expenditure and the change in real GDP in the short run if the price level remains unchanged.

24. **Obama's Economic Recovery Plan**

President Obama's proposal to jolt a listless recovery with $180 billion worth of tax breaks and transportation projects left economists largely unimpressed Tuesday.

Source: *USA Today*, September 10, 2010

If taxes fall by $90 billion and the spending on transport projects increases by $90 billion, which component of Obama's recovery plan would have the larger effect on equilibrium expenditure, other things remaining the same?

The Multiplier and the Price Level

Use the following news item to work Problems 25 to 27.

The BEA reported that in the third quarter of 2014 U.S. exports increased by $40 billion.

25. Explain and draw a graph to illustrate the effect of an increase in exports on equilibrium expenditure in the short run.
26. Explain and draw a graph to illustrate the effect of an increase in exports on equilibrium real GDP in the short run.
27. Explain and draw a graph to illustrate the effect of an increase in exports on equilibrium real GDP in the long run.
28. Compare the multiplier in the short run and the long run and explain why they are not identical.

Use the following news clip to work Problems 29 to 31.

Japan's Economy Grows Faster Than Expected

Japanese economy has staged an encouraging comeback in the first quarter. The growth in GDP has been driven by private consumption that had remained long an obstacle in the country's economic recovery whereas capital expenditure has risen for the first time in four quarters.

Source: CNBC, May 19, 2015

29. Is capital expenditure part of induced expenditure or autonomous expenditure? Explain.
30. Examine how Japan's real GDP increases due to a movement along the aggregate demand curve and a shift in the aggregate demand curve. Illustrate your answer using a graph.
31. Explain using a graph how in the Keynesian model, keeping the price level fixed, an increase in private consumption influences aggregate expenditure and aggregate demand.
32. **Japan Slides Into Recession**

In Japan, consumer prices slid at a faster pace in July and industrial production unexpectedly slumped.

Source: Bloomberg, September 1, 2012

Contrast what the news clip says is happening in Japan with what is happening in the United States in Problem 29 and provide a graphical analysis of the differences.

Economics in the News

33. After you have studied *Economics in the News* on pp. 692–693, answer the following questions.
    a. If the 2014 changes in inventories were mainly *planned* changes, what role did they play in shifting the *AE* curve and changing equilibrium expenditure? Use a two-part figure (similar to that on p. 718) to answer this question.
    b. The BEA news release reports that exports of goods and services were up 10.1 percent and imports of goods and services were up 11.0 percent. Were these increases in expenditure increases in autonomous expenditure or increases in induced expenditure, and how do they influence the magnitude of the multiplier?
    c. Using the assumptions made in Fig. 2 on p. 731, what is the value of the autonomous expenditure multiplier?

Mathematical Note

34. In an economy with a fixed price level, autonomous spending is $20 trillion and the slope of the *AE* curve is 0.6.
    a. What is the equation of the *AE* curve?
    b. Calculate equilibrium expenditure.
    c. Calculate the multiplier.
    d. Calculate the shift of the aggregate demand curve if investment increases by $1 billion.

29 THE BUSINESS CYCLE, INFLATION, AND DEFLATION

After studying this chapter, you will be able to:

- Explain how aggregate demand shocks and aggregate supply shocks create the business cycle
- Explain how demand-pull and cost-push forces bring cycles in inflation and output
- Explain the causes and consequences of deflation
- Explain the short-run and long-run tradeoff between inflation and unemployment

We fear deflation because it brings stagnant incomes and high unemployment. And we worry about inflation because it raises our cost of living. We want low inflation, low unemployment, and rapid income growth. But can we have all these things at the same time? Or do we face a tradeoff among them? As this chapter explains, we face a tradeoff in the short run but not in the long run.

At the end of the chapter, in *Economics in the News*, we examine a stagnating European economy and the lessons it holds for the United States and other countries.

The Business Cycle

The business cycle is easy to describe but hard to explain and the next peak or trough is impossible to predict. We'll look at two approaches to understanding the business cycle:

- Mainstream business cycle theory
- Real business cycle theory

Mainstream Business Cycle Theory

The mainstream business cycle theory is that potential GDP grows at a steady rate while aggregate demand grows at a fluctuating rate. Because the money wage rate is sticky, if aggregate demand grows faster than potential GDP, real GDP moves above potential GDP and an inflationary gap emerges. And if aggregate demand grows slower than potential GDP, real GDP moves below potential GDP and a recessionary gap emerges. If aggregate demand decreases, real GDP also decreases in a recession.

Figure 29.1 illustrates this business cycle theory. Initially, potential GDP is $13 trillion. The long-run aggregate supply curve is LAS_0, the aggregate demand curve is AD_0, and the price level is 100. The economy is at full employment at point *A*.

An expansion occurs when potential GDP increases and the *LAS* curve shifts rightward to LAS_1. During an expansion, aggregate demand also increases, and usually by more than potential GDP, so the price level rises. Assume that in the current expansion, the price level is expected to rise to 110 and the money wage rate has been set based on that expectation. The short-run aggregate supply curve is SAS_1.

