Short-Run Economic Fluctuations
Economic activity fluctuates from year to year. In most years, the production of goods and services rises. Because of increases in the labor force, increases in the capital stock, and advances in technological knowledge, the economy can produce more and more over time. This growth allows everyone to enjoy a higher standard of living. On average over the past 50 years, the production of the U.S. economy as measured by real GDP has grown by about 3 percent per year.

In some years, however, this normal growth does not occur. Firms find themselves unable to sell all of the goods and services they have to offer, so they cut back on production. Workers are laid off, unemployment rises, and factories are left idle. With the economy producing fewer goods and services, real GDP and other measures of income fall. Such a period of falling incomes and rising unemployment is called a recession if it is relatively mild and a depression if it is more severe.

What causes short-run fluctuations in economic activity? What, if anything, can public policy do to prevent periods of falling incomes and rising unemployment? When recessions and depressions occur, how can policymakers reduce their length and severity? These are the questions that we take up now.

The variables that we study are largely those we have already seen in previous chapters. They include GDP, unemployment, interest rates, and the price

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**recession**

a period of declining real incomes and rising unemployment

**depression**

a severe recession
level. Also familiar are the policy instruments of government spending, taxes, and the money supply. What differs from our earlier analysis is the time horizon. So far, our focus has been on the behavior of the economy in the long run. Our focus now is on the economy’s short-run fluctuations around its long-run trend.

Although there remains some debate among economists about how to analyze short-run fluctuations, most economists use the model of aggregate demand and aggregate supply. Learning how to use this model for analyzing the short-run effects of various events and policies is the primary task ahead. This chapter introduces the model’s two pieces: the aggregate-demand curve and the aggregate-supply curve. But before turning to the model, let’s look at some of the key facts that describe the ups and downs in the economy.

THREE KEY FACTS ABOUT ECONOMIC FLUCTUATIONS

Short-run fluctuations in economic activity occur in all countries and have occurred throughout history. As a starting point for understanding these year-to-year fluctuations, let’s discuss some of their most important properties.

Fact 1: Economic Fluctuations Are Irregular and Unpredictable

Fluctuations in the economy are often called the business cycle. As this term suggests, economic fluctuations correspond to changes in business conditions. When real GDP grows rapidly, business is good. During such periods of economic expansion, most firms find that customers are plentiful and that profits are growing. When real GDP falls during recessions, businesses have trouble. During such periods of economic contraction, most firms experience declining sales and dwindling profits.

The term business cycle is somewhat misleading because it suggests that economic fluctuations follow a regular, predictable pattern. In fact, economic fluctuations are not at all regular, and they are almost impossible to predict with much accuracy. Panel (a) of Figure 1 shows the real GDP of the U.S. economy since 1965. The shaded areas represent times of recession. As the figure shows, recessions do not come at regular intervals. Sometimes recessions are close together, such as the recessions of 1980 and 1982. Sometimes the economy goes many years without a recession. The longest period in U.S. history without a recession was the economic expansion from 1991 to 2001.

Fact 2: Most Macroeconomic Quantities Fluctuate Together

Real GDP is the variable that is most commonly used to monitor short-run changes in the economy because it is the most comprehensive measure of economic activity. Real GDP measures the value of all final goods and services produced within a given period of time. It also measures the total income (adjusted for inflation) of everyone in the economy.

It turns out, however, that for monitoring short-run fluctuations, it does not really matter which measure of economic activity one looks at. Most macroeconomic variables that measure some type of income, spending, or production fluctuate closely together. When real GDP falls in a recession, so do personal income, corporate profits, consumer spending, investment spending, industrial
A Look at Short-Run Economic Fluctuations

This figure shows real GDP in panel (a), investment spending in panel (b), and unemployment in panel (c) for the U.S. economy using quarterly data since 1965. Recessions are shown as the shaded areas. Notice that real GDP and investment spending decline during recessions, while unemployment rises.

Source: U.S. Department of Commerce; U.S. Department of Labor.
production, retail sales, home sales, auto sales, and so on. Because recessions are economy-wide phenomena, they show up in many sources of macroeconomic data.

Although many macroeconomic variables fluctuate together, they fluctuate by different amounts. In particular, as panel (b) of Figure 1 shows, investment spending varies greatly over the business cycle. Even though investment averages about one-seventh of GDP, declines in investment account for about two-thirds of the declines in GDP during recessions. In other words, when economic conditions deteriorate, much of the decline is attributable to reductions in spending on new factories, housing, and inventories.

Fact 3: As Output Falls, Unemployment Rises

Changes in the economy’s output of goods and services are strongly correlated with changes in the economy’s utilization of its labor force. In other words, when real GDP declines, the rate of unemployment rises. This fact is hardly surprising: When firms choose to produce a smaller quantity of goods and services, they lay off workers, expanding the pool of unemployed.

Panel (c) of Figure 1 shows the unemployment rate in the U.S. economy since 1965. Once again, recessions are shown as the shaded areas in the figure. The figure shows clearly the impact of recessions on unemployment. In each of the recessions, the unemployment rate rises substantially. When the recession ends and real GDP starts to expand, the unemployment rate gradually declines. The unemployment rate never approaches zero; instead, it fluctuates around its natural rate of about 5 or 6 percent.

Quick Quiz List and discuss three key facts about economic fluctuations.

EXPLAINING SHORT-RUN ECONOMIC FLUCTUATIONS

Describing what happens to economies as they fluctuate over time is easy. Explaining what causes these fluctuations is more difficult. Indeed, compared to the topics we have studied in previous chapters, the theory of economic fluctuations remains controversial. In this and the next two chapters, we develop the model that most economists use to explain short-run fluctuations in economic activity.

The Assumptions of Classical Economics

In previous chapters, we developed theories to explain what determines most important macroeconomic variables in the long run. Chapter 25 explained the level and growth of productivity and real GDP. Chapters 26 and 27 explained how the financial system works and how the real interest rate adjusts to balance saving and investment. Chapter 28 explained why there is always some unemployment in the economy. Chapters 29 and 30 explained the monetary system and how changes in the money supply affect the price level, the inflation rate, and the nominal interest rate. Chapters 31 and 32 extended this analysis to open economies to explain the trade balance and the exchange rate.
All of this previous analysis was based on two related ideas: the classical dichotomy and monetary neutrality. Recall that the classical dichotomy is the separation of variables into real variables (those that measure quantities or relative prices) and nominal variables (those measured in terms of money). According to classical macroeconomic theory, changes in the money supply affect nominal variables but not real variables. As a result of this monetary neutrality, Chapters 25 through 28 were able to examine the determinants of real variables.
In a sense, money does not matter in a classical world. If the quantity of money in the economy were to double, everything would cost twice as much, and everyone’s income would be twice as high. But so what? The change would be nominal (by the standard meaning of “nearly insignificant”). The things that people really care about—whether they have a job, how many goods and services they can afford, and so on—would be exactly the same.

This classical view is sometimes described by the saying, “Money is a veil.” That is, nominal variables may be the first things we see when we observe an economy because economic variables are often expressed in units of money. But what’s important are the real variables and the economic forces that determine them. According to classical theory, to understand these real variables, we need to look beneath the veil.

The Reality of Short-Run Fluctuations

Do these assumptions of classical macroeconomic theory apply to the world in which we live? The answer to this question is of central importance to understanding how the economy works. Most economists believe that classical theory describes the world in the long run but not in the short run.

Consider again the impact of money on the economy. Most economists believe that, beyond a period of several years, changes in the money supply affect prices and other nominal variables but do not affect real GDP, unemployment, or other real variables—just as classical theory says. When studying year-to-year changes in the economy, however, the assumption of monetary neutrality is no longer appropriate. In the short run, real and nominal variables are highly intertwined, and changes in the money supply can temporarily push real GDP away from its long-run trend.

Even the classical economists themselves, such as David Hume, realized that classical economic theory did not hold in the short run. From his vantage point in 18th-century England, Hume observed that when the money supply expanded after gold discoveries, it took some time for prices to rise, and in the meantime, the economy enjoyed higher employment and production.

To understand how the economy works in the short run, we need a new model. This new model can be built using many of the tools we developed in previous chapters, but it must abandon the classical dichotomy and the neutrality of money. We can no longer separate our analysis of real variables such as output and employment from our analysis of nominal variable such as money and the price level. Our new model focuses on how real and nominal variables interact.

The Model of Aggregate Demand and Aggregate Supply

Our model of short-run economic fluctuations focuses on the behavior of two variables. The first variable is the economy’s output of goods and services, as measured by real GDP. The second is the average level of prices, as measured by the CPI or the GDP deflator. Notice that output is a real variable, whereas the price level is a nominal variable. By focusing on the relationship between these two variables, we are departing from the classical assumption that real and nominal variables can be studied separately.
We analyze fluctuations in the economy as a whole with the model of aggregate demand and aggregate supply, which is illustrated in Figure 2. On the vertical axis is the overall price level in the economy. On the horizontal axis is the overall quantity of goods and services produced in the economy. The aggregate-demand curve shows the quantity of goods and services that households, firms, the government, and customers abroad want to buy at each price level. The aggregate-supply curve shows the quantity of goods and services that firms produce and sell at each price level. According to this model, the price level and the quantity of output adjust to bring aggregate demand and aggregate supply into balance.

