profits.

The transformation into fractional-reserve banks—holding fractional rather than 100 percent reserves against deposits—was in fact revolutionary. It led to the leveraged financial institutions that dominate our financial system today.

***Legal Reserve Requirements.*** In the nineteenth century, banks sometimes had insufficient reserves to meet depositors' demands, and these occasionally spiraled into bank crises. Therefore, beginning at that time, and currently formalized under Federal Reserve regulations, banks were required to keep a certain fraction of their checking deposits (the Fed uses the technical term "checkable deposits") as reserves. In an earlier period, reserve requirements were an important part of controlling the quantity of money (as discussed later in this chapter). In today's environment, where the Fed primarily targets interest rates, reserve requirements are a relatively unimportant instrument of monetary policy.

Reserve requirements apply to all types of checking deposits. Under Federal Reserve regulations, banks are required to hold a fixed fraction of their checking deposits as reserves. This fraction is called the **required reserve ratio.** Bank reserves take the form of vault cash (bank holdings of currency) and deposits by banks with the Federal Reserve System.

Table 24-3 shows current reserve requirements along with the Fed's discretionary power to change these requirements. The key concept is the level of required reserve ratios. They currently range from 10 percent against checking deposits down to zero for personal savings accounts. For convenience in our numerical examples, we use 10 percent reserve ratios, with the understanding that the actual ratio may differ from time to time.

In normal times, the level of required reserves is generally higher than what banks would voluntarily hold. These high requirements serve primarily to ensure that the demand for reserves is relatively

| Type of deposit | Reserve ratio (%) | Range in which Fed can vary (%) |
|---|---|---|
| **Checking (transactions) accounts:** | | |
| $0–$44 million | 3 | No change allowed |
| Above $44 million | 10 | 8–14 |
| **Time and savings deposits:** | | |
| Personal | 0 | |
| Nonpersonal: | | |
| Up to 1½ years' maturity | 0 | 0–9 |
| More than 1½ years' maturity | 0 | 0–9 |

**TABLE 24-3. Required Reserves for Financial Institutions**

Reserve requirements are governed by law and regulation. The reserve-ratio column shows the percent of deposits in each category that must be held in non-interest-bearing deposits at the Fed or as cash on hand. Checking accounts in large banks face a required reserve ratio of 10 percent, while other major deposits have no reserve requirements. The Fed has power to alter the reserve ratio within a given range but does so only on the rare occasion when economic conditions warrant a sharp change in monetary policy.

Source: *Federal Reserve Bulletin*, March 2008.

predictable so that the Fed can have more precise control over the federal funds rate.

The Fed began to pay interest on bank reserves in 2008. The idea was that the interest rate on reserves would serve as a floor under the federal funds rate, thereby allowing better control over the federal funds rate. For example, if the target federal funds rate is 3½ percent, while the interest rate on reserves is 3 percent and the discount rate is 4 percent, then the federal funds rate will effectively be constrained between 3 and 4 percent, and the Fed can more easily attain its target. The financial environment took an unusual turn during the financial crisis of 2007–2009 as the economy entered a "liquidity trap." We return to this point briefly later in this chapter.

### Determination of the Federal Funds Rate

Now that we have surveyed the basic instruments, we can analyze how the Fed determines short-term interest rates. The basic operation is shown in Figure 24-3. This shows the demand for and supply of bank reserves.

First, consider the demand for bank reserves. As we saw in the last chapter, banks are required to hold reserves as determined by the total value of their checking deposits and the required reserve ratio. Because the demand for checking deposits is an inverse function of the interest rate, this implies that the demand for bank reserves will also decline as interest rates rise. This is what lies behind the downward-sloping $D_RD_R$ curve in Figure 24-3.

Next, we need to consider the supply of reserves. This is determined by open-market operations. By purchasing and selling securities, the Fed controls the level of reserves in the system. A purchase of securities by the Fed increases the supply of bank reserves, while a sale does the opposite.

The equilibrium federal funds interest rate is determined where desired supply and demand are equal. The important insight here is that the Fed can achieve its target through the judicious purchase and sale of securities—that is, through open-market operations.

But Figure 24-3 shows only the very short run supply and demand. Because the Fed intervenes in the market daily, and because market participants know the Fed's interest-rate target, the Fed can keep the federal funds rate close to its target. Figure 24-4 shows supply and demand over the period of a month or more. The central bank in essence provides a perfectly elastic supply of reserves at the target federal funds rate. This shows how the Fed achieves its funds target on a week-to-week and month-to-month basis.

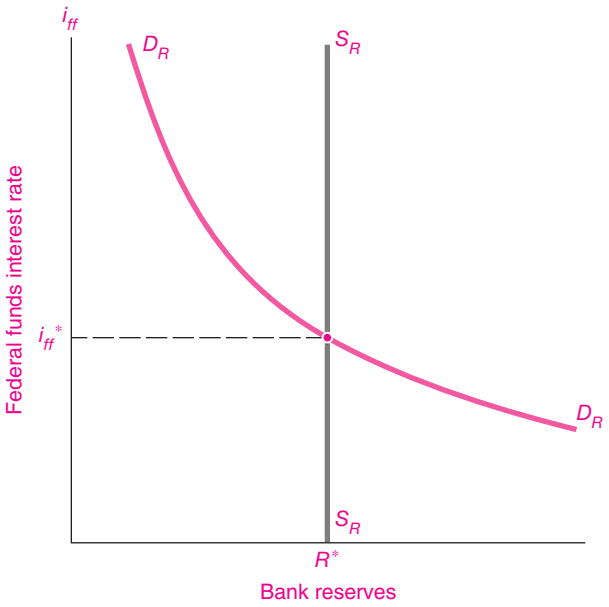


**FIGURE 24-3. Supply of and Demand for Bank Reserves Determine the Federal Funds Rate**

The demand for bank reserves declines as interest rates rise, reflecting that checking deposits decline as lower interest rates increase money demand. The Fed has a target interest rate at $i_{ff}^*$. By supplying the appropriate quantity of reserves at $R^*$ through open-market operations, the Fed achieves its target.

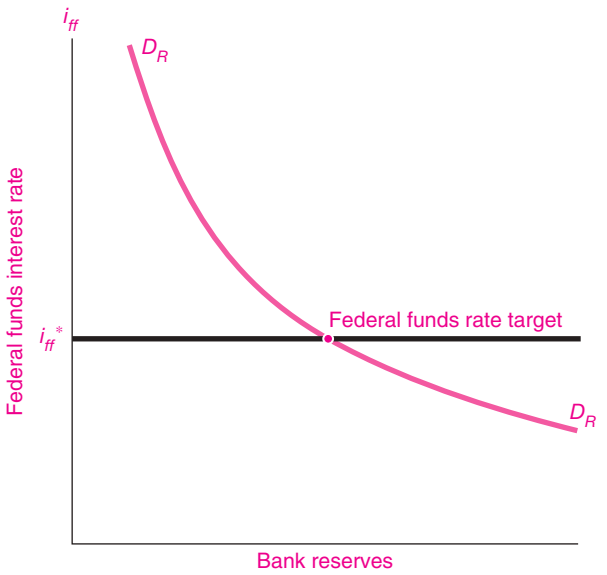


**FIGURE 24-4. By Constant Intervention the Fed Can Achieve Its Interest-Rate Target**

Because the Fed intervenes daily, undertaking open-market operations as illustrated in Figure 24-3, it can achieve its target with a narrow margin.