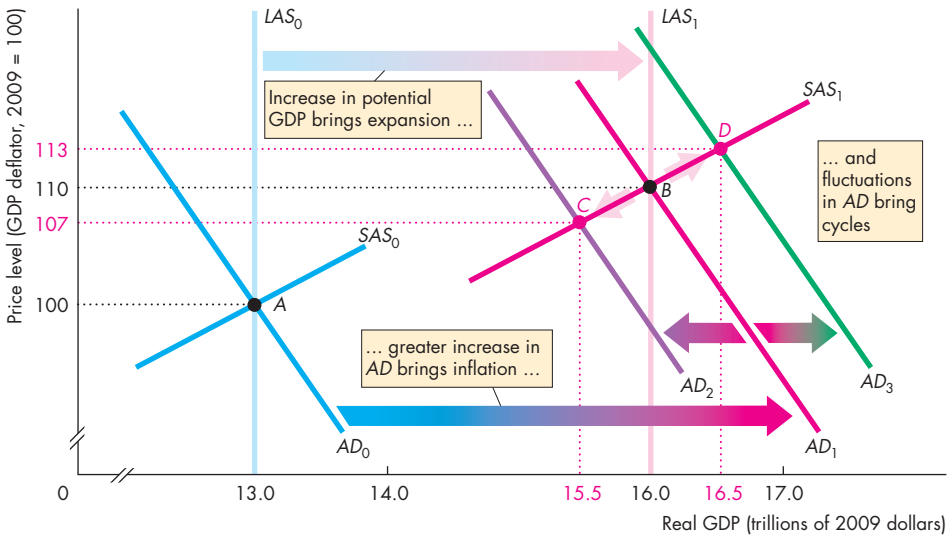
If aggregate demand increases to AD_1, real GDP increases from $13 trillion to $16 trillion, the new level of potential GDP, and the price level rises, as expected, to 110. The economy remains at full employment but now at point *B*.

If aggregate demand increases more slowly to AD_2, real GDP grows by less than potential GDP and the economy moves to point *C*, with real GDP at $15.5 trillion and the price level at 107. Real GDP growth is slower and inflation is lower than expected.

If aggregate demand increases more quickly to AD_3, real GDP grows by more than potential GDP and the economy moves to point *D*, with real GDP at $16.5 trillion and the price level at 113. Real GDP growth is faster and inflation is higher than expected.

Growth, inflation, and the business cycle arise from the relentless increases in potential GDP, faster (on average) increases in aggregate demand, and fluctuations in the pace of aggregate demand growth.

FIGURE 29.1 The Mainstream Business Cycle Theory



In a business cycle expansion, potential GDP increases and the *LAS* curve shifts rightward from LAS_0 to LAS_1. A greater than expected increase in aggregate demand brings inflation.

If the aggregate demand curve shifts to AD_1, the economy remains at full employment. If the aggregate demand curve shifts to AD_2, a recessionary gap arises. If the aggregate demand curve shifts to AD_3, an inflationary gap arises.

MyEconLab Animation and Draw Graph

This mainstream theory comes in a number of special forms that differ regarding the source of fluctuations in aggregate demand growth and the source of money wage stickiness.

Keynesian Cycle Theory In **Keynesian cycle theory**, fluctuations in investment driven by fluctuations in business confidence—summarized by the phrase "animal spirits"—are the main source of fluctuations in aggregate demand.

Monetarist Cycle Theory In **monetarist cycle theory**, fluctuations in both investment and consumption expenditure, driven by fluctuations in the growth rate of the quantity of money, are the main source of fluctuations in aggregate demand.

Both the Keynesian and monetarist cycle theories simply assume that the money wage rate is rigid and don't explain that rigidity.

Two newer theories seek to explain money wage rate rigidity and to be more careful about working out its consequences.

New Classical Cycle Theory In **new classical cycle theory**, the rational expectation of the price level, which is determined by potential GDP and *expected* aggregate demand, determines the money wage rate and the position of the *SAS* curve. In this theory, only *unexpected* fluctuations in aggregate demand bring fluctuations in real GDP around potential GDP.

New Keynesian Cycle Theory The **new Keynesian cycle theory** emphasizes the fact that today's money wage rates were negotiated at many past dates, which means that *past* rational expectations of the current price level influence the money wage rate and the position of the *SAS* curve. In this theory, both unexpected and currently expected fluctuations in aggregate demand bring fluctuations in real GDP around potential GDP.

The mainstream cycle theories don't rule out the possibility that aggregate supply shocks might occur. An oil price rise, a widespread drought, a major hurricane, or another natural disaster, could, for example, bring a recession. But supply shocks are not the normal source of fluctuations in the mainstream theories. In contrast, real business cycle theory puts supply shocks at center stage.

Real Business Cycle Theory

The newest theory of the business cycle, known as **real business cycle theory** (or RBC theory), regards random fluctuations in productivity as the main source of economic fluctuations. These productivity fluctuations are assumed to result mainly from fluctuations in the pace of technological change, but they might also have other sources, such as international disturbances, climate fluctuations, or natural disasters. The origins of RBC theory can be traced to the rational expectations revolution set off by Robert E. Lucas, Jr., but the first demonstrations of the power of this theory were given by Edward Prescott and Finn Kydland and by John Long and Charles Plosser. Today, RBC theory is part of a broad research agenda called dynamic general equilibrium analysis, and hundreds of young macroeconomists do research on this topic.