It is tempting to view the model of aggregate demand and aggregate supply as nothing more than a large version of the model of market demand and market supply introduced in Chapter 4. In fact, this model is quite different. When we consider demand and supply in a particular market—ice cream, for instance—the behavior of buyers and sellers depends on the ability of resources to move from one market to another. When the price of ice cream rises, the quantity demanded falls because buyers will use their incomes to buy products other than ice cream. Similarly, a higher price of ice cream raises the quantity supplied because firms that produce ice cream can increase production by hiring workers away from other parts of the economy. This microeconomic substitution from one market to another is impossible for the economy as a whole. After all, the quantity that our model is trying to explain—real GDP—measures the total quantity of goods and services produced in all markets. To understand why the aggregate-demand curve is downward sloping and why the aggregate-supply curve is upward sloping, we need a macroeconomic theory that explains the total quantity of goods and services demanded and the total quantity of goods and services supplied. Developing such a theory is our next task.

**FIGURE 2**

Aggregate Demand and Aggregate Supply
Economists use the model of aggregate demand and aggregate supply to analyze economic fluctuations. On the vertical axis is the overall level of prices. On the horizontal axis is the economy’s total output of goods and services. Output and the price level adjust to the point at which the aggregate-supply and aggregate-demand curves intersect.
Quick Quiz  How does the economy’s behavior in the short run differ from its behavior in the long run?  •  Draw the model of aggregate demand and aggregate supply. What variables are on the two axes?

THE AGGREGATE-DEMAND CURVE

The aggregate-demand curve tells us the quantity of all goods and services demanded in the economy at any given price level. As Figure 3 illustrates, the aggregate-demand curve is downward sloping. This means that, other things equal, a decrease in the economy’s overall level of prices (from, say, $P_1$ to $P_2$) raises the quantity of goods and services demanded (from $Y_1$ to $Y_2$). Conversely, an increase in the price level reduces the quantity of goods and services demanded.

Why the Aggregate-Demand Curve Slopes Downward

Why does a change in the price level move the quantity of goods and services demanded in the opposite direction? To answer this question, it is useful to recall that an economy’s GDP (which we denote as $Y$) is the sum of its consumption ($C$), investment ($I$), government purchases ($G$), and net exports ($NX$):

$$Y = C + I + G + NX.$$ 

Each of these four components contributes to the aggregate demand for goods and services. For now, we assume that government spending is fixed by policy.

Figure 3: The Aggregate-Demand Curve

A fall in the price level from $P_1$ to $P_2$ increases the quantity of goods and services demanded from $Y_1$ to $Y_2$. There are three reasons for this negative relationship. As the price level falls, real wealth rises, interest rates fall, and the exchange rate depreciates. These effects stimulate spending on consumption, investment, and net exports. Increased spending on any or all of these components of output means a larger quantity of goods and services demanded.
The other three components of spending—consumption, investment, and net exports—depend on economic conditions and, in particular, on the price level. To understand the downward slope of the aggregate-demand curve, therefore, we must examine how the price level affects the quantity of goods and services demanded for consumption, investment, and net exports.

**The Price Level and Consumption: The Wealth Effect**  Consider the money that you hold in your wallet and your bank account. The nominal value of this money is fixed: One dollar is always worth one dollar. Yet the *real* value of a dollar is not fixed. If a candy bar costs 1 dollar, then a dollar is worth one candy bar. If the price of a candy bar falls to 50 cents, then 1 dollar is worth two candy bars. Thus, when the price level falls, the dollars you are holding rise in value, which increases your real wealth and your ability to buy goods and services.

This logic gives us the first reason the aggregate demand curve is downward sloping. *A decrease in the price level raises the real value of money and makes consumers wealthier, which in turn encourages them to spend more.* The increase in consumer spending means a larger quantity of goods and services demanded. Conversely, *an increase in the price level reduces the real value of money, in turn reducing wealth, consumer spending, and the quantity of goods and services demanded.*

**The Price Level and Investment: The Interest-Rate Effect**  The price level is one determinant of the quantity of money demanded. The lower the price level, the less money households need to hold to buy the goods and services they want. Therefore, when the price level falls, households try to reduce their holdings of money by lending some of it out. For instance, a household might use its excess money to buy interest-bearing bonds. Or it might deposit its excess money in an interest-bearing savings account, and the bank would use these funds to make more loans. In either case, as households try to convert some of their money into interest-bearing assets, they drive down interest rates. (*The next chapter analyzes this in more detail.*)

Interest rates, in turn, affect spending on goods and services. Because a lower interest rate makes borrowing less expensive, it encourages firms to borrow more to invest in new plants and equipment, and it encourages households to borrow more to invest in new housing. (*A lower interest rate might also stimulate consumer spending, especially large durable purchases such as cars, which are often bought on credit.*) Thus, a lower interest rate increases the quantity of goods and services demanded.

This gives us a second reason the aggregate demand curve is downward sloping. *A lower price level reduces the interest rate, encourages greater spending on investment goods, and thereby increases the quantity of goods and services demanded.* Conversely, *a higher price level raises the interest rate, reducing investment spending and the quantity of goods and services demanded.*

**The Price Level and Net Exports: The Exchange-Rate Effect**  As we have just discussed, a lower price level in the United States lowers the U.S. interest rate. In response to the lower interest rate, some U.S. investors will seek higher returns by investing abroad. For instance, as the interest rate on U.S. government bonds falls, a mutual fund might sell U.S. government bonds to buy German government bonds. As the mutual fund tries to convert its dollars into euros to buy the German bonds, it increases the supply of dollars in the market for foreign-currency exchange.
The increased supply of dollars to be turned into euros causes the dollar to depreciate relative to the euro. This leads to a change in the real exchange rate—the relative price of domestic and foreign goods. Because each dollar buys fewer units of foreign currencies, foreign goods become more expensive relative to domestic goods.

The change in relative prices affects spending, both at home and abroad. Because foreign goods are now more expensive, Americans buy less from other countries, causing U.S. imports of goods and services to decrease. At the same time, because U.S. goods are now cheaper, foreigners buy more from the United States, so U.S. exports increase. Net exports equal exports minus imports, so both of these changes cause U.S. net exports to increase. Thus, the fall in the real exchange value of the dollar leads to an increase in the quantity of goods and services demanded.

This gives us a third reason the aggregate demand curve is downward sloping. When a fall in the U.S. price level causes U.S. interest rates to fall, the real value of the dollar declines in foreign exchange markets, and this depreciation stimulates U.S. net exports and thereby increases the quantity of goods and services demanded. Conversely, when the U.S. price level rises and causes U.S. interest rates to rise, the real value of the dollar increases, and this appreciation reduces U.S. net exports and the quantity of goods and services demanded.

Summary There are three distinct but related reasons a fall in the price level increases the quantity of goods and services demanded:

1. Consumers are wealthier, which stimulates the demand for consumption goods.
2. Interest rates fall, which stimulates the demand for investment goods.
3. The currency depreciates, which stimulates the demand for net exports.

The same three effects work in reverse: When the price level rises, decreased wealth depresses consumer spending, higher interest rates depress investment spending, and a currency appreciation depresses net exports.

Here is a thought experiment to hone your intuition about these effects. Imagine that one day you wake up and notice that, for some mysterious reason, the prices of all goods and services have fallen by half, so the dollars you are holding are worth twice as much. In real terms, you now have twice as much money as you had when you went to bed the night before. What would you do with the extra money? You could spend it at your favorite restaurant, increasing consumer spending. You could lend it out (by buying a bond or depositing it in your bank), reducing interest rates and increasing investment spending. Or you could invest it overseas (by buying shares in an international mutual fund), reducing the real exchange value of the dollar and increasing net exports. Whichever of these three responses you choose, the fall in the price level leads to an increase in the quantity of goods and services demanded. This is what the downward slope of the aggregate-demand curve represents.

It is important to keep in mind that the aggregate-demand curve (like all demand curves) is drawn holding “other things equal.” In particular, our three explanations of the downward-sloping aggregate-demand curve assume that the money supply is fixed. That is, we have been considering how a change in the price level affects the demand for goods and services, holding the amount of money in the economy constant. As we will see, a change in the quantity of
Why the Aggregate-Demand Curve Might Shift

The downward slope of the aggregate-demand curve shows that a fall in the price level raises the overall quantity of goods and services demanded. Many other factors, however, affect the quantity of goods and services demanded at a given price level. When one of these other factors changes, the aggregate-demand curve shifts.

Let’s consider some examples of events that shift aggregate demand. We can categorize them according to which component of spending is most directly affected.