The federal funds rate, which is the most important short-term interest rate in the market, is determined by the supply of and demand for bank reserves. By constantly monitoring the market and providing or removing reserves as needed through open-market operations, the Federal Reserve can ensure that short-term interest rates stay very close to its target.

## B. THE MONETARY TRANSMISSION MECHANISM

### *A Summary Statement*

Having examined the building blocks of monetary theory, we now describe the **monetary transmission mechanism,** the route by which monetary policy affects output, employment, prices, and inflation. We sketched the mechanism at the beginning of the previous chapter, and now we describe the mechanism in greater detail.

1. *The central bank raises the interest-rate target.* The central bank announces a target short-term interest rate chosen in light of its objectives and the state of the economy. The Fed may also change the discount rate and the terms of its lending facilities. These decisions are based on current economic conditions, particularly inflation, output growth, employment, and financial conditions.
2. *The central bank undertakes open-market operations.* The central bank undertakes daily open-market operations to meet its federal funds target. If the Fed wished to slow the economy, it would sell securities, thereby reducing reserves and raising short-term interest rates; if a recession threatened, the Fed would buy securities, increasing the supply of reserves and lowering short-term interest rates. Through open-market operations,

the Fed keeps the short-term interest rate close to its target on average.

3. *Asset markets react to the policy changes.* As the short-term interest rate changes, given expectations about future financial conditions, banks adjust their loans and investments, as well as their interest rates and credit terms. Changes in current and expected future short-term interest rates, along with other financial and macroeconomic influences, determine the entire spectrum of longer-term interest rates. Higher interest rates tend to reduce asset prices (such as those of stocks, bonds, and houses). Higher interest rates also tend to raise foreign-exchange rates in a flexible-exchange-rate system.
4. *Investment and other spending react to interest-rate changes.* Suppose the Fed has raised interest rates to reduce inflation. The combination of higher interest rates, tighter credit, lower wealth, and a higher exchange rate tends to reduce investment, consumption, and net exports. Businesses scale down their investment plans. Similarly, when mortgage interest rates rise, people may postpone buying a house, lowering housing investment. In addition, in an open economy, the higher foreign-exchange rate of the dollar will depress net exports. Hence, tight money will reduce spending on interest-sensitive components of aggregate demand.
5. *Monetary policy will ultimately affect output and price inflation.* The aggregate supply-and-demand analysis (or, equivalently, the multiplier analysis) showed how changes in investment and other autonomous spending affect output and employment. If the Fed tightens money and credit, the decline in *AD* will lower output and cause prices to rise less rapidly, thereby curbing inflationary forces.

We can summarize the steps as follows:

Change in monetary policy
→ change in interest rates, asset prices, exchange rates
→ impact on *I, C, X*
→ effect on *AD*
→ effect on *Q, P*

Make sure you understand this important sequence from the central bank's change in its interest-rate target to the ultimate effect on output and prices. We have discussed the first steps of the sequence in depth, and we now follow through by exploring the effect on the overall economy.

## The Effect of Changes in Monetary Policy on Output

We close with a graphical analysis of the monetary transmission mechanism.

***Interest Rates and the Demand for Investment.*** We can track the first part of the mechanism in Figure 24-5. This diagram puts together two diagrams we have met before: the supply of and demand for reserves in (*a*) and the demand for investment in (*b*). We have simplified our analysis by assuming that there is no inflation, no taxes, and no risk, with the result that the federal funds interest rate in (*a*) is the same as the cost of capital paid by business and residential investors in (*b*). In this simplified situation, the real interest rate ($r$) equals the central bank's interest rate ($i_{ff}$). Monetary policy leads to interest rate $r^*$, which then leads to the corresponding level of investment $I^*$.

Next, consider what happens when economic conditions change. Suppose that economic conditions deteriorate. This could be the result of a decline in military spending after a war, or the result of a decline in investment due to the burst of a bubble, or the result of a collapse in consumer confidence after a terrorist attack. The Fed would examine economic conditions and determine that it should lower short-term interest rates through open-market purchases. This would lead to the downward shift in interest rates from $r^*$ to $r^{**}$ shown in Figure 24-6(*a*).

The next step in the sequence would be the reaction of investment, shown in Figure 24-6(*b*). As interest rates decline *and holding other things constant,* the demand for investment would increase from $I^*$ to $I^{**}$. (We emphasize the point about holding other things constant because this diagram shows the shift relative to what would otherwise occur. Taking into account that other things *are* changing, we might see a fall in *actual* investment. However, the monetary shift indicates that investment would fall less with the policy than without it.)

***Changes in Investment and Output.*** The final link in the mechanism is the impact on aggregate demand,

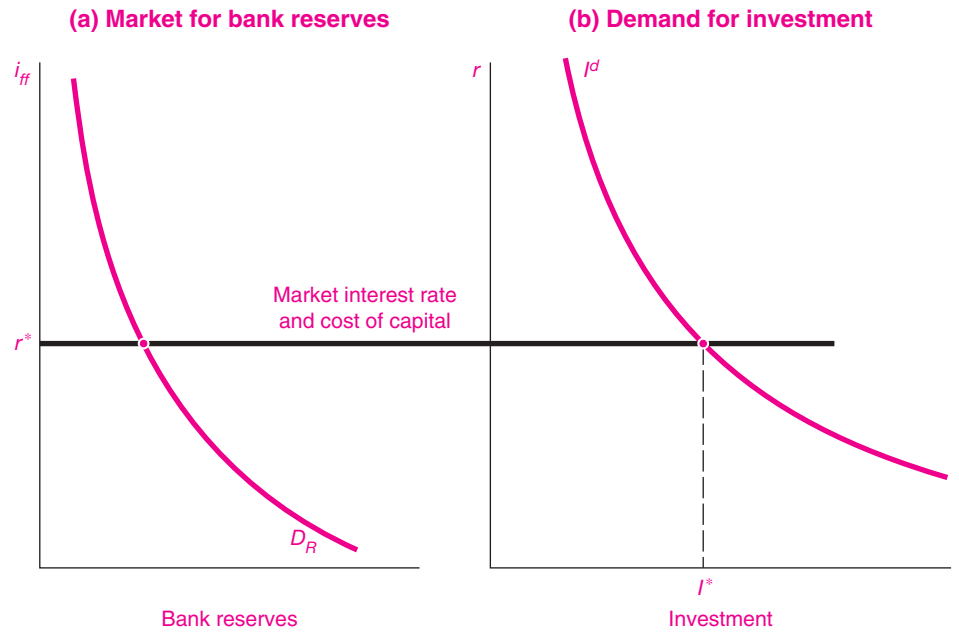


**FIGURE 24-5. Interest Rate Determines Business and Residential Investment**

This figure shows the linkage between monetary policy and the real economy. (**a**) The Fed uses open-market operations to determine short-term interest rates. (**b**) Assuming no inflation or risk, the interest rate determines the cost of business and residential investment; that is, $r = i_{ff}$. Total investment, which is the most interest-sensitive component of *AD*, can be found at $I^*$.