We'll explore RBC theory by looking first at its impulse and then at the mechanism that converts that impulse into a cycle in real GDP.

The RBC Impulse The impulse in RBC theory is the growth rate of productivity that results from technological change. RBC theorists believe this impulse to be generated mainly by the process of research and development that leads to the creation and use of new technologies (see *Economics in Action*).

The pace of technological change and productivity growth is not constant. Sometimes productivity growth speeds up, sometimes it slows, and occasionally it even *falls*—labor and capital become less productive, on average. A period of rapid productivity growth brings a business cycle expansion, and a slowdown or fall in productivity triggers a recession.

It is easy to understand why technological change brings productivity growth. But how does it *decrease* productivity? All technological change eventually increases productivity. But if initially, technological change makes a sufficient amount of existing capital—especially human capital—obsolete, productivity can temporarily fall. At such a time, more jobs are destroyed than created and more businesses fail than start up.

The RBC Mechanism Two effects follow from a change in productivity that sparks an expansion or a contraction: Investment demand changes and the demand for labor changes. We'll study these effects and their consequences during a recession. In an

ECONOMICS IN ACTION

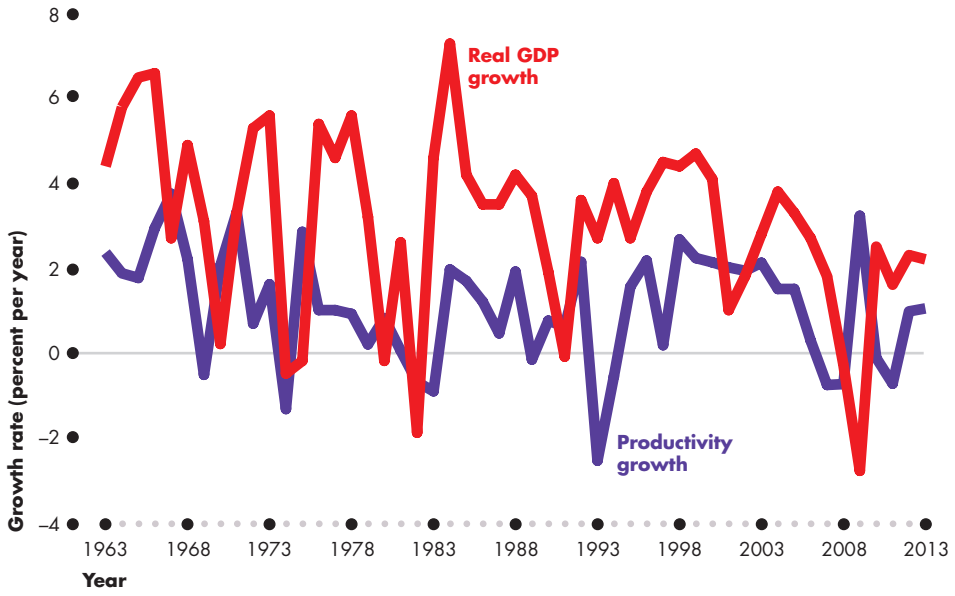
The Real Business Cycle Impulse

To isolate the RBC impulse, economists measure the change in the combined productivity of capital and labor—called *total factor productivity*. The figure shows the RBC impulse for the United States from 1963 through 2013.

You can see that the productivity growth rate fluctuations are not directly correlated with real GDP fluctuations. Their influence on real GDP growth is spread out over time.

You can also see that the fluctuations in real GDP growth have wider swings than those of productivity growth.

Real business cycle theory explains these facts.



Sources of data: Real GDP, Bureau of Economic Analysis; Productivity growth, Federal Reserve Bank of San Francisco.

expansion, they work in the direction opposite to what is described here.

Technological change makes some existing capital obsolete and temporarily decreases productivity. Firms expect the future profits to fall and see their labor productivity falling. With lower profit expectations, they cut back their purchases of new capital, and with lower labor productivity, they plan to lay off some workers. So the initial effect of a temporary fall in productivity is a decrease in investment demand and a decrease in the demand for labor.