Shifts Arising from Changes in Consumption Suppose Americans suddenly become more concerned about saving for retirement and, as a result, reduce their current consumption. Because the quantity of goods and services demanded at any price level is lower, the aggregate-demand curve shifts to the left. Conversely, imagine that a stock-market boom makes people wealthier and less concerned about saving. The resulting increase in consumer spending means a greater quantity of goods and services demanded at any given price level, so the aggregate-demand curve shifts to the right.

Thus, any event that changes how much people want to consume at a given price level shifts the aggregate-demand curve. One policy variable that has this effect is the level of taxation. When the government cuts taxes, it encourages people to spend more, so the aggregate-demand curve shifts to the right. When the government raises taxes, people cut back on their spending, and the aggregate-demand curve shifts to the left.

Shifts Arising from Changes in Investment Any event that changes how much firms want to invest at a given price level also shifts the aggregate-demand curve. For instance, imagine that the computer industry introduces a faster line of computers, and many firms decide to invest in new computer systems. Because the quantity of goods and services demanded at any price level is higher, the aggregate-demand curve shifts to the right. Conversely, if firms become pessimistic about future business conditions, they may cut back on investment spending, shifting the aggregate-demand curve to the left.

Tax policy can also influence aggregate demand through investment. As we saw in Chapter 26, an investment tax credit (a tax rebate tied to a firm’s investment spending) increases the quantity of investment goods that firms demand at any given interest rate. It therefore shifts the aggregate-demand curve to the right. The repeal of an investment tax credit reduces investment and shifts the aggregate-demand curve to the left.

Another policy variable that can influence investment and aggregate demand is the money supply. As we discuss more fully in the next chapter, an increase in the money supply lowers the interest rate in the short run. This makes borrowing less costly, which stimulates investment spending and thereby shifts the aggregate-demand curve to the right. Conversely, a decrease in the money supply raises the interest rate, discourages investment spending, and thereby shifts the aggregate-demand curve to the left. Many economists believe that throughout U.S. history,
Changes in monetary policy have been an important source of shifts in aggregate demand.

**Shifts Arising from Changes in Government Purchases** The most direct way that policymakers shift the aggregate-demand curve is through government purchases. For example, suppose Congress decides to reduce purchases of new weapons systems. Because the quantity of goods and services demanded at any price level is lower, the aggregate-demand curve shifts to the left. Conversely, if state governments start building more highways, the result is a greater quantity of goods and services demanded at any price level, so the aggregate-demand curve shifts to the right.

**Shifts Arising from Changes in Net Exports** Any event that changes net exports for a given price level also shifts aggregate demand. For instance, when Europe experiences a recession, it buys fewer goods from the United States. This reduces U.S. net exports at every price level and shifts the aggregate-demand curve for the U.S. economy to the left. When Europe recovers from its recession, it starts buying U.S. goods again, and the aggregate-demand curve shifts to the right.

Net exports sometimes change because international speculators cause movements in the exchange rate. Suppose, for instance, that these speculators lose confidence in foreign economies and want to move some of their wealth into the U.S. economy. In doing so, they bid up the value of the U.S. dollar in the foreign exchange market. This appreciation of the dollar makes U.S. goods more expensive compared to foreign goods, which depresses net exports and shifts the aggregate-demand curve to the left. Conversely, speculation that causes a depreciation of the dollar stimulates net exports and shifts the aggregate-demand curve to the right.

**Summary** In the next chapter, we analyze the aggregate-demand curve in more detail. There we examine more precisely how the tools of monetary and fiscal policy can shift aggregate demand and whether policymakers should use these tools for that purpose. At this point, however, you should have some idea about why the aggregate-demand curve slopes downward and what kinds of events and policies can shift this curve. Table 1 summarizes what we have learned so far.

**Quick Quiz** Explain the three reasons the aggregate-demand curve slopes downward. • Give an example of an event that would shift the aggregate-demand curve. Which way would this event shift the curve?

**THE AGGREGATE-SUPPLY CURVE**

The aggregate-supply curve tells us the total quantity of goods and services that firms produce and sell at any given price level. Unlike the aggregate-demand curve, which is always downward sloping, the aggregate-supply curve shows a relationship that depends crucially on the time horizon examined. In the long run, the aggregate-supply curve is vertical, whereas in the short run, the aggregate-supply
Why the Aggregate-Supply Curve Is Vertical in the Long Run

What determines the quantity of goods and services supplied in the long run? We implicitly answered this question earlier in the book when we analyzed the process of economic growth. In the long run, an economy’s production of goods and services (its real GDP) depends on its supplies of labor, capital, and natural resources and on the available technology used to turn these factors of production into goods and services.

When we analyzed these forces that govern long-run growth, we did not need to make any reference to the overall level of prices. We examined the price level in a separate chapter, where we saw that it was determined by the quantity of money. We learned that if two economies were identical except that one had twice as much money in circulation as the other, the price level would be twice as high in the economy with more money, but the output of goods and services would be the same.
Because the price level does not affect the long-run determinants of real GDP, the long-run aggregate-supply curve is vertical, as in Figure 4. In other words, in the long run, the economy’s labor, capital, natural resources, and technology determine the total quantity of goods and services supplied, and this quantity supplied is the same regardless of what the price level happens to be.

The vertical long-run aggregate-supply curve is a graphical representation of the classical dichotomy and monetary neutrality. As we have already discussed, classical macroeconomic theory is based on the assumption that real variables do not depend on nominal variables. The long-run aggregate-supply curve is consistent with this idea because it implies that the quantity of output (a real variable) does not depend on the level of prices (a nominal variable). As noted earlier, most economists believe that this principle works well when studying the economy over a period of many years but not when studying year-to-year changes. Thus, the aggregate-supply curve is vertical only in the long run.

**Why the Long-Run Aggregate-Supply Curve Might Shift**

Because classical macroeconomic theory predicts the quantity of goods and services produced by an economy in the long run, it also explains the position of the long-run aggregate-supply curve. The long-run level of production is sometimes called potential output or full-employment output. To be more precise, we call it the natural rate of output because it shows what the economy produces when unemployment is at its natural, or normal, rate. The natural rate of output is the level of production toward which the economy gravitates in the long run.

Any change in the economy that alters the natural rate of output shifts the long-run aggregate-supply curve. Because output in the classical model depends on labor, capital, natural resources, and technological knowledge, we can categorize shifts in the long-run aggregate-supply curve as arising from these four sources.

**Shifts Arising from Changes in Labor** Imagine that an economy experiences an increase in immigration. Because there would be a greater number of
workers, the quantity of goods and services supplied would increase. As a result, the long-run aggregate-supply curve would shift to the right. Conversely, if many workers left the economy to go abroad, the long-run aggregate-supply curve would shift to the left.

The position of the long-run aggregate-supply curve also depends on the natural rate of unemployment, so any change in the natural rate of unemployment shifts the long-run aggregate-supply curve. For example, if Congress were to raise the minimum wage substantially, the natural rate of unemployment would rise, and the economy would produce a smaller quantity of goods and services. As a result, the long-run aggregate-supply curve would shift to the left. Conversely, if a reform of the unemployment insurance system were to encourage unemployed workers to search harder for new jobs, the natural rate of unemployment would fall, and the long-run aggregate-supply curve would shift to the right.

**Shifts Arising from Changes in Capital** An increase in the economy's capital stock increases productivity and, thereby, the quantity of goods and services supplied. As a result, the long-run aggregate-supply curve shifts to the right. Conversely, a decrease in the economy's capital stock decreases productivity and the quantity of goods and services supplied, shifting the long-run aggregate-supply curve to the left.

Notice that the same logic applies regardless of whether we are discussing physical capital such as machines and factories or human capital such as college degrees. An increase in either type of capital will raise the economy's ability to produce goods and services and, thus, shift the long-run aggregate-supply curve to the right.

**Shifts Arising from Changes in Natural Resources** An economy's production depends on its natural resources, including its land, minerals, and weather. A discovery of a new mineral deposit shifts the long-run aggregate-supply curve to the right. A change in weather patterns that makes farming more difficult shifts the long-run aggregate-supply curve to the left.

In many countries, important natural resources are imported. A change in the availability of these resources can also shift the aggregate-supply curve. As we discuss later in this chapter, events occurring in the world oil market have historically been an important source of shifts in aggregate supply for the United States and other oil-importing nations.

**Shifts Arising from Changes in Technological Knowledge** Perhaps the most important reason that the economy today produces more than it did a generation ago is that our technological knowledge has advanced. The invention of the computer, for instance, has allowed us to produce more goods and services from any given amounts of labor, capital, and natural resources. As computer use has spread throughout the economy, it has shifted the long-run aggregate-supply curve to the right.

Although not literally technological, there are many other events that act like changes in technology. For instance, opening up international trade has effects similar to inventing new production processes because it allows a country to specialize in higher-productivity industries, so it also shifts the long-run aggregate-supply curve to the right. Conversely, if the government passed new regulations preventing firms from using some production methods, perhaps to address worker safety or environmental concerns, the result would be a leftward shift in the long-run aggregate-supply curve.
Summary Because the long-run aggregate-supply curve reflects the classical model of the economy we developed in previous chapters, it provides a new way to describe our earlier analysis. Any policy or event that raised real GDP in previous chapters can now be described as increasing the quantity of goods and services supplied and shifting the long-run aggregate-supply curve to the right. Any policy or event that lowered real GDP in previous chapters can now be described as decreasing the quantity of goods and services supplied and shifting the long-run aggregate-supply curve to the left.