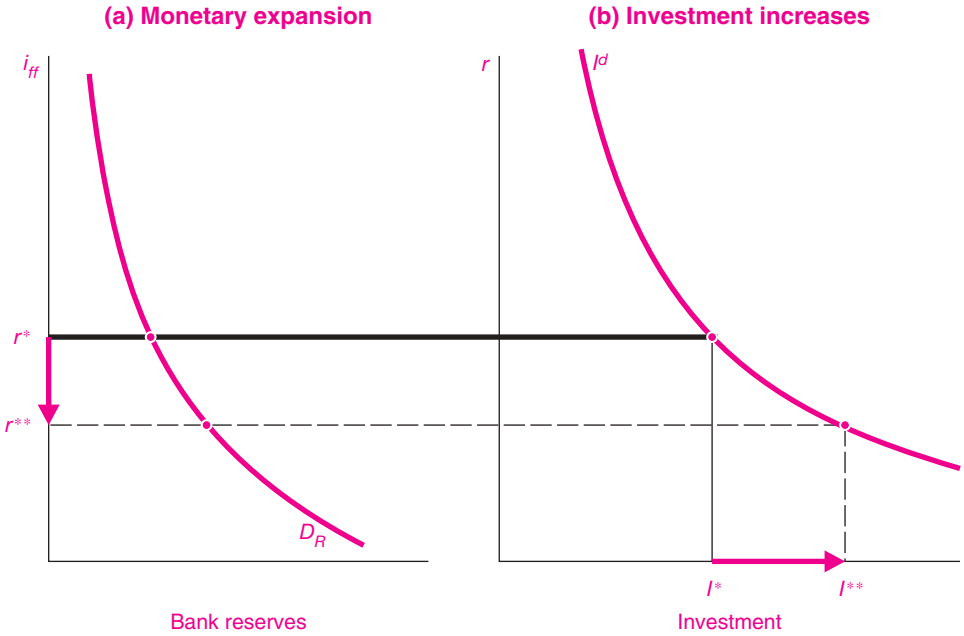


**FIGURE 24-6. Monetary Expansion Leads to Lower Interest Rates and Increased Investment**

Suppose that the economy weakens, as happened in 2007–2008. **(a)** The Fed buys securities and increases reserves, lowering the interest rate. **(b)** The effect (other things held constant) is that the lower interest rate raises asset prices and stimulates business and residential investment. See how investment rises from $I^*$ to $I^{**}$.

as shown in Figure 24-7. This is the same diagram we used to illustrate the multiplier mechanism in Chapter 22. We have shown the $C + I + G$ curve of total expenditure as a function of total output on the horizontal axis. With the original interest rate $r^*$, output is at the depressed level $Q^*$ before the central bank undertakes its expansionary policy.

Next, assume that the Fed takes steps to lower market interest rates, as shown in Figure 24-6. The lower interest rates increase investment from $I^*$ to $I^{**}$. This is illustrated in Figure 24-7 as an upward shift in the total expenditure line to $C + I(r^{**}) + G$. The result is a higher total output at $Q^{**}$. This diagram shows how the sequence of monetary steps has led to higher output, just as the Fed desired in the face of deteriorating economic conditions.

This graphical device is oversimplified. It omits many other contributions to changes in aggregate demand, such as the impact of monetary policy on wealth and consequently on consumption, the effect of exchange rates on foreign trade, and the direct effect of credit conditions on spending. Additionally, we have not yet fully described how monetary policy affects inflation. Nevertheless, this simple graph illustrates the essence of the monetary transmission mechanism.

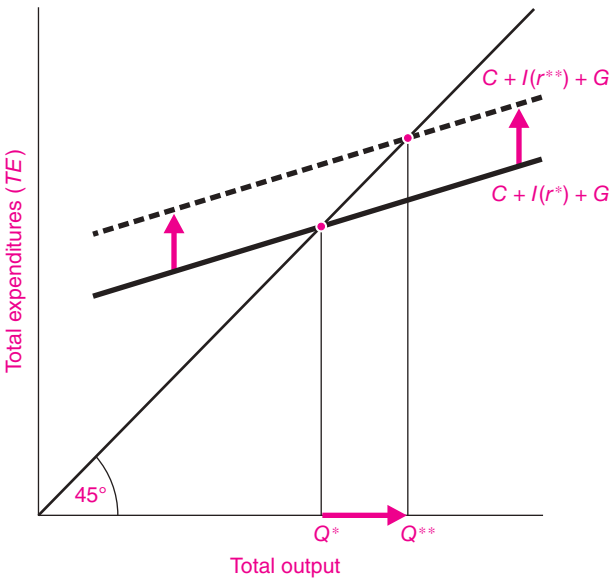


**FIGURE 24-7. Monetary Expansion Lowers Interest Rate and Increases Output**

As interest rates decline from $r^*$ to $r^{**}$, then (other things held constant) investment increases from $I(r^*)$ to $I(r^{**})$. This increase shifts up the aggregate demand $C + I + G$ curve of total expenditure, and output increases from $Q^*$ to $Q^{**}$. This completes the monetary transmission mechanism.

Monetary policy uses open-market operations and other instruments to affect short-term interest rates. These short-term interest rates then interact with other economic influences to affect other interest rates and asset prices. By affecting interest-sensitive spending, such as business and residential investment, monetary policy helps control output, employment, and price inflation.

## The Challenge of a Liquidity Trap

One of the greatest challenges for a central bank arises as nominal interest rates approach zero. This is referred to as the **liquidity trap.** Such a situation occurred in the Great Depression of the 1930s and then again in 2008–2009 in the United States.

When short-term safe interest rates are zero, short-term safe securities are equivalent to money. The demand for money becomes infinitely elastic with respect to the interest rate. In this situation, banks have no reason to economize on their reserve holdings; they get essentially the same interest rates on reserves as on riskless short-term investments. For example, in early 2009, banks could earn 0.10 percent annually on reserves and 0.12 percent on Treasury bills.

Central bank open-market operations therefore have little or no impact upon interest rates and financial markets. Instead, when the Fed purchases securities, the banks just increase their excess reserves. This syndrome appeared with a vengeance in 2008–2009 as excess reserves rose from a normal level of $1 billion to over $900 billion. In essence, banks were using the Fed as a safe deposit box for their funds! (Make sure you understand why open-market operations are ineffective in a liquidity trap.) Because the Fed cannot lower short-term interest rates, it is unable to use the normal monetary transmission mechanism to stimulate the economy in a liquidity trap.

If the central bank cannot lower short-term interest rates below zero, what other steps can it take to stimulate a depressed economy? This was

the dilemma that the Fed faced in early 2009. One step would be to attempt to lower *long-term interest rates*. This would require that the central bank purchase long-term bonds instead of focusing on short-term securities, which is its usual practice. A second step would be to *reduce the risk premium on risky securities*. Acting with the U.S. Treasury, the Fed has been taking forceful steps in this direction since the early stages of the 2007–2009 credit crisis. The steps included buying distressed assets, opening the discount window to non-bank financial institutions, buying commercial paper, and lending against a wide range of private financial assets. The purpose of these steps was to improve liquidity and increase the availability of credit in financial markets. An excellent review of the Fed's activities during this period is contained in a 2009 speech by Fed chair Bernanke cited in the Further Readings section at the end of this chapter.