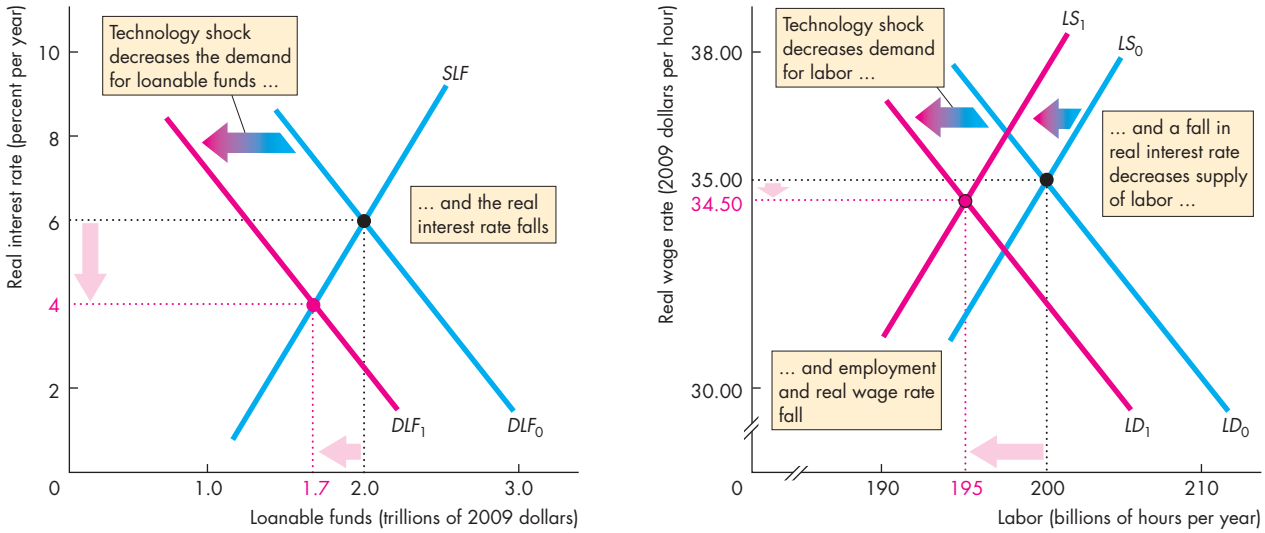
Figure 29.2 illustrates these two initial effects of a decrease in productivity. Part (a) shows the effects of a decrease in investment demand in the loanable funds market. The demand for loanable funds curve is *DLF* and the supply of loanable funds curve is *SLF* (both of which are explained in Chapter 24, pp. 613–615). Initially, the demand for loanable funds curve is DLF_0 and the equilibrium quantity of funds is $2 trillion at a real interest rate of 6 percent a year. A decrease in productivity decreases investment demand, and the demand for loanable funds curve shifts leftward from DLF_0 to DLF_1. The real interest rate falls to 4 percent a year, and the equilibrium quantity of loanable funds decreases to $1.7 trillion.

Figure 29.2(b) shows the demand for labor and supply of labor (which are explained in Chapter 23, pp. 584–585). Initially, the demand for labor curve is LD_0, the supply of labor curve is LS_0, and equilibrium employment is 200 billion hours a year at a real wage rate of $35 an hour. The decrease in productivity decreases the demand for labor, and the demand for labor curve shifts leftward from LD_0 to LD_1.

Before we can determine the new level of employment and real wage rate, we need to look at a ripple effect—the key effect in RBC theory.

The Key Decision: When to Work? According to RBC theory, people decide *when* to work by doing a cost-benefit calculation. They compare the return

FIGURE 29.2 Loanable Funds and Labor Markets in a Real Business Cycle



(a) Loanable funds and interest rate

(b) Labor and wage rate

In part (a), the supply of loanable funds *SLF* and the initial demand for loanable funds DLF_0 determine the real interest rate at 6 percent a year. In part (b), the initial demand for labor LD_0 and the supply of labor LS_0 determine the real wage rate at $35 an hour and employment at 200 billion hours. A technological change temporarily decreases productivity, and both the demand for loanable funds and the demand for labor decrease. The two demand curves shift leftward to DLF_1 and LD_1. In part (a), the real interest rate falls to 4 percent a year. In part (b), the fall in the real interest rate decreases the supply of labor (the when-to-work decision) and the supply of labor curve shifts leftward to LS_1. Employment decreases to 195 billion hours, and the real wage rate falls to $34.50 an hour. A recession is under way.

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from working in the current period with the *expected* return from working in a later period. You make such a comparison every day in school. Suppose your goal in this course is to get an A. To achieve this goal, you work hard most of the time. But during the few days before the midterm and final exams, you work especially hard. Why? Because you believe that the return from studying close to the exam is greater than the return from studying when the exam is a long time away. So during the term, you take time off for the movies and other leisure pursuits, but at exam time, you study every evening and weekend.

RBC theory says that workers behave like you. They work fewer hours, sometimes zero hours, when the real wage rate is temporarily low, and they work more hours when the real wage rate is temporarily high. But to properly compare the current wage rate with the expected future wage rate, workers must use the real interest rate. If the real interest rate is 6 percent a year, a real wage of $1 an hour earned this week will become $1.06 a year from now. If the real wage rate is expected to be $1.05 an hour next year, today's real wage of $1 looks good. By working longer hours now and shorter hours a year from now, a person can get a 1 percent higher real wage. But suppose the real interest rate is 4 percent a year. In this case, $1 earned now is worth $1.04 next year. Working fewer hours now and more next year is the way to get a 1 percent higher real wage.

So the when-to-work decision depends on the real interest rate. The lower the real interest rate, other things remaining the same, the smaller is the supply of labor today. Many economists believe this *intertemporal substitution* effect to be of negligible size. RBC theorists believe that the effect is large, and it is the key feature of the RBC mechanism.

You saw in Fig. 29.2(a) that the decrease in the demand for loanable funds lowers the real interest rate. This fall in the real interest rate lowers the return to current work and decreases the supply of labor.