Using Aggregate Demand and Aggregate Supply to Depict Long-Run Growth and Inflation

Having introduced the economy’s aggregate-demand curve and the long-run aggregate-supply curve, we now have a new way to describe the economy’s long-run trends. Figure 5 illustrates the changes that occur in an economy from...
decade to decade. Notice that both curves are shifting. Although there are many forces that govern the economy in the long run and can in theory cause such shifts, the two most important in the real world are technology and monetary policy. Technological progress enhances an economy’s ability to produce goods and services, and this increase in output is reflected in the continual shifts of the long-run aggregate-supply curve to the right. At the same time, because the Fed increases the money supply over time, the aggregate-demand curve also shifts to the right. As the figure illustrates, the result is trend growth in output (as shown by increasing $Y$) and continuing inflation (as shown by increasing $P$). This is just another way of representing the classical analysis of growth and inflation we conducted in earlier chapters.

The purpose of developing the model of aggregate demand and aggregate supply, however, is not to dress our previous long-run conclusions in new clothing. Instead, it is to provide a framework for short-run analysis, as we will see in a moment. As we develop the short-run model, we keep the analysis simple by not showing the continuing growth and inflation depicted by the shifts in Figure 5. But always remember that long-run trends provide the background for short-run fluctuations. Short-run fluctuations in output and the price level should be viewed as deviations from the continuing long-run trends of output growth and inflation.

**Why the Aggregate-Supply Curve Slopes Upward in the Short Run**

The key difference between the economy in the short run and in the long run is the behavior of aggregate supply. The long-run aggregate-supply curve is vertical because, in the long run, the overall level of prices does not affect the economy’s ability to produce goods and services. By contrast, in the short run, the price level does affect the economy’s output. That is, over a period of a year or two, an increase in the overall level of prices in the economy tends to raise the quantity of goods and services supplied, and a decrease in the level of prices tends to reduce the quantity of goods and services supplied. As a result, the short-run aggregate-supply curve is upward sloping, as shown in Figure 6.

Why do changes in the price level affect output in the short run? Macro-economists have proposed three theories for the upward slope of the short-run aggregate-supply curve. In each theory, a specific market imperfection causes the supply side of the economy to behave differently in the short run than it does in the long run. Although the following theories differ in their details, they share a common theme: The quantity of output supplied deviates from its long-run, or “natural,” level when the actual price level in the economy deviates from the price level that people expected to prevail. When the price level rises above the level that people expected, output rises above its natural rate, and when the price level falls below the expected level, output falls below its natural rate.

**The Sticky-Wage Theory** The first explanation of the upward slope of the short-run aggregate-supply curve is the sticky-wage theory. Because this theory is the simplest of the three approaches to aggregate supply, it is the one we emphasize in this book.

According to this theory, the short-run aggregate-supply curve slopes upward because nominal wages are slow to adjust to changing economic conditions. In other words, wages are “sticky” in the short run. To some extent, the slow adjustment of nominal wages is attributable to long-term contracts between workers and firms that fix nominal wages, sometimes for as long as three years.
In addition, this slow adjustment may be attributable to social norms and notions of fairness that influence wage setting and that change only slowly over time.

An example helps explain how sticky nominal wages can result in a short-run aggregate-supply curve that slopes upward. Imagine that a year ago a firm expected the price level to be 100, and based on this expectation, it signed a contract with its workers agreeing to pay them, say, $20 an hour. In fact, the price level, \( P \), turns out to be only 95. Because prices have fallen below expectations, the firm gets 5 percent less than expected for each unit of its product that it sells. The cost of labor used to make the output, however, is stuck at $20 per hour. Production is now less profitable, so the firm hires fewer workers and reduces the quantity of output supplied. Over time, the labor contract will expire, and the firm can renegotiate with its workers for a lower wage (which they may accept because prices are lower), but in the meantime, employment and production will remain below their long-run levels.

The same logic works in reverse. Suppose the price level turns out to be 105, and the wage remains stuck at $20. The firm sees that the amount it is paid for each unit sold is up by 5 percent, while its labor costs are not. In response, it hires more workers and increases the quantity supplied. Eventually, the workers will demand higher nominal wages to compensate for the higher price level, but for a while, the firm can take advantage of the profit opportunity by increasing employment and the quantity of output supplied above their long-run levels.

In short, according to the sticky-wage theory, the short-run aggregate-supply curve is upward sloping because nominal wages are based on the expected prices and do not respond immediately when the actual price level turns out to be different from what was expected. This stickiness of wages gives firms an incentive to produce less than the natural rate of output when the price level turns out lower than expected and to produce more when the price level turns out higher than expected.
The Sticky-Price Theory  Some economists have advocated another approach to explaining the upward slope of the short-run aggregate-supply curve, called the sticky-price theory. As we just discussed, the sticky-wage theory emphasizes that nominal wages adjust slowly over time. The sticky-price theory emphasizes that the prices of some goods and services also adjust sluggishly in response to changing economic conditions. This slow adjustment of prices occurs in part because there are costs to adjusting prices, called menu costs. These menu costs include the cost of printing and distributing catalogs and the time required to change price tags. As a result of these costs, prices as well as wages may be sticky in the short run.

To see how sticky prices explain the aggregate-supply curve’s upward slope, suppose that each firm in the economy announces its prices in advance based on the economic conditions it expects to prevail over the coming year. Suppose further that after prices are announced, the economy experiences an unexpected contraction in the money supply, which (as we have learned) will reduce the overall price level in the long run. Although some firms can reduce their prices immediately in response to an unexpected change in economic conditions, other firms may not want to incur additional menu costs. As a result, they may temporarily lag behind in reducing their prices. Because these lagging firms have prices that are too high, their sales decline. Declining sales, in turn, cause these firms to cut back on production and employment. In other words, because not all prices adjust instantly to changing economic conditions, an unexpected fall in the price level leaves some firms with higher-than-desired prices, and these higher-than-desired prices depress sales and induce firms to reduce the quantity of goods and services they produce.

The same reasoning applies when the money supply and price level turn out to be above what firms expected when they originally set their prices. While some firms raise their prices immediately in response to the new economic environment, other firms lag behind, keeping their prices at the lower-than-desired levels. These low prices attract customers, which induces these firms to increase employment and production. Thus, during the time these lagging firms are operating with outdated prices, there is a positive association between the overall price level and the quantity of output. This positive association is represented by the upward slope of the short-run aggregate-supply curve.

The Misperceptions Theory  A third approach to explaining the upward slope of the short-run aggregate-supply curve is the misperceptions theory. According to this theory, changes in the overall price level can temporarily mislead suppliers about what is happening in the individual markets in which they sell their output. As a result of these short-run misperceptions, suppliers respond to changes in the level of prices, and this response leads to an upward-sloping aggregate-supply curve.

To see how this might work, suppose the overall price level falls below the level that suppliers expected. When suppliers see the prices of their products fall, they may mistakenly believe that their relative prices have fallen; that is, they may believe that their prices have fallen compared to other prices in the economy. For example, wheat farmers may notice a fall in the price of wheat before they notice a fall in the prices of the many items they buy as consumers. They may infer from this observation that the reward to producing wheat is temporarily low, and they may respond by reducing the quantity of wheat they supply. Similarly, workers may notice a fall in their nominal wages before they notice that the prices of the goods they buy are also falling. They may infer that
the reward for working is temporarily low and respond by reducing the quantity of labor they supply. In both cases, a lower price level causes misperceptions about relative prices, and these misperceptions induce suppliers to respond to the lower price level by decreasing the quantity of goods and services supplied.

Similar misperceptions arise when the price level is above what was expected. Suppliers of goods and services may notice the price of their output rising and infer, mistakenly, that their relative prices are rising. They would conclude that it is a good time to produce. Until their misperceptions are corrected, they respond to the higher price level by increasing the quantity of goods and services supplied. This behavior results in a short-run aggregate-supply curve that slopes upward.

Summary

There are three alternative explanations for the upward slope of the short-run aggregate-supply curve: (1) sticky wages, (2) sticky prices, and (3) misperceptions about relative prices. Economists debate which of these theories is correct, and it is very possible each contains an element of truth. For our purposes in this book, the similarities of the theories are more important than the differences. All three theories suggest that output deviates in the short run from its long-run level (the natural rate) when the actual price level deviates from the price level that people had expected to prevail. We can express this mathematically as follows:

\[
\text{Quantity of output supplied} = \text{Natural rate of output} + a \left( \frac{\text{Actual price level}}{\text{Expected price level}} - 1 \right)
\]

where \(a\) is a number that determines how much output responds to unexpected changes in the price level.