## Monetary Policy in the AS-AD Framework

Figures 24-5, 24-6, and 24-7 illustrate how a change in monetary policy could lead to an increase in aggregate demand. We can now show the effect of such an increase on the overall macroeconomic equilibrium by using aggregate supply and aggregate demand curves.

The increase in aggregate demand produced by a monetary expansion is shown as a rightward shift of the *AD* curve, as drawn in Figure 24-8. This shift illustrates a monetary expansion in the presence of unemployed resources, with a relatively flat *AS* curve. The monetary expansion shifts aggregate demand from *AD* to *AD′*, moving the equilibrium from *E* to *E′*. This example demonstrates how monetary expansion can increase aggregate demand and have a powerful impact on real output.

The complete sequence of impacts from expansionary monetary policy is therefore as follows: Open-market operations lower market interest rates. Lower interest rates stimulate interest-sensitive spending on business investment, housing, net exports, and the like. Aggregate demand increases via the multiplier mechanism, raising output and prices above the levels they would otherwise attain. Therefore, the basic sequence is

$$r \text{ down} \rightarrow I,\ C,\ X \text{ up} \rightarrow AD \text{ up} \rightarrow Q \text{ and } P \text{ up}$$

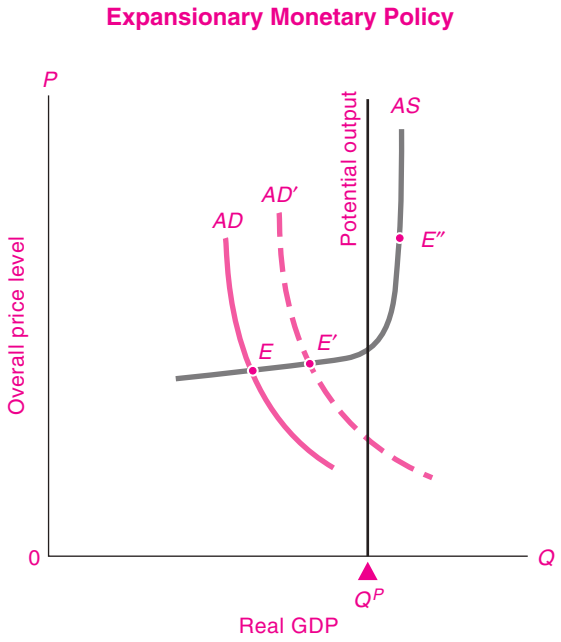


**FIGURE 24-8. Expansionary Monetary Policy Shifts Out the *AD* Curve, Increasing Output and Prices**

Figures 24-5 to 24-7 showed how a monetary expansion would lead to an increase in investment and thereby to a multiplied increase in output. This results in a rightward shift of the *AD* curve.

In the Keynesian region where the *AS* curve is relatively flat, a monetary expansion has its primary effect on real output, with only a small effect on prices. In a fully employed economy, the *AS* curve is near-vertical (shown at point *E″*), and a monetary expansion will primarily raise prices and nominal GDP, with little effect on real GDP. Can you see why in the long run monetary policy would have no impact on real output if the *AS* curve is vertical?

To clinch your understanding of this vital sequence, work through the opposite case of a monetary contraction. Say that the Federal Reserve decides to raise interest rates, slow the economy, and reduce inflation. You can trace this sequence in Figures 24-5 through 24-7 by reversing the direction of the initial change in monetary policy, thereby seeing how money, interest rates, investment, and aggregate demand react when monetary policy is tightened. Then see how a corresponding leftward shift of the *AD* curve in Figure 24-8 would reduce both output and prices.

### *Monetary Policy in the Long Run*

The analysis in this chapter focuses primarily on monetary policy and business cycles. That is, it considers how monetary policy and interest rates affect output in the short run.

Be aware, however, that a different set of forces will operate in the long run. Monetary policies to stimulate the economy cannot keep increasing output beyond its potential for long. If the central bank holds interest rates too low for long periods of time, the economy will overheat and inflationary forces will take hold. With low real interest rates, speculation may arise, and animal spirits may overtake rational calculations. Some analysts believe that interest rates were too low for too long in the 1990s, causing the stock market bubble; some people think that the same mechanism was behind the housing market bubble of the 2000s.

In the long run, therefore, monetary expansion mainly affects the price level with little or no impact upon real output. As shown in Figure 24-8, monetary changes will affect aggregate demand and real GDP in the short run when there are unemployed resources in the economy and the *AS* curve is relatively flat. However, in our analysis of aggregate supply in the following chapters, we will see that the *AS* curve tends to be vertical or near-vertical in the long run as wages and prices adjust. Because of such price-wage adjustments and a near-vertical *AS* curve, the effects of *AD* shifts on output will diminish in the long run, and the effects on prices will tend to dominate. *This means that, as prices and wages become more flexible in the long run, monetary-policy changes tend to have a relatively small impact on output and a relatively large impact on prices.*

What is the intuition behind this difference between the short run and the long run? Suppose that monetary policy lowers interest rates. In the beginning, real output rises smartly and prices rise modestly. As time passes, however, wages and prices adjust more completely to the higher price and output levels. Higher demand in both labor and product markets raises wages and prices; wages are adjusted to reflect the higher cost of living. In the end, the expansionary monetary policy would produce an economy with unchanged real output and higher prices. All dollar variables (including the money supply, reserves, government debt, wages, prices, exchange rates, etc.) would be higher, while all real variables would be unchanged. In such a case, we say that *money is neutral*, meaning that changes in monetary policy have no effect on real variables.

This discussion of monetary policy has taken place without reference to fiscal policy. In reality, whatever the philosophical predilections of the government, every advanced economy simultaneously conducts both fiscal and monetary policies. Each type of policy has both strengths and weaknesses. In the chapters that follow, we return to an integrated consideration of the roles of monetary and fiscal policies in combating the business cycle and promoting economic growth.

## C. APPLICATIONS OF MONETARY ECONOMICS

Having examined the basic elements of monetary economics and central banking, we now turn to two important applications of money to macroeconomics. We begin with a review of the influential monetarist approach, and then we examine the implications of globalization for monetary policy.

### MONETARISM AND THE QUANTITY THEORY OF MONEY AND PRICES

Financial and monetary systems cannot manage themselves. The government, including the central bank, must make fundamental decisions about the monetary standard, the money supply, and the ease or tightness of money and credit. Today, there are many different philosophies about the best way to manage monetary affairs. Many believe in an active policy that "leans against the wind" by raising interest rates when inflation threatens and lowering them in recessions. Others are skeptical about the ability of policymakers to use monetary policy to "fine-tune" the economy to attain the desired levels of inflation and unemployment; they would rather limit monetary policy to targeting inflation. Then there are the monetarists, who believe that discretionary monetary policy should be replaced by a fixed rule relating to the growth of the money supply.

Having reviewed the basics of mainstream monetary theory, this section analyzes monetarism and traces the history of its development from the older quantity theory of money and prices. We will also see that monetarism is closely related to modern macroeconomic theory.

## The Roots of Monetarism

**Monetarism** holds that the money supply is the primary determinant of both short-run movements in nominal GDP and long-run movements in prices. Of course, Keynesian macroeconomics also recognizes the key role of money in determining aggregate demand. The main difference between monetarists and Keynesians lies in the importance assigned to the role of money in the determination of aggregate demand. While Keynesian theories hold that many other forces besides money also affect aggregate demand, monetarists believe that changes in the money supply are the primary factor that determines movement in output and prices.