In Fig. 29.2(b), the labor supply curve shifts leftward to LS_1. The effect of the decrease in productivity on the demand for labor is larger than the effect of the fall in the real interest rate on the supply of labor. That is, the demand curve shifts farther leftward than does the supply curve. As a result, the real wage rate falls to $34.50 an hour and employment decreases to 195 billion hours. A recession has begun and is intensifying.

What Happened to Money? The name *real* business cycle theory is no accident. It reflects the central prediction of the theory. Real things, not nominal or monetary things, cause the business cycle. If the quantity of money changes, aggregate demand changes. But if there is no real change—with no change in the use of resources and no change in potential GDP—the change in the quantity of money changes only the price level. In RBC theory, this outcome occurs because the aggregate supply curve is the *LAS* curve, which pins real GDP down at potential GDP, so when aggregate demand changes, only the price level changes.

Cycles and Growth The shock that drives the business cycle of RBC theory is the same as the force that generates economic growth: technological change. On average, as technology advances, productivity grows; but as you saw in *Economics in Action* on p. 744, it grows at an uneven pace. Economic growth arises from the upward trend in productivity growth and, according to RBC theory, the mostly positive but occasionally negative higher frequency shocks to productivity bring the business cycle.

Criticisms and Defenses of RBC Theory The three main criticisms of RBC theory are that

1. The money wage rate *is* sticky, and to assume otherwise is at odds with a clear fact.
2. Intertemporal substitution is too weak a force to account for large fluctuations in labor supply and employment with small real wage rate changes.
3. Productivity shocks are as likely to be caused by *changes in aggregate demand* as by technological change.

If aggregate demand fluctuations cause the fluctuations in productivity, then the traditional aggregate demand theories are needed to explain them. Fluctuations in productivity do not cause the business cycle but are caused by it!

Building on this theme, the critics point out that the so-called productivity fluctuations that growth accounting measures are correlated with changes in the growth rate of money and other indicators of changes in aggregate demand.

The defenders of RBC theory claim that the theory explains the macroeconomic facts about the business cycle and is consistent with the facts about economic growth. In effect, a single theory explains *both growth and the business cycle*. The growth accounting exercise that explains slowly changing trends also explains the more frequent business cycle swings. Its defenders also claim that RBC theory is consistent with a wide range of *micro*economic evidence about labor supply decisions, labor demand and investment demand decisions, and information on the distribution of income between labor and capital.

REVIEW QUIZ

1. Explain the mainstream theory of the business cycle.
2. What are the four special forms of the mainstream theory of the business cycle and how do they differ?
3. According to RBC theory, what is the source of the business cycle? What is the role of fluctuations in the rate of technological change?
4. According to RBC theory, how does a fall in productivity growth influence investment demand, the market for loanable funds, the real interest rate, the demand for labor, the supply of labor, employment, and the real wage rate?
5. What are the main criticisms of RBC theory and how do its supporters defend it?

Work these questions in Study Plan 29.1 and get instant feedback. Do a Key Terms Quiz. MyEconLab

In this first section, we've focussed on the cycles in real GDP and the loanable funds and labor markets. Next, we're going to look at the causes and effects of cycles in the inflation rate.

Inflation Cycles

In the long run, inflation is a monetary phenomenon. It occurs if the quantity of money grows faster than potential GDP. But in the short run, many factors can start an inflation, and real GDP and the price level interact. To study these interactions, we distinguish between two sources of inflation:

- Demand-pull inflation
- Cost-push inflation

Demand-Pull Inflation

An inflation that starts because aggregate demand increases is called **demand-pull inflation**. Demand-pull inflation can be kicked off by *any* of the factors that change aggregate demand. Examples are a cut in the interest rate, an increase in the quantity of money, an increase in government expenditure, a tax cut, an increase in exports, or an increase in investment stimulated by an increase in expected future profits.

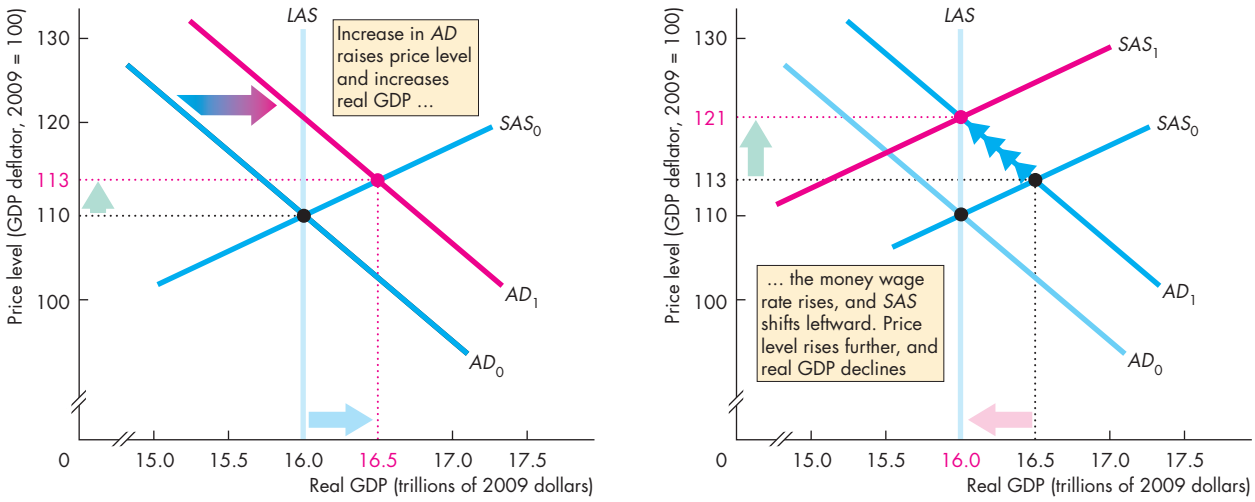
Initial Effect of an Increase in Aggregate Demand