Notice that each of the three theories of short-run aggregate supply emphasizes a problem that is likely to be temporary. Whether the upward slope of the aggregate-supply curve is attributable to sticky wages, sticky prices, or misperceptions, these conditions will not persist forever. Over time, nominal wages will become unstuck, prices will become unstuck, and misperceptions about relative prices will be corrected. In the long run, it is reasonable to assume that wages and prices are flexible rather than sticky and that people are not confused about relative prices. Thus, while we have several good theories to explain why the short-run aggregate-supply curve is upward sloping, they are all consistent with a long-run aggregate-supply curve that is vertical.

Why the Short-Run Aggregate-Supply Curve Might Shift

The short-run aggregate-supply curve tells us the quantity of goods and services supplied in the short run for any given level of prices. This curve is similar to the long-run aggregate-supply curve, but it is upward sloping rather than vertical because of sticky wages, sticky prices, and misperceptions. Thus, when thinking about what shifts the short-run aggregate-supply curve, we have to consider all those variables that shift the long-run aggregate-supply curve plus a new variable—the expected price level—that influences the wages that are stuck, the prices that are stuck, and the perceptions about relative prices.
Let’s start with what we know about the long-run aggregate-supply curve. As we discussed earlier, shifts in the long-run aggregate-supply curve normally arise from changes in labor, capital, natural resources, or technological knowledge. These same variables shift the short-run aggregate-supply curve. For example, when an increase in the economy’s capital stock increases productivity, the economy is able to produce more output, so both the long-run and short-run aggregate-supply curves shift to the right. When an increase in the minimum wage raises the natural rate of unemployment, the economy has fewer employed workers and thus produces less output, so both the long-run and short-run aggregate-supply curves shift to the left.

The important new variable that affects the position of the short-run aggregate-supply curve is the price level that people expected to prevail. As we have discussed, the quantity of goods and services supplied depends, in the short run, on sticky wages, sticky prices, and misperceptions. Yet wages, prices, and perceptions are set on the basis of the expected price level. So when people change their expectations of the price level, the short-run aggregate-supply curve shifts.

To make this idea more concrete, let’s consider a specific theory of aggregate supply—the sticky-wage theory. According to this theory, when workers and firms expect the price level to be high, they are more likely to reach a bargain with a high level of nominal wages. High wages raise firms’ costs, and for any given actual price level, higher costs reduce the quantity of goods and services that firms supply. Thus, when the expected price level rises, wages are higher, costs increase, and firms supply a smaller quantity of goods and services at any given actual price level. Thus, the short-run aggregate-supply curve shifts to the left. Conversely, when the expected price level falls, wages are lower, costs decline, firms increase output at any given price level, and the short-run aggregate-supply curve shifts to the right.

A similar logic applies in each theory of aggregate supply. The general lesson is the following: An increase in the expected price level reduces the quantity of goods and services supplied and shifts the short-run aggregate-supply curve to the left. A decrease in the expected price level raises the quantity of goods and services supplied and shifts the short-run aggregate-supply curve to the right. As we will see in the next section, this influence of expectations on the position of the short-run aggregate-supply curve plays a key role in explaining how the economy makes the transition from the short run to the long run. In the short run, expectations are fixed, and the economy finds itself at the intersection of the aggregate-demand curve and the short-run aggregate-supply curve. In the long run, if people observe that the price level is different from what they expected, their expectations adjust, and the short-run aggregate-supply curve shifts. This shift ensures that the economy eventually finds itself at the intersection of the aggregate-demand curve and the long-run aggregate-supply curve.

You should now have some understanding about why the short-run aggregate-supply curve slopes upward and what events and policies can cause this curve to shift. Table 2 summarizes our discussion.

Quick Quiz  Explain why the long-run aggregate-supply curve is vertical. • Explain three theories for why the short-run aggregate-supply curve is upward sloping. • What variables shift both the long-run and short-run aggregate-supply curves? • What variable shifts the short-run aggregate-supply curve but not the long-run aggregate-supply curve?
Why Does the Short-Run Aggregate-Supply Curve Slope Upward?
1. The Sticky-Wage Theory: An unexpectedly low price level raises the real wage, which causes firms to hire fewer workers and produce a smaller quantity of goods and services.
2. The Sticky-Price Theory: An unexpectedly low price level leaves some firms with higher-than-desired prices, which depresses their sales and leads them to cut back production.
3. The Misperceptions Theory: An unexpectedly low price level leads some suppliers to think their relative prices have fallen, which induces a fall in production.

Why Might the Short-Run Aggregate-Supply Curve Shift?
1. Shifts Arising from Labor: An increase in the quantity of labor available (perhaps due to a fall in the natural rate of unemployment) shifts the aggregate-supply curve to the right. A decrease in the quantity of labor available (perhaps due to a rise in the natural rate of unemployment) shifts the aggregate-supply curve to the left.
2. Shifts Arising from Capital: An increase in physical or human capital shifts the aggregate-supply curve to the right. A decrease in physical or human capital shifts the aggregate-supply curve to the left.
3. Shifts Arising from Natural Resources: An increase in the availability of natural resources shifts the aggregate-supply curve to the right. A decrease in the availability of natural resources shifts the aggregate-supply curve to the left.
4. Shifts Arising from Technology: An advance in technological knowledge shifts the aggregate-supply curve to the right. A decrease in the available technology (perhaps due to government regulation) shifts the aggregate-supply curve to the left.
5. Shifts Arising from the Expected Price Level: A decrease in the expected price level shifts the short-run aggregate-supply curve to the right. An increase in the expected price level shifts the short-run aggregate-supply curve to the left.

TWO CAUSES OF ECONOMIC FLUCTUATIONS

Now that we have introduced the model of aggregate demand and aggregate supply, we have the basic tools we need to analyze fluctuations in economic activity. In particular, we can use what we have learned about aggregate demand and aggregate supply to examine the two basic causes of short-run fluctuations: shifts in aggregate demand and shifts in aggregate supply.

To keep things simple, we assume the economy begins in long-run equilibrium, as shown in Figure 7. Output and the price level are determined in the long run by the intersection of the aggregate-demand curve and the long-run aggregate-supply curve, shown as point A in the figure. At this point, output is at its natural rate. Because the economy is always in a short-run equilibrium, the short-run aggregate-supply curve passes through this point as well, indicating that the expected price level has adjusted to this long-run equilibrium. That is, when an economy is in its long-run equilibrium, the expected price level must equal the actual price level so that the intersection of aggregate demand with short-run aggregate supply is the same as the intersection of aggregate demand with long-run aggregate supply.
The Effects of a Shift in Aggregate Demand

Suppose that a wave of pessimism suddenly overtakes the economy. The cause might be a scandal in the White House, a crash in the stock market, or the outbreak of war overseas. Because of this event, many people lose confidence in the future and alter their plans. Households cut back on their spending and delay major purchases, and firms put off buying new equipment.

What is the macroeconomic impact of such a wave of pessimism? In answering this question, we can follow the three steps we used in Chapter 4 when analyzing supply and demand in specific markets. First, we determine whether the event affects aggregate demand or aggregate supply. Second, we decide which direction the curve shifts. Third, we use the diagram of aggregate demand and aggregate supply to compare the initial and the new equilibrium. The new wrinkle is that we need to add a fourth step: We have to keep track of a new short-run equilibrium, a new long-run equilibrium, and the transition between them.

Table 3 summarizes the four steps to analyzing economic fluctuations.

The first two steps are easy. First, because the wave of pessimism affects spending plans, it affects the aggregate-demand curve. Second, because households and

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**TABLE 3**
Four Steps for Analyzing Macroeconomic Fluctuations

1. Decide whether the event shifts the aggregate demand curve or the aggregate supply curve (or perhaps both).
2. Decide in which direction the curve shifts.
3. Use the diagram of aggregate demand and aggregate supply to see how the shift changes output and the price level in the short run.
4. Use the diagram of aggregate demand and aggregate supply to analyze how the economy moves from its new short-run equilibrium to its long-run equilibrium.
firms now want to buy a smaller quantity of goods and services for any given price level, the event reduces aggregate demand. As Figure 8 shows, the aggregate-demand curve shifts to the left from $AD_1$ to $AD_2$.

With this figure, we can perform step three: By comparing the initial and new equilibrium, we can see the effects of the fall in aggregate demand. In the short run, the economy moves along the initial short-run aggregate-supply curve, $AS_1$, going from point A to point B. As the economy moves between these two points, output falls from $Y_1$ to $Y_2$, and the price level falls from $P_1$ to $P_2$. The falling level of output indicates that the economy is in a recession. Although not shown in the figure, firms respond to lower sales and production by reducing employment. Thus, the pessimism that caused the shift in aggregate demand is, to some extent, self-fulfilling: Pessimism about the future leads to falling incomes and rising unemployment.