In order to understand monetarism, we need to understand the concept of the *velocity of money*.

## The Equation of Exchange and the Velocity of Money

Money sometimes turns over very slowly; it may sit under a mattress or in a bank account for long periods of time between transactions. At other times, particularly during periods of rapid inflation, money circulates quickly from hand to hand. The speed of the turnover of money is described by the concept of the velocity of money, introduced by Cambridge University's Alfred Marshall and Yale University's Irving Fisher. The velocity of money measures the number of times per year that the average dollar in the money supply is spent for goods and services. When the quantity of money is large relative to the flow of expenditures, the velocity of circulation is low; when money turns over rapidly, its velocity is high.

The concept of velocity is formally introduced in the **equation of exchange.** This equation states[2]

$$MV \equiv PQ \equiv (p_1q_1 + p_2q_2 + \cdots)$$

where $M$ is the money supply, $V$ is the velocity of money, $P$ is the overall price level, and $Q$ is total real output. This can be restated as the definition of the **velocity of money** by dividing both sides by $M$:

$$V \equiv \frac{PQ}{M}$$

We generally measure $PQ$ as total income or output (nominal GDP); the associated velocity concept is the *income velocity of money.*

Velocity is the rate at which money circulates through the economy. The **income velocity of money** is measured as the ratio of nominal GDP to the stock of money.

As a simple example, assume that the economy produces only bread. GDP consists of 48 million loaves of bread, each selling at a price of \$1, so GDP = $PQ$ = \$48 million per year. If the money supply is \$4 million, then by definition $V$ = \$48/\$4 = 12 per year. This means that money turns over 12 times per year or once a month as incomes are used to buy the monthly bread.

## The Quantity Theory of Prices

Having defined an interesting variable called velocity, we now describe how early monetary economists used velocity to explain movements in the overall price level. The key assumption here is that *the velocity of money is stable and predictable.* The reason for stability, according to monetarists, is that velocity mainly reflects underlying patterns in the timing of earning and spending. If people are paid once a month and tend to spend their income evenly over the course of the month, income velocity will be 12 per year. Suppose that all prices, wages, and incomes double. With unchanged spending patterns, the income velocity of money would remain unchanged and the demand for money would double. Only if people and businesses modify their spending patterns or the way in which they pay their bills would the income velocity of money change.

On the basis of this insight about the stability of velocity, some early writers used velocity to explain changes in the price level. This approach, called the **quantity theory of money and prices,** rewrites the definition of velocity as follows:

$$P \equiv \frac{MV}{Q} \equiv \left(\frac{V}{Q}\right)M \approx kM$$

[2] The definitional equations have been written with the three-bar identity symbol rather than with the more common two-bar equality symbol. This usage emphasizes that they are "identities"—statements which hold true by definition.

This equation is obtained from the earlier definition of velocity by substituting the variable $k$ as a shorthand for $V/Q$ and solving for $P$. We write the equation in this way because many classical economists believed that if transaction patterns were stable, $k$ would be constant or stable. In addition, they generally assumed full employment, which meant that real output would grow smoothly. Putting these two assumptions together, $k \approx (V/Q)$ would be near-constant in the short run and decline smoothly in the long run.

What are the implications of the quantity theory? As we can see from the equation, if $k$ were constant, the price level would then move proportionally with the supply of money. A stable money supply would produce stable prices; if the money supply grew rapidly, so would prices. Similarly, if the money supply were growing a hundredfold or a millionfold each year, the economy would experience galloping inflation or hyperinflation. Indeed, the most vivid demonstrations of the quantity theory can be seen in periods of hyperinflation. Look at Figure 30-4 (on page 613). Note how prices rose a billionfold in Weimar Germany after the central bank unleashed the power of the monetary printing presses. This is the quantity theory of money with a vengeance.

To understand the quantity theory of money, it is essential to recall that money differs fundamentally from ordinary goods such as bread and cars. We want bread to eat and cars to drive. But we want money only because it buys us bread and cars. If prices in Zimbabwe today are 100 million times what they were a few years ago, it is natural that people will need about 100 million times as much money to buy things as they did before. Here lies the core of the quantity theory of money: the demand for money rises proportionally with the price level as long as other things are held constant.

In reality, velocity has tended to increase slowly over time, so the $k$ ratio might also change slowly over time. Moreover, in normal times, the quantity theory is only a rough approximation to the facts. Figure 24-9 shows a scatter plot of money growth and inflation over the last half-century. While periods of faster U.S. money growth are also periods of higher inflation, other factors are clearly at work as well, as evidenced by the imperfect correlation between money supply and prices.

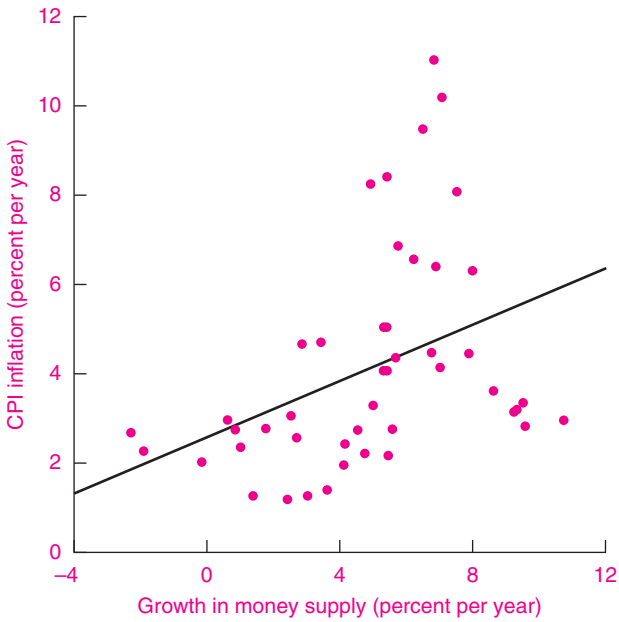


**FIGURE 24-9. The Quantity Theory in the United States, 1962–2007**

The quantity theory states that prices should change 1 percent for each 1 percent change in the money supply. The scatter plot and the line of best fit show how the simple quantity theory holds for data from the last half-century. Inflation is indeed correlated with money growth, but the relationship is a loose fit. As we will see in our chapters on inflation, other variables such as unemployment and commodity prices influence inflation as well. Query: Assuming velocity is constant and output grows at 3 percent per year, what scatter plot would be produced if money were neutral?

Source: Money supply from the Federal Reserve Board, and the consumer price index from the Bureau of Labor Statistics. Data are 3-year moving averages.

The quantity theory of money and prices holds that prices move proportionally with the supply of money. Although the quantity theory is only a rough approximation, it does help to explain why countries with low money growth have moderate inflation while those with rapid money growth find their prices galloping along.

### Modern Monetarism

Modern monetary economics was developed after World War II by Chicago's Milton Friedman and his numerous colleagues and followers. Under

Friedman's leadership, monetarists challenged Keynesian macroeconomics and emphasized the importance of monetary policy in macroeconomic stabilization. In the 1970s, the monetarist approach branched into two separate schools of thought. One continued the monetarist tradition, which we will now describe. The younger offshoot became the influential "new classical school," which is analyzed in Chapter 31.