Suppose that last year the price level was 110 and real GDP was $16 trillion. Potential GDP was also $16 trillion. Figure 29.3(a) illustrates this situation. The aggregate demand curve is AD_0, the short-run aggregate supply curve is SAS_0, and the long-run aggregate supply curve is *LAS*.

Now suppose that the Fed cuts the interest rate. The quantity of money increases and the aggregate demand curve shifts from AD_0 to AD_1. With no change in potential GDP and no change in the money wage rate, the long-run aggregate supply curve and the short-run aggregate supply curve remain at *LAS* and SAS_0, respectively.

The price level and real GDP are determined at the point where the aggregate demand curve AD_1 intersects the short-run aggregate supply curve. The price level rises to 113, and real GDP increases above potential GDP to $16.5 trillion. Unemployment falls below its natural rate. The economy is at an above full-employment equilibrium and there is an inflationary gap. The next step in the unfolding story is a rise in the money wage rate.

FIGURE 29.3 A Demand-Pull Rise in the Price Level



(a) Initial effect

In part (a), the aggregate demand curve is AD_0, the short-run aggregate supply curve is SAS_0, and the long-run aggregate supply curve is *LAS*. The price level is 110, and real GDP is $16 trillion, which equals potential GDP. Aggregate demand increases to AD_1. The price level rises to 113, and real GDP increases to $16.5 trillion.

(b) The money wage rate adjusts

In part (b), starting from the above full-employment equilibrium, the money wage rate begins to rise and the short-run aggregate supply curve shifts leftward toward SAS_1. The price level rises further, and real GDP returns to potential GDP.

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Money Wage Rate Response Real GDP cannot remain above potential GDP forever. With unemployment below its natural rate, there is a shortage of labor. In this situation, the money wage rate begins to rise. As it does so, short-run aggregate supply decreases and the *SAS* curve starts to shift leftward. The price level rises further, and real GDP begins to decrease.

With no further change in aggregate demand—that is, the aggregate demand curve remains at AD_1—this process ends when the short-run aggregate supply curve has shifted to SAS_1 in Fig. 29.3(b). At this time, the price level has increased to 121 and real GDP has returned to potential GDP of $16 trillion, the level at which it started.

A Demand-Pull Inflation Process The events that we've just described bring a *one-time rise in the price level*, not an inflation. For inflation to proceed, aggregate demand must *persistently* increase.

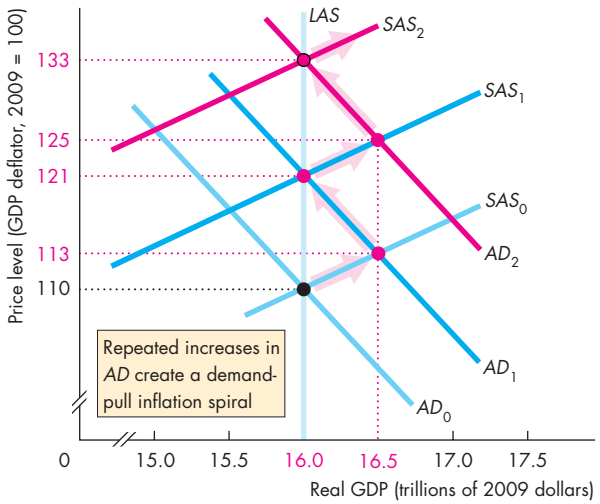
The only way in which aggregate demand can persistently increase is if the quantity of money persistently increases. Suppose the government has a budget deficit that it finances by selling bonds. Also suppose that the Fed buys some of these bonds. When the Fed buys bonds, it creates more money. In this situation, aggregate demand increases year after year. The aggregate demand curve keeps shifting rightward. This persistent increase in aggregate demand puts continual upward pressure on the price level. The economy now experiences demand-pull inflation.

Figure 29.4 illustrates the process of demand-pull inflation. The starting point is the same as that shown in Fig. 29.3. The aggregate demand curve is AD_0, the short-run aggregate supply curve is SAS_0, and the long-run aggregate supply curve is *LAS*. Real GDP is $16 trillion, and the price level is 110. Aggregate demand increases, shifting the aggregate demand curve to AD_1. Real GDP increases to $16.5 trillion, and the price level rises to 113. The economy is at an above full-employment equilibrium. There is a shortage of labor, and the money wage rate rises. The short-run aggregate supply curve shifts to SAS_1. The price level rises to 121, and real GDP returns to potential GDP.