Now comes step four—the transition from the short-run equilibrium to the long-run equilibrium. Because of the reduction in aggregate demand, the price level initially falls from $P_1$ to $P_2$. The price level is thus below the level that people had come to expect ($P_1$) before the sudden fall in aggregate demand. Although people are surprised in the short run, they will not remain surprised. Over time, expectations catch up with this new reality, and the expected price level falls as well. The fall in the expected price level alters wages, prices, and perceptions, which in turn influences the position of the short-run aggregate-supply curve. For example, according to the sticky-wage theory, once workers and firms come to expect a lower level of prices, they start to strike bargains for lower nominal wages; the reduction in labor costs encourages firms to hire more workers and expands production at any given level of prices. Thus, the fall in the expected price level shifts the short-run aggregate-supply curve to the right.
from $AS_1$ to $AS_2$ in Figure 8. This shift allows the economy to approach point C, where the new aggregate-demand curve ($AD_2$) crosses the long-run aggregate-supply curve.

In the new long-run equilibrium, point C, output is back to its natural rate. The economy has corrected itself: The decline in output is reversed in the long run, even without action by policymakers. Although the wave of pessimism has reduced aggregate demand, the price level has fallen sufficiently (to $P_3$) to offset the shift in the aggregate-demand curve, and people have come to expect this new lower price level as well. Thus, in the long run, the shift in aggregate demand is reflected fully in the price level and not at all in the level of output. In other words, the long-run effect of a shift in aggregate demand is a nominal change (the price level is lower) but not a real change (output is the same).

What should policymakers do when faced with a sudden fall in aggregate demand? In this analysis, we assumed they did nothing. Another possibility is that, as soon as the economy heads into recession (moving from point A to point B), policymakers could take action to increase aggregate demand. As we noted earlier, an increase in government spending or an increase in the money supply would increase the quantity of goods and services demanded at any price and, therefore, would shift the aggregate-demand curve to the right. If policymakers act with sufficient speed and precision, they can offset the initial shift in aggregate demand, return the aggregate-demand curve back to $AD_1$, and bring the economy back to point A. If the policy is successful, the painful period of depressed output and employment can be reduced in length and severity. The
next chapter discusses in more detail the ways in which monetary and fiscal policy influence aggregate demand, as well as some of the practical difficulties in using these policy instruments.

To sum up, this story about shifts in aggregate demand has three important lessons:

- In the short run, shifts in aggregate demand cause fluctuations in the economy’s output of goods and services.
- In the long run, shifts in aggregate demand affect the overall price level but do not affect output.
- Policymakers who influence aggregate demand can potentially mitigate the severity of economic fluctuations.

**CASE STUDY**

**TWO BIG SHIFTS IN AGGREGATE DEMAND: THE GREAT DEPRESSION AND WORLD WAR II**

At the beginning of this chapter, we established three key facts about economic fluctuations by looking at data since 1965. Let’s now take a longer look at U.S. economic history. Figure 9 shows data since 1900 on the percentage change in real GDP over the previous 3 years. In an average 3-year period, real GDP grows about 10 percent—a bit more than 3 percent per year. The business cycle, however, causes fluctuations around this average. Two episodes jump out as being particularly significant: the large drop in real GDP in the early 1930s and the large increase in real GDP in the early 1940s. Both of these events are attributable to shifts in aggregate demand.

Over the course of U.S. economic history, two fluctuations stand out as especially large. During the early 1930s, the economy went through the Great Depression, when the production of goods and services plummeted. During the early 1940s, the United States entered World War II, and the economy experienced rapidly rising production. Both of these events are usually explained by large shifts in aggregate demand.
The economic calamity of the early 1930s is called the Great Depression, and it is by far the largest economic downturn in U.S. history. Real GDP fell by 27 percent from 1929 to 1933, and unemployment rose from 3 percent to 25 percent. At the same time, the price level fell by 22 percent over these 4 years. Many other countries experienced similar declines in output and prices during this period.

Economic historians continue to debate the causes of the Great Depression, but most explanations center on a large decline in aggregate demand. What caused aggregate demand to contract? Here is where the disagreement arises.

Many economists place primary blame on the decline in the money supply: From 1929 to 1933, the money supply fell by 28 percent. As you may recall from our discussion of the monetary system, this decline in the money supply was due to problems in the banking system. As households withdrew their money from financially shaky banks and bankers became more cautious and started holding greater reserves, the process of money creation under fractional-reserve banking went into reverse. The Fed, meanwhile, failed to offset this fall in the money multiplier with expansionary open-market operations. As a result, the money supply declined. Many economists blame the Fed’s failure to act for the Great Depression’s severity.

Other economists have suggested alternative reasons for the collapse in aggregate demand. For example, stock prices fell about 90 percent during this period, depressing household wealth and thereby consumer spending. In addition, the banking problems may have prevented some firms from obtaining the financing they wanted for investment projects, and this would have depressed investment spending. Of course, all of these forces may have acted together to contract aggregate demand during the Great Depression.

The second significant episode in Figure 9—the economic boom of the early 1940s—is easier to explain. The obvious cause of this event was World War II. As the United States entered the war overseas, the federal government had to devote more resources to the military. Government purchases of goods and services increased almost fivefold from 1939 to 1944. This huge expansion in aggregate demand almost doubled the economy’s production of goods and services and led to a 20 percent increase in the price level (although widespread government price controls limited the rise in prices). Unemployment fell from 17 percent in 1939 to about 1 percent in 1944—the lowest level in U.S. history.

**CASE STUDY**

**THE RECESSION OF 2001**

After the longest economic expansion in history, the U.S. economy experienced a recession in 2001. The unemployment rate rose from 3.9 percent in December 2000 to 4.9 percent in August 2001 and to 6.3 percent in June 2003. The unemployment rate then began to decline. By January 2005, unemployment had fallen back to 5.2 percent.

What caused the recession, and what ended it? The answer to both questions is shifts in aggregate demand.

The recession began with the end of the dot-com bubble in the stock market. During the 1990s, many stock-market investors became optimistic about information technology, and they bid up stock prices, particularly of high-tech companies. With hindsight, it is fair to say that this optimism was excessive. Eventually, the optimism faded, and stock prices fell by about 25 percent from August 2000 to August 2001. The fall in the stock market reduced household wealth,
which in turn reduced consumer spending. In addition, when the new technologies started to appear less profitable than they had originally seemed, investment spending fell. The aggregate-demand curve shifted to the left.

The second shock to the economy was the terrorist attacks on New York and Washington on September 11, 2001. In the week after the attacks, the stock market fell another 12 percent, its biggest weekly loss since the Great Depression of the 1930s. Moreover, the attacks increased uncertainty about what the future would hold. Uncertainty can reduce spending, as households and firms postpone plans, waiting for the uncertainty to be resolved. Thus, the terrorist attacks also shifted the aggregate-demand curve further to the left.

The third event that put downward pressure on aggregate demand was a series of corporate accounting scandals. During 2001 and 2002, several major corporations, including Enron and WorldCom, were found to have misled the public about their profitability. When the truth became known, the value of their stock plummeted. Even honest companies experienced stock declines, as stock-market investors became less trustful of all accounting data. This fall in the stock market further depressed aggregate demand.
Policymakers were quick to respond to these events. As soon as the economic slowdown became apparent, the Federal Reserve pursued expansionary monetary policy. Money growth accelerated, and interest rates fell. The federal funds rate (the interest rate on loans between banks that the Fed uses as its short-term policy target) fell from 6.5 percent in December 2000 to 1.0 percent in June 2003. Lower interest rates stimulated spending by reducing the cost of borrowing. At the same time, with the president’s urging, Congress passed a tax cut in 2001, including an immediate tax rebate, and another tax cut in 2003. One goal of these tax cuts was to stimulate consumer and investment spending. Interest-rate cuts and tax cuts both shifted the aggregate-demand curve to the right, offsetting the three contractionary shocks the economy had experienced.

The recession of 2001 is a reminder of the many kinds of events that can influence aggregate demand and, thus, the direction of the economy.

The Effects of a Shift in Aggregate Supply

Imagine once again an economy in its long-run equilibrium. Now suppose that suddenly some firms experience an increase in their costs of production. For example, bad weather in farm states might destroy some crops, driving up the cost of producing food products. Or a war in the Middle East might interrupt the shipping of crude oil, driving up the cost of producing oil products.

To analyze the macroeconomic impact of such an increase in production costs, we follow the same four steps. First, which curve is affected? Because production costs affect the firms that supply goods and services, changes in production costs alter the position of the aggregate-supply curve. Second, which direction does the curve shift? Because higher production costs make selling goods and services less profitable, firms now supply a smaller quantity of output for any given price level. Thus, as Figure 10 shows, the short-run aggregate-supply curve shifts to the left from \( AS_1 \) to \( AS_2 \). (Depending on the event, the long-run aggregate-supply curve might also shift. To keep things simple, however, we will assume that it does not.)

The figure allows us to perform step three of comparing the initial and new equilibrium. In the short run, the economy goes from point A to point B, moving along the existing aggregate-demand curve. The output of the economy falls from \( Y_1 \) to \( Y_2 \), and the price level rises from \( P_1 \) to \( P_2 \). Because the economy is experiencing both stagnation (falling output) and inflation (rising prices), such an event is sometimes called stagflation.