Strict monetarists hold that "only money matters." This means that prices and output are determined solely by the money supply and that other factors affecting aggregate demand, such as fiscal policy, have no effect on total output or prices. Moreover, while monetary changes may affect real output in the short run, in the long run output is determined by supply factors of labor, capital, and technology. This theory predicts that in the long run, *money is neutral*. This proposition means that in the long run, after expectations have been corrected and business-cycle movements have damped out, (1) nominal output moves proportionally with the money supply and (2) all real variables (output, employment, and unemployment) are independent of the money supply.

### The Monetarist Platform: Constant Money Growth

Monetarism played a significant role in shaping macroeconomic policy in the period after World War II. Monetarists hold that money has no effect on real output in the long run, while it does affect output in the short run with long and variable lags. These views lead to the central monetarist tenet of a **fixed-money-growth rule:** The central bank should set the growth of the money supply at a fixed rate and hold firmly to that rate.

Monetarists believe that a fixed growth rate of money would eliminate the major source of instability in a modern economy—the capricious and unreliable shifts of monetary policy. They argue that we should, in effect, replace the Federal Reserve with a computer that produces a fixed-money-growth rate. Such a computerized policy would ensure that there would be no bursts in money growth. With stable velocity, nominal GDP would grow at a stable rate. With suitably low money growth, the economy would soon achieve price stability. So argue the monetarists.

### The Monetarist Experiment

When U.S. inflation moved into the double-digit range in the late 1970s, many economists and policymakers believed that monetary policy was the only hope for an effective anti-inflation policy. In October 1979, Federal Reserve chair Paul Volcker launched a fierce attack against inflation in what has been called the *monetarist experiment*. In a dramatic shift from its normal operating procedures, the Fed attempted to stabilize the growth of bank reserves and the money supply rather than targeting interest rates.

The Fed hoped that the quantitative approach to monetary management would lower the growth rate of nominal GDP and thereby lower inflation. In addition, some economists believed that a disciplined monetary policy would quickly reduce inflationary expectations. Once people's expectations were reduced, the economy could experience a relatively painless reduction in the underlying rate of inflation.

The experiment succeeded in slowing the growth of nominal GDP and reducing inflation. With tight money, interest rates rose sharply. Inflation slowed from 13 percent per year in 1980 to 4 percent per year in 1982. Any lingering doubts about the efficacy of monetary policy were killed by the monetarist experiment. Money works. Money matters. Tight money can wring inflation out of the economy. However, the decline in inflation came at the cost of a deep recession and high unemployment during the 1980–1983 period.

### The Decline of Monetarism

Paradoxically, just as the monetarist experiment succeeded in rooting inflation out of the American economy, changes in financial markets undermined the monetarist approach. During and after the monetarist experiment, velocity became extremely unstable. Careful economic studies have shown that velocity is positively affected by interest rates and cannot be considered to be a constant that is independent of monetary policy.

Figure 24-10 shows trends in velocity over the 1960–2007 period. $M_1$ velocity growth was relatively stable in the 1960–1979 period, leading many economists to believe that velocity was predictable. Velocity became much more unstable after 1980 as the high interest rates of the 1979–1982 period spurred financial innovations, including money market

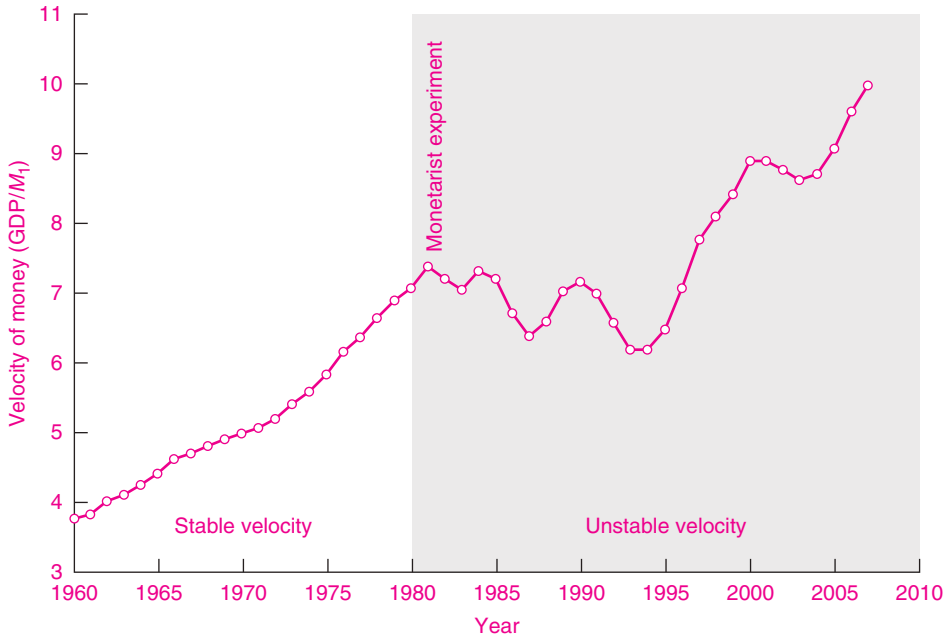


**FIGURE 24-10. Income Velocity of $M_1$**

Monetarists assume that the velocity of money is stable and thereby argue for a constant money-supply growth rate. The velocity of money grew at a steady and predictable rate until around 1979. Beginning in 1980 (the shaded area of the graph), an active monetary policy, more-volatile interest rates, and financial innovations led to the extreme instability of velocity.

Source: Velocity defined as the ratio of nominal GDP to $M_1$; money supply from the Federal Reserve Board, and GDP from the Commerce Department.

accounts and interest-bearing checking accounts. Some economists believe that the instability of velocity was actually *produced* by the heavy reliance on targeting monetary aggregates during this period.

As the velocity of money became increasingly unstable, the Federal Reserve gradually stopped using it as a guide for monetary policy. By the early 1990s, the Fed began to rely on macroeconomic indicators such as inflation, output, and employment to diagnose the state of the economy. Interest rates, not the money supply, became the major instrument of policy.

For most central banks today, monetarism is no longer a useful macroeconomic theory. Indeed, during the recession of 2007–2009, the Federal Reserve did not include monetary quantities among its objectives. But this did not diminish the importance of monetary policy, which continues to be a central partner in macroeconomic policy around the world.

Monetarism holds that "only money matters" in the determination of output and prices and that money is neutral in the long run. Although monetarism is no longer a dominant branch of macroeconomics, monetary policy continues to be a central tool of stabilization policy in large market economies today.

## MONETARY POLICY IN AN OPEN ECONOMY[3]

Central banks are particularly important in open economies, where they manage reserve flows and the exchange rate and monitor international financial developments. As economies become increasingly

[3] This section is relatively advanced and can usefully be studied after the chapters on open-economy macroeconomics (Chapters 27 and 28) have been covered.

integrated (a process often called *globalization*), central banks must learn to manage external flows as well as internal targets. This section discusses some of the major issues concerning the monetary management of an open economy.

### International Linkages

No country is an island, isolated from the world economy. All economies are linked through international trade in goods and services and through flows of capital and financial assets.