But the Fed increases the quantity of money again, and aggregate demand continues to increase. The aggregate demand curve shifts rightward to AD_2. The price level rises further to 125, and real GDP again exceeds potential GDP at $16.5 trillion. Yet again, the money wage rate rises and decreases short-run aggregate supply. The *SAS* curve shifts to SAS_2, and the price level rises further, to 133. As the quantity of money continues to grow, aggregate demand increases and the price level rises in an ongoing demand-pull inflation process.

The process you have just studied generates inflation—a persisently rising price level.

FIGURE 29.4 A Demand-Pull Inflation Spiral



Each time the quantity of money increases, aggregate demand increases and the aggregate demand curve shifts rightward from AD_0 to AD_1 to AD_2, and so on. Each time real GDP increases above potential GDP, the money wage rate rises and the short-run aggregate supply curve shifts leftward from SAS_0 to SAS_1 to SAS_2, and so on. The price level rises from 110 to 113, 121, 125, 133, and so on. There is a demand-pull inflation spiral. Real GDP fluctuates between $16 trillion and $16.5 trillion.

MyEconLab Animation and Draw Graph

Demand-Pull Inflation in Kalamazoo You may better understand the inflation process that we've just described by considering what is going on in an individual part of the economy, such as a Kalamazoo soda-bottling plant. Initially, when aggregate demand increases, the demand for soda increases and the price of soda rises. Faced with a higher price, the soda plant works overtime and increases production. Conditions

are good for workers in Kalamazoo, and the soda factory finds it hard to hang on to its best people. To do so, it offers a higher money wage rate. As the wage rate rises, so do the soda factory's costs.

What happens next depends on aggregate demand. If aggregate demand remains constant, the firm's costs increase but the price of soda does not increase as quickly as its costs. In this case, the firm cuts production. Eventually, the money wage rate and costs increase by the same percentage as the rise in the price of soda. In real terms, the soda factory is in the same situation as it was initially. It produces the same amount of soda and employs the same amount of labor as before the increase in demand.

But if aggregate demand continues to increase, so does the demand for soda and the price of soda rises at the same rate as wages. The soda factory continues to operate at above full employment and there is a persistent shortage of labor. Prices and wages chase each other upward in a demand-pull inflation spiral.

Demand-Pull Inflation in the United States A demand-pull inflation like the one you've just studied occurred in the United States during the late 1960s. In 1960, inflation was a moderate 2 percent a year, but its rate increased slowly to 3 percent by 1966. Then, in 1967, a large increase in government expenditure on the Vietnam War and an increase in spending on social programs, together with an increase in the growth rate of the quantity of money, increased aggregate demand more quickly. Consequently, the rightward shift of the aggregate demand curve accelerated and the price level increased more quickly. Real GDP moved above potential GDP, and the unemployment rate fell below its natural rate.

With unemployment below its natural rate, the money wage rate started to rise more quickly and the short-run aggregate supply curve shifted leftward. The Fed responded with a further increase in the money growth rate, and a demand-pull inflation spiral unfolded. By 1970, the inflation rate had reached 5 percent a year.

For the next few years, aggregate demand grew even more quickly and the inflation rate kept rising. By 1974, the inflation rate had reached 11 percent a year.

Next, let's see how shocks to aggregate supply can create cost-push inflation.

Cost-Push Inflation

An inflation that is kicked off by an increase in costs is called **cost-push inflation**. The two main sources of cost increases are

1. An increase in the money wage rate
2. An increase in the money prices of raw materials

At a given price level, the higher the cost of production, the smaller is the amount that firms are willing to produce. So if the money wage rate rises or if the prices of raw materials (for example, oil) rise, firms decrease their supply of goods and services. Aggregate supply decreases, and the short-run aggregate supply curve shifts leftward.[1] Let's trace the effects of such a decrease in short-run aggregate supply on the price level and real GDP.

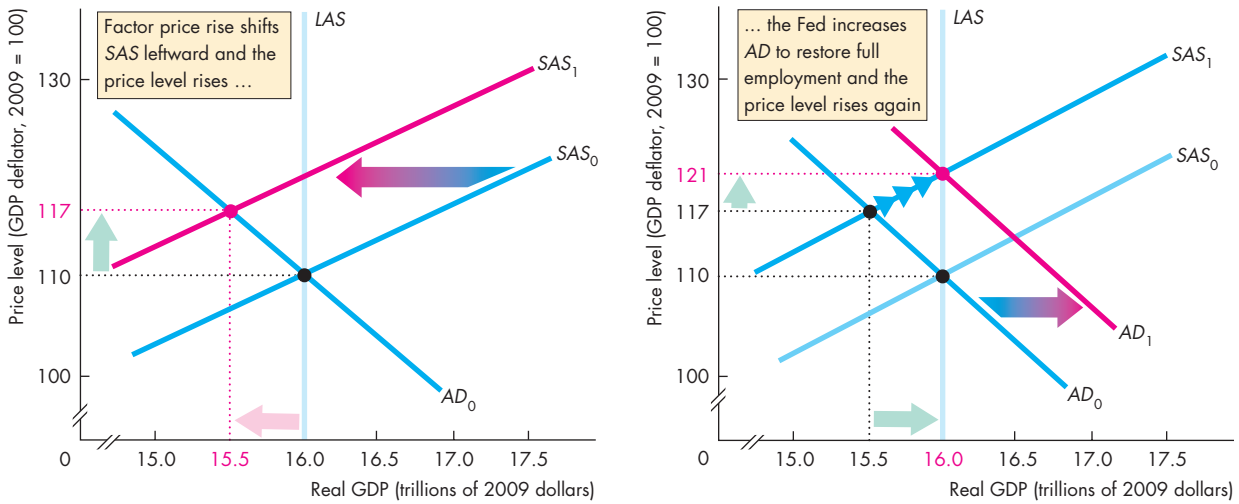
Initial Effect of a Decrease in Aggregate Supply