Now consider step four—the transition from the short-run equilibrium to the long-run equilibrium. According to the sticky-wage theory, the key issue is how stagflation affects nominal wages. Firms and workers may at first respond to the higher level of prices by raising their expectations of the price level and setting higher nominal wages. In this case, firms’ costs will rise yet again, and the short-run aggregate-supply curve will shift further to the left, making the problem of stagflation even worse. This phenomenon of higher prices leading to higher wages, in turn leading to even higher prices, is sometimes called a wage-price spiral.

At some point, this spiral of ever-rising wages and prices will slow. The low level of output and employment will put downward pressure on workers’ wages because workers have less bargaining power when unemployment is high. As nominal wages fall, producing goods and services becomes more profitable, and
the short-run aggregate-supply curve shifts to the right. As it shifts back toward $AS_1$, the price level falls, and the quantity of output approaches its natural rate. In the long run, the economy returns to point A, where the aggregate-demand curve crosses the long-run aggregate-supply curve.

This transition back to the initial equilibrium assumes, however, that aggregate demand is held constant throughout the process. In the real world, that may not be the case. Policymakers who control monetary and fiscal policy might attempt to offset some of the effects of the shift in the short-run aggregate-supply curve by shifting the aggregate-demand curve. This possibility is shown in Figure 11. In this case, changes in policy shift the aggregate-demand curve to the right from $AD_1$ to $AD_2$—exactly enough to prevent the shift in aggregate supply from affecting output. The economy moves directly from point A to point C. Output remains at its natural rate, and the price level rises from $P_1$ to $P_2$. In this case, policymakers are said to accommodate the shift in aggregate supply. An accommodative policy accepts a permanently higher level of prices to maintain a higher level of output and employment.

To sum up, this story about shifts in aggregate supply has two important lessons:

- Shifts in aggregate supply can cause stagflation—a combination of recession (falling output) and inflation (rising prices).
- Policymakers who can influence aggregate demand can potentially mitigate the adverse impact on output but only at the cost of exacerbating the problem of inflation.
Some of the largest economic fluctuations in the U.S. economy since 1970 have originated in the oil fields of the Middle East. Crude oil is a key input into the production of many goods and services, and much of the world’s oil comes from Saudi Arabia, Kuwait, and other Middle Eastern countries. When some event (usually political in origin) reduces the supply of crude oil flowing from this region, the price of oil rises around the world. U.S. firms that make gasoline, tires, and many other products experience rising costs, and they find it less profitable to supply their output of goods and services at any given price level. The result is a leftward shift in the aggregate-supply curve, which in turn leads to stagflation.

The first episode of this sort occurred in the mid-1970s. The countries with large oil reserves got together as members of OPEC, the Organization of Petroleum Exporting Countries. OPEC is a cartel—a group of sellers that attempts to thwart competition and reduce production to raise prices. And indeed, oil prices rose substantially. From 1973 to 1975, oil approximately doubled in price. Oil-importing countries around the world experienced simultaneous inflation and recession. The U.S. inflation rate as measured by the CPI exceeded 10 percent for the first time in decades. Unemployment rose from 4.9 percent in 1973 to 8.5 percent in 1975.

Almost the same thing happened a few years later. In the late 1970s, the OPEC countries again restricted the supply of oil to raise the price. From 1978 to 1981, the price of oil more than doubled. Once again, the result was stagflation.
Inflation, which had subsided somewhat after the first OPEC event, again rose above 10 percent per year. But because the Fed was not willing to accommodate such a large rise in inflation, a recession was soon to follow. Unemployment rose from about 6 percent in 1978 and 1979 to about 10 percent a few years later.

The world market for oil can also be a source of favorable shifts in aggregate supply. In 1986, squabbling broke out among members of OPEC. Member countries reneged on their agreements to restrict oil production. In the world market for crude oil, prices fell by about half. This fall in oil prices reduced costs to U.S. firms, which now found it more profitable to supply goods and services at any

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**FYI**

### The Macroeconomic Impact of Hurricane Katrina

In August 2005, as this book was going to press, the Gulf Coast of the United States was hit by Hurricane Katrina, devastating New Orleans and the surrounding area. While the human toll was the primary focus of policymakers’ attentions, economists in and out of government immediately started analyzing the economic impact. Here are some excerpts from the analysis of the Congressional Budget Office (CBO), prepared just a few days after the disaster:

*Katrina could dampen real gross domestic product (GDP) growth in the second half of the year by 1/2 to 1 percentage point and reduce employment through the end of this year by about 400,000. Most economic forecasters had expected 3 percent to 4 percent growth during the second half, and employment growth of 150,000 to 200,000 per month. Economic growth and employment are likely to rebound during the first half of 2006 as rebuilding accelerates.*

*Katrina’s macroeconomic effects will be greater than those of previous major hurricanes such as Andrew and Hugo, which caused a great deal of devastation but which had a small effect on the macroeconomy. Katrina’s effects will be greater because of the greater devastation, the long-term flooding of New Orleans (which will preclude immediate rebuilding), and the destruction of energy and port infrastructure.*

*The gross state product of Louisiana is about 1.2 percent of U.S. GDP, and that for Mississippi is about 0.7 percent. If half of that product were lost for three months (September to November), the level of real GDP would be lowered by about 1 percent from what it otherwise would be. . . . It is unlikely that production would be hurt that much for that long, however. Presumably some people in New Orleans and other parts of the coast will be able to return to work in one or two months, and construction employment will be picking up during the fourth quarter.*

*Economic activity in the rest of the United States will be adversely affected through higher energy prices, which will temporarily reduce other consumption . . . [This fall in consumption occurs because] the increase in gasoline prices is basically a temporary redistribution of income from consumers of gasoline to the stockholders of refiners . . . If sustained, that would reduce annualized GDP growth for the third quarter by 0.4 percent and for the fourth quarter by 0.9 percent. That effect is temporary: as gasoline prices return to pre-Katrina levels, consumption would bounce back, meaning higher GDP growth.*

In other words, the hurricane was expected to reduce aggregate supply by making unavailable some of the productive capacity of the Gulf area. In addition, it was expected to reduce aggregate demand because consumers might respond to higher gasoline prices by cutting back their overall level of spending. The predicted decline in GDP growth from these two shifts was significant, but according to CBO, it was not large enough to push the economy into recession.

As you read this book, you should know if this analysis proved correct.
given price level. As a result, the aggregate-supply curve shifted to the right. The U.S. economy experienced the opposite of stagflation: Output grew rapidly, unemployment fell, and the inflation rate reached its lowest level in many years.

In recent years, the world market for oil has not been as important a source of economic fluctuations. Part of the reason is that OPEC has been less effective as a cartel: Adjusted for inflation, the price of oil has never again reached the record levels set in the early 1980s. In addition, conservation efforts and changes in technology have reduced the economy’s dependence on oil. The amount of oil used to produce a unit of real GDP has declined about 40 percent since the OPEC shocks of the 1970s. As a result, the economic impact of any change in oil prices is smaller today than it was in the past.

 Nonetheless, it would be premature to conclude that the United States no longer needs to worry about oil prices. Political troubles in the Middle East or greater cooperation among the members of OPEC could always send oil prices higher. And indeed, during the Iraq war, the price of crude oil did rise significantly. If the rise in oil prices were ever large enough, the macroeconomic result would most likely resemble the stagflation of the 1970s.

Quick Quiz Suppose that the election of a popular presidential candidate suddenly increases people’s confidence in the future. Use the model of aggregate demand and aggregate supply to analyze the effect on the economy.

CONCLUSION

This chapter has achieved two goals. First, we have discussed some of the important facts about short-run fluctuations in economic activity. Second, we have introduced a basic model to explain those fluctuations, called the model of aggregate demand and aggregate supply. We continue our study of this model in the next chapter to understand more fully what causes fluctuations in the economy and how policymakers might respond to these fluctuations.

SUMMARY

- All societies experience short-run economic fluctuations around long-run trends. These fluctuations are irregular and largely unpredictable. When recessions do occur, real GDP and other measures of income, spending, and production fall, and unemployment rises.
- Classical economic theory is based on the assumption that nominal variables such as the money supply and the price level do not influence real variables such as output and employment. Most economists believe that this assumption is accurate in the long run but not in the short run. Economists analyze short-run economic fluctuations using the model of aggregate demand and aggregate supply. According to this model, the output of goods and services and the overall level of prices adjust to balance aggregate demand and aggregate supply.
- The aggregate-demand curve slopes downward for three reasons. The first is the wealth effect: A lower price level raises the real value of households’ money holdings, which stimulates

Changes in Middle East oil production are one source of U.S. economic fluctuations.
consumer spending. The second is the interest-rate effect: A lower price level reduces the quantity of money households demand; as households try to convert money into interest-bearing assets, interest rates fall, which stimulates investment spending. The third is the exchange-rate effect: As a lower price level reduces interest rates, the dollar depreciates in the market for foreign-currency exchange, which stimulates net exports.