An important element in the international financial linkage between two countries is the exchange rate. As we will see again in later chapters, international trade and finance involve the use of different national currencies, all of which are linked by relative prices called foreign exchange rates. Hence, the relative price of Euros to U.S. dollars is the exchange rate between those two currencies.

One important exchange-rate system is floating exchange rates, in which a country's foreign exchange rate is determined by market forces of supply and demand. Today, the United States, Europe, and Japan all operate floating-exchange-rate systems. These three regions can pursue their monetary policies independently from other countries. This chapter's analysis mainly concerns the operation of monetary policy under floating exchange rates.

Some economies—such as Hong Kong and China today, as well as virtually all countries in earlier periods—maintain fixed exchange rates. They "peg" their currencies to one or more external currencies. When a country has a fixed exchange rate, it must align its monetary policy with that of the country to which its currency is pegged. For example, if Hong Kong has open financial markets and an exchange rate pegged to the U.S. dollar, then it must have the same interest rates as the United States.

The Federal Reserve acts as the government's operating arm in the international financial system. Under a floating-exchange-rate system, the main aim of the central bank is to prevent disorderly conditions, such as might occur during a political crisis. The Fed might buy or sell dollars or work with foreign central banks to ensure that exchange rates do not move erratically. However, unlike in the earlier era of fixed exchange rates, the Fed does not "intervene" to maintain a particular exchange rate.

In addition, the Federal Reserve often takes the lead in working with foreign countries and international agencies when international financial crises erupt. The Fed played an important role in the Mexican loan package in 1994–1995, worked with other countries to help calm markets during the East Asian crisis in 1997 and the global liquidity crisis in 1998, and helped calm markets during the Argentine crisis of 2001–2002. When financial institutions in many countries began to incur large losses in 2007–2008, the Federal Reserve joined forces with other central banks to provide liquidity and prevent investor panics in one country from spilling over into other countries.

## MONETARY TRANSMISSION IN THE OPEN ECONOMY

The monetary transmission mechanism in the United States has evolved over the last three decades as the economy has become more open and changes have occurred in the exchange-rate system. The relationship between monetary policy and foreign trade has always been a major concern for smaller and more open economies like Canada and Great Britain. However, after the introduction of flexible exchange rates in 1973 and with the rapid growth of cross-border linkages, international trade and finance have come to play a new and central role in U.S. macroeconomic policy.

Let's see how monetary policy affects the economy through international trade with a flexible exchange rate. Suppose the Federal Reserve decides to tighten money. This raises interest rates on assets denominated in U.S. dollars. Attracted by higher-dollar interest rates, investors buy dollar securities, driving up the foreign exchange rate on the dollar. The higher exchange rate on the dollar encourages imports into the United States and reduces U.S. exports. As a result, net exports fall, reducing aggregate demand. This will lower real GDP and reduce the rate of inflation. We will study the international aspects of macroeconomics in more detail in Chapters 27 and 28.

Foreign trade opens up another link in the monetary transmission mechanism. Monetary policy has the same impact on international trade as it has on domestic investment: tight money lowers net exports,

thereby depressing output and prices. The international-trade impact of monetary policy reinforces its domestic-economy impact.

## FROM AGGREGATE DEMAND TO AGGREGATE SUPPLY

We have completed our introductory analysis of the determinants of aggregate demand. We examined the foundations and saw that aggregate demand is determined by exogenous factors, such as investment and net exports, along with monetary and fiscal government policies. In the short run, changes in these factors lead to changes in spending and changes in both output and prices.

In today's volatile and globalized world, economies are exposed to shocks from both the inside and the outside of their borders. Wars, revolutions, stock market collapses, housing-price bubbles, financial and currency crises, oil-price shocks, and government miscalculations have led to periods of high inflation or high unemployment or both. No market mechanism provides an automatic pilot that can eliminate macroeconomic fluctuations. Governments must therefore take responsibility for moderating the swings of the business cycle.

While the United States experienced recessions in 1990, 2001, and 2008, it has up to now been fortunate to avoid deep and prolonged downturns. Other countries over the last quarter-century have not been so lucky. Japan, much of Europe, Latin America, Russia, and the East Asian countries have all occasionally been caught in the turbulent storms of rapid inflation, high unemployment, currency crises, or sharp declines in living standards. These events serve as a reminder that there is no universal cure for unemployment and inflation in the face of all the shocks to a modern economy.

We have now concluded our introductory chapters on short-run macroeconomics. The next part of the book turns to issues of economic growth, the open economy, and economic policy.

## SUMMARY

### A. Central Banking and the Federal Reserve System

1. Every modern country has a central bank. The U.S. central bank is made up of the Federal Reserve Board in Washington, together with the 12 regional Federal Reserve Banks. Its primary mission is to conduct the nation's monetary policy by influencing financial conditions in pursuit of low inflation, high employment, and stable financial markets.
2. The Federal Reserve System (or "the Fed") was created in 1913 to control the nation's money and credit and to act as the "lender of last resort." It is run by the Board of Governors and the Federal Open Market Committee (FOMC). The Fed acts as an independent government agency and has great discretion in determining monetary policy.
3. The Federal Reserve has four major functions: conducting monetary policy by setting short-term interest rates, maintaining the stability of the financial system and containing systemic risk as the lender of last resort, supervising and regulating banking institutions, and providing financial services to banks and the government.
4. The Fed has three major policy instruments: (*a*) open-market operations, (*b*) the discount window for borrowing by banks and, more recently, primary dealers, and (*c*) legal reserve requirements for depository institutions.
5. The Federal Reserve conducts its policy through changes in an important short-term interest rate called the federal funds rate. This is the short-term interest rate that banks charge each other to trade reserve balances at the Fed. The Fed controls the federal funds rate by exercising control over its instruments, primarily through open-market operations.

### B. The Monetary Transmission Mechanism

6. Remember the important monetary transmission mechanism, the route by which monetary policy is translated into changes in output, employment, and inflation:
   a. The central bank announces a target short-term interest rate chosen in light of its objectives and the state of the economy.

**b.** The central bank undertakes daily open-market operations to meet its interest-rate target.
**c.** The central bank's interest-rate target and expectations about future financial conditions determine the entire spectrum of short- and long-term interest rates, asset prices, and exchange rates.
**d.** The level of interest rates, credit conditions, asset prices, and exchange rates affect investment, consumption, and net exports.
**e.** Investment, consumption, and net exports affect the path of output and inflation through the *AS-AD* mechanism.

We can write the operation of a monetary policy change as follows:

Change in monetary policy
→ change in interest rates, asset prices, exchange rates
→ impact on *I, X, C*
→ effect on *AD*
→ effect on *Q, P*

**7.** Although the monetary transmission mechanism is often described simply in terms of "the interest rate" and "investment," this mechanism is in fact an extremely rich and complex process whereby changes in all kinds of financial conditions influence a wide variety of spending. The affected sectors include: housing, affected by mortgage interest rates and housing prices; business investment, affected by interest rates and stock prices; spending on consumer durables, influenced by interest rates and credit availability; state and local capital spending, affected by interest rates; and net exports, determined by the effects of interest rates upon foreign exchange rates.

### C. Applications of Monetary Economics

**8.** Monetarism holds that the money supply is the primary determinant of short-run movements in both real and nominal GDP as well as the primary determinant of long-run movements in nominal GDP. The income velocity of money ($V$) is defined as the ratio of the dollar-GDP flow ($PQ$) to the stock of money ($M$): $V \equiv PQ/M$. With constant velocity, prices move proportionally to the money supply. Monetarists propose that the money supply should grow at a low fixed rate. Statistical studies indicate that velocity tends to be positively correlated with interest rates, a finding that undermines the monetarist policy prescription.
**9.** In an open economy, the international-trade linkage reinforces the domestic impacts of monetary policy. In a regime of flexible exchange rates, changes in monetary policy affect the exchange rate and net exports, adding yet another facet to the monetary mechanism. The trade link tends to reinforce the impact of monetary policy, which operates in the same direction on net exports as it does on domestic investment.

## CONCEPTS FOR REVIEW

### Central Banking

bank reserves
federal funds interest rate
Federal Reserve balance sheet
open-market purchases and sales
discount rate, borrowing from the Fed
legal reserve requirements
FOMC, Board of Governors

### The Monetary Transmission Mechanism and Applications

demand for and supply of reserves
monetary transmission mechanism
interest-sensitive components of spending
monetary policy in the *AS-AD* framework
"neutrality" of money
second route by which *M* affects output

## FURTHER READING AND INTERNET WEBSITES

### Further Reading

Alan Greenspan's memoir, *The Age of Turbulence* (Penguin, New York, 2007) is a valuable history of the last half-decade as well as of his stewardship of the Federal Reserve.

The *Federal Reserve Bulletin* contains monthly reports on Federal Reserve activities and other important financial developments. The *Bulletin* is available on the Internet at *www.federalreserve.gov/pubs/bulletin/default.htm.*

The quotation on the lender of last resort is from Alan Greenspan, "Remarks," Lancaster House, London, U.K., September 25, 2002, available at *www.federalreserve.gov/boarddocs/speeches/2002/200209253/default.htm.*

The governors of the Fed often bring informed economic expertise to monetary and other issues. See speeches at *www.federalreserve.gov/newsevents/*. A particularly influential speech by current Fed chair Ben Bernanke on the "global savings glut" is at *www.federalreserve.gov/boarddocs/speeches/2005/200503102/default.htm.*

### Websites

*The Federal Reserve System: Purposes and Functions*, 9th ed. (Board of Governors of the Federal Reserve System, Washington, D.C., 2005), available online at *www.federalreserve.gov/pf/pf.htm*, provides a useful description of the operations of the Fed. Also, see the Further Reading and Websites sections in Chapter 25 for a more detailed list of sites on monetary policy. An excellent review of the Federal Reserve's response to the credit crisis of 2007–2009 is contained in a speech by Fed chair Ben Bernanke, "The Crisis and the Policy Response," January 2009, available at http://www.federalreserve.gov/newsevents/speech/bernanke20090113a.htm.

If you want to know which Reserve Bank region you live in, see *www.federalreserve.gov/otherfrb.htm.* Why are the eastern regions so small?

Biographies of the members of the Board of Governors can be found at *www.federalreserve.gov/bios/*. Particularly interesting are the transcripts and minutes of Fed meetings, at *www.federalreserve.gov/fomc/*.

## QUESTIONS FOR DISCUSSION

1. Using Figures 24-5 through 24-7, work through each of the following:
   a. As in 2007–2008, the Federal Reserve is concerned about a decline in housing prices that is reducing investment. What steps might the Fed take to stimulate the economy? What will be the impact on bank reserves? What will be the impact on interest rates? What will be the impact on investment (other things held constant)?
   b. As in 1979, the Fed is concerned about rising inflation and wishes to reduce output. Answer the same questions as in **a**.
2. Suppose you are the chair of the Fed's Board of Governors at a time when the economy is heading into a recession and you are called to testify before a congressional committee. Write your explanation to an interrogating senator outlining what monetary steps you would take to prevent the recession.
3. Consider the balance sheet of the Fed in Table 24-1. Construct a corresponding balance sheet for banks (like the one in Table 23-3 in the previous chapter) assuming that reserve requirements are 10 percent on checking accounts and zero on everything else.
   a. Construct a new set of balance sheets, assuming that the Fed sells $1 billion worth of government securities through open-market operations.
   b. Construct another set of balance sheets, assuming that the Fed increases reserve requirements from 10 to 20 percent.
   c. Assume that banks borrow $1 billion worth of reserves from the Fed. How will this action change the balance sheets?
4. Assume that commercial banks have $100 billion of checking deposits and $4 billion of vault cash. Further assume that reserve requirements are 10 percent of checking deposits. Lastly, assume that the public holds $200 billion of currency, which is always fixed. Central-bank assets include only government securities.
   a. Construct the balance sheets for the central bank and the banking system. Make sure you include banks' deposits with the central bank.
   b. Now assume that the central bank decides to engage in an open-market operation, selling

$1 billion worth of government securities to the public. Show the new balance sheets. What has happened to $M_1$?

**c.** Finally, using the graphical apparatus of the monetary transmission mechanism, show the qualitative impact of the policy on interest rates, investment, and output.

**5.** In his memoirs, Alan Greenspan wrote, "I regret to say that Federal Reserve independence is not set in stone. FOMC discretion is granted by statute and can be withdrawn by statute." (*The Age of Turbulence*, p. 478 f.) Explain why the independence of a central bank might affect the way in which monetary policy is conducted. If a central bank is not independent, how might its monetary policies change in response to electoral pressures? Would you recommend that a new country have an independent central bank? Explain.

**6.** One of the nightmares of central bankers is the liquidity trap. This occurs when nominal interest rates approach or even equal zero. Once the interest rate has declined to zero, monetary expansion is ineffective because interest rates on securities cannot go below zero.

**a.** Explain why the nominal interest rate on government bonds cannot be negative. (*Hint:* What is the nominal interest rate on currency? Why would you hold a bond whose interest rate is below the interest rate on currency?)

**b.** A liquidity trap is particularly serious when a country simultaneously experiences falling prices, also called deflation. For example, in the early 2000s, consumer prices in Japan were falling at 2 percent per year. What were Japanese real interest rates during this period if the nominal interest rate was 0? What was the *lowest* real interest rate that the Bank of Japan could have produced during this period?

**c.** Explain on the basis of **b** why the liquidity trap poses such a serious problem for monetary policy during periods of deflation and depression.

**7.** After the reunification of Germany in 1990, payments to rebuild the East led to a major expansion of aggregate demand in Germany. The German central bank responded by slowing money growth and raising German real interest rates. Trace through why this German monetary tightening would be expected to lead to a depreciation of the dollar. Explain why such a depreciation would stimulate economic activity in the United States. Also explain why European countries that had pegged their currencies to the German mark would find themselves plunged into recessions as German interest rates rose and pulled other European rates up with them.

**8.** In December 2007, the Federal Open Market Committee made the following statement: "The Federal Open Market Committee seeks monetary and financial conditions that will foster price stability and promote sustainable growth in output. To further its long-run objectives, the Committee [will reduce] the federal funds rate [from 4½ percent to] 4¼ percent." Your assignment is to explain the macroeconomic rationale behind this monetary expansion. It will help to review the minutes of the FOMC meeting at *www.federalreserve.gov/monetarypolicy/files/fomcminutes20071211.pdf*.