- Any event or policy that raises consumption, investment, government purchases, or net exports at a given price level increases aggregate demand. Any event or policy that reduces consumption, investment, government purchases, or net exports at a given price level decreases aggregate demand.

- The long-run aggregate-supply curve is vertical. In the long run, the quantity of goods and services supplied depends on the economy’s labor, capital, natural resources, and technology but not on the overall level of prices.

- Three theories have been proposed to explain the upward slope of the short-run aggregate-supply curve. According to the sticky-wage theory, an unexpected fall in the price level temporarily raises real wages, which induces firms to reduce employment and production. According to the sticky-price theory, an unexpected fall in the price level leaves some firms with prices that are temporarily too high, which reduces their sales and causes them to cut back production. According to the misperceptions theory, an unexpected fall in the price level leads suppliers to mistakenly believe that their relative prices have fallen, which induces them to reduce production. All three theories imply that output deviates from its natural rate when the actual price level deviates from the price level that people expected.

- Events that alter the economy’s ability to produce output, such as changes in labor, capital, natural resources, or technology, shift the short-run aggregate-supply curve (and may shift the long-run aggregate-supply curve as well). In addition, the position of the short-run aggregate-supply curve depends on the expected price level.

- One possible cause of economic fluctuations is a shift in aggregate demand. When the aggregate-demand curve shifts to the left, for instance, output and prices fall in the short run. Over time, as a change in the expected price level causes wages, prices, and perceptions to adjust, the short-run aggregate-supply curve shifts to the right, and the economy returns to its natural rate of output at a new, lower price level.

- A second possible cause of economic fluctuations is a shift in aggregate supply. When the aggregate-supply curve shifts to the left, the short-run effect is falling output and rising prices—a combination called stagflation. Over time, as wages, prices, and perceptions adjust, the price level falls back to its original level, and output recovers.

**KEY CONCEPTS**

- recession, p. 739
- depression, p. 739
- model of aggregate demand and aggregate supply, p. 745
- aggregate-demand curve, p. 745
- aggregate-supply curve, p. 745
- natural rate of output, p. 752
- stagflation, p. 767

**QUESTIONS FOR REVIEW**

1. Name two macroeconomic variables that decline when the economy goes into a recession. Name one macroeconomic variable that rises during a recession.

2. Draw a diagram with aggregate demand, short-run aggregate supply, and long-run aggregate supply. Be careful to label the axes correctly.
3. List and explain the three reasons the aggregate-demand curve is downward sloping.

4. Explain why the long-run aggregate-supply curve is vertical.

5. List and explain the three theories for why the short-run aggregate-supply curve is upward sloping.

6. What might shift the aggregate-demand curve to the left? Use the model of aggregate demand and aggregate supply to trace through the short-run and long-run effects of such a shift on output and the price level.

7. What might shift the aggregate-supply curve to the left? Use the model of aggregate demand and aggregate supply to trace through the short-run and long-run effects of such a shift on output and the price level.

**PROBLEMS AND APPLICATIONS**

1. Suppose that the economy is in a long-run equilibrium.
   a. Draw a diagram to illustrate the state of the economy. Be sure to show aggregate demand, short-run aggregate supply, and long-run aggregate supply.
   b. Now suppose that a stock-market crash causes aggregate demand to fall. Use your diagram to show what happens to output and the price level in the short run. What happens to the unemployment rate?
   c. Use the sticky-wage theory of aggregate supply to explain what will happen to output and the price level in the long run (assuming there is no change in policy). What role does the expected price level play in this adjustment? Be sure to illustrate your analysis in a graph.

2. Explain whether each of the following events will increase, decrease, or have no effect on long-run aggregate supply.
   a. The United States experiences a wave of immigration.
   b. Congress raises the minimum wage to $10 per hour.
   c. Intel invents a new and more powerful computer chip.
   d. A severe hurricane damages factories along the East Coast.

3. Suppose an economy is in long-run equilibrium.
   a. Use the model of aggregate demand and aggregate supply to illustrate the initial equilibrium (call it point A). Be sure to include both short-run and long-run aggregate supply.
   b. The central bank raises the money supply by 5 percent. Use your diagram to show what happens to output and the price level as the economy moves from the initial to the new short-run equilibrium (call it point B).
   c. Now show the new long-run equilibrium (call it point C). What causes the economy to move from point B to point C?
   d. According to the sticky-wage theory of aggregate supply, how do nominal wages at point A compare to nominal wages at point B? How do nominal wages at point A compare to nominal wages at point C?
   e. According to the sticky-wage theory of aggregate supply, how do real wages at point A compare to real wages at point B? How do real wages at point A compare to real wages at point C?
   f. Judging by the impact of the money supply on nominal and real wages, is this analysis consistent with the proposition that money has real effects in the short run but is neutral in the long run?

4. In 1939, with the U.S. economy not yet fully recovered from the Great Depression, President Roosevelt proclaimed that Thanksgiving would fall a week earlier than usual so that the shopping period before Christmas would be longer. Explain what President Roosevelt might have been trying to achieve, using the model of aggregate demand and aggregate supply.

5. Explain why the following statements are false.
   a. “The aggregate-demand curve slopes downward because it is the horizontal sum of the demand curves for individual goods.”
b. “The long-run aggregate-supply curve is vertical because economic forces do not affect long-run aggregate supply.”

c. “If firms adjusted their prices every day, then the short-run aggregate-supply curve would be horizontal.”

d. “Whenever the economy enters a recession, its long-run aggregate-supply curve shifts to the left.”

6. For each of the three theories for the upward slope of the short-run aggregate-supply curve, carefully explain the following:

a. How the economy recovers from a recession and returns to its long-run equilibrium without any policy intervention.

b. What determines the speed of that recovery.

7. Suppose the Fed expands the money supply, but because the public expects this Fed action, it simultaneously raises its expectation of the price level. What will happen to output and the price level in the short run? Compare this result to the outcome if the Fed expanded the money supply but the public didn’t change its expectation of the price level.

8. Suppose that the economy is currently in a recession. If policymakers take no action, how will the economy change over time? Explain in words and using an aggregate-demand/aggregate-supply diagram.

9. The economy begins in long-run equilibrium. Then one day, the president appoints a new chairman of the Federal Reserve. This new chairman is well-known for his view that inflation is not a major problem for an economy.

a. How would this news affect the price level that people would expect to prevail?

b. How would this change in the expected price level affect the nominal wage that workers and firms agree to in their new labor contracts?

c. How would this change in the nominal wage affect the profitability of producing goods and services at any given price level?

d. How does this change in profitability affect the short-run aggregate-supply curve?

e. If aggregate demand is held constant, how does this shift in the aggregate-supply curve affect the price level and the quantity of output produced?

f. Do you think this Fed chairman was a good appointment?

10. Explain whether each of the following events shifts the short-run aggregate-supply curve, the aggregate-demand curve, both, or neither. For each event that does shift a curve, draw a diagram to illustrate the effect on the economy.

a. Households decide to save a larger share of their income.

b. Florida orange groves suffer a prolonged period of below-freezing temperatures.

c. Increased job opportunities overseas cause many people to leave the country.

11. For each of the following events, explain the short-run and long-run effects on output and the price level, assuming policymakers take no action.

a. The stock market declines sharply, reducing consumers’ wealth.

b. The federal government increases spending on national defense.

c. A technological improvement raises productivity.

d. A recession overseas causes foreigners to buy fewer U.S. goods.

12. Suppose that firms become very optimistic about future business conditions and invest heavily in new capital equipment.

a. Draw an aggregate-demand/aggregate-supply diagram to show the short-run effect of this optimism on the economy. Label the new levels of prices and real output. Explain in words why the aggregate quantity of output supplied changes.

b. Now use the diagram from part (a) to show the new long-run equilibrium of the economy. (For now, assume there is no change in the long-run aggregate-supply curve.) Explain in words why the aggregate quantity of output demanded changes between the short run and the long run.

c. How might the investment boom affect the long-run aggregate-supply curve? Explain.

13. In economy A, all workers agree in advance on the nominal wages that their employers will pay them. In economy B, half of all workers have these nominal wage contracts, while the other half have indexed employment contracts, so their wages rise and fall automatically with the
price level. According to the sticky-wage theory of aggregate supply, which economy has a more steeply sloped short-run aggregate-supply curve? In which economy would a 5 percent increase in the money supply have a larger impact on output? In which economy would it have a larger impact on the price level? Explain.

14. The National Bureau of Economic Research is a nonprofit economic research group that sets the official dates for the beginning and end of recessions in the United States. Go to its website, http://www.nber.org, and find information about business cycle dating. Notice that the NBER often uses the term contraction for a recession and the term expansion for the period of growth between recessions.

a. What was the U.S. economy’s most recent turning point? Is the U.S economy now in an expansion or a contraction?

b. When was the most recent completed contraction? How long was it? By historical standards, was this contraction short or long?

c. When was the most recent completed expansion? How long was it? By historical standards, was this expansion short or long?

For further information on topics in this chapter, additional problems, examples, applications, online quizzes, and more, please visit our website at http://mankiw.swlearning.com.