Suppose that last year the price level was 110 and real GDP was $16 trillion. Potential real GDP was also $16 trillion. Figure 29.5(a) illustrates this situation. The aggregate demand curve was AD_0, the short-run aggregate supply curve was SAS_0, and the long-run aggregate supply curve was *LAS*. In the current year, the world's oil producers form a price-fixing organization that strengthens their market power and increases the relative price of oil. They raise the price of oil, and this action decreases short-run aggregate supply. The short-run aggregate supply curve shifts leftward to SAS_1. The price level rises to 117, and real GDP decreases to $15.5 trillion. The economy is at a below full-employment equilibrium and there is a recessionary gap.

This event is a *one-time rise in the price level*. It is not inflation. In fact, a supply shock on its own cannot cause inflation. Something more must happen to enable a one-time supply shock, which causes a one-time rise in the price level, to be converted into a process of ongoing inflation. The quantity of money must persistently increase. Sometimes it does increase, as you will now see.

[1] Some cost-push forces, such as an increase in the price of oil accompanied by a decrease in the availability of oil, can also decrease long-run aggregate supply. We'll ignore such effects here and examine cost-push factors that change only short-run aggregate supply. Later in the chapter, we study the effects of shocks to long-run aggregate supply.

FIGURE 29.5 A Cost-Push Rise in the Price Level



(a) Initial cost push

Initially, the aggregate demand curve is AD_0, the short-run aggregate supply curve is SAS_0, and the long-run aggregate supply curve is *LAS*. A decrease in aggregate supply (for example, resulting from a rise in the world price of oil) shifts the short-run aggregate supply curve to SAS_1. The economy moves to the point where the short-run aggregate supply curve SAS_1 intersects the aggregate demand curve AD_0. The price level rises to 117, and real GDP decreases to $15.5 trillion.

(b) The Fed responds

In part (b), if the Fed responds by increasing aggregate demand to restore full employment, the aggregate demand curve shifts rightward to AD_1. The economy returns to full employment, but the price level rises further to 121.

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Aggregate Demand Response When real GDP decreases, unemployment rises above its natural rate. In such a situation, there is often an outcry of concern and a call for action to restore full employment. Suppose that the Fed cuts the interest rate and increases the quantity of money. Aggregate demand increases. In Fig. 29.5(b), the aggregate demand curve shifts rightward to AD_1 and full employment is restored. But the price level rises further to 121.

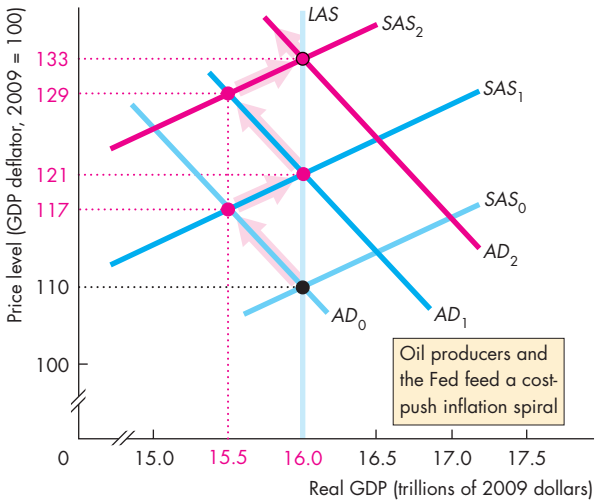
A Cost-Push Inflation Process The oil producers now see the prices of everything they buy increasing, so oil producers increase the price of oil again to restore its new high relative price. Figure 29.6 continues the story. The short-run aggregate supply curve now shifts to SAS_2. The price level rises and real GDP decreases.

The price level rises further, to 129, and real GDP decreases to $15.5 trillion. Unemployment increases above its natural rate. If the Fed responds yet again with an increase in the quantity of money, aggregate demand increases and the aggregate demand curve shifts to AD_2. The price level rises even higher—to 133—and full employment is again restored. A cost-push inflation spiral results. The combination of a rising price level and decreasing real GDP is called **stagflation**.

You can see that the Fed has a dilemma. If it does not respond when producers raise the oil price, the economy remains below full employment. If the Fed increases the quantity of money to restore full employment, it invites another oil price hike that will call forth yet a further increase in the quantity of money.

If the Fed responds to each oil price hike by increasing the quantity of money, inflation will rage along at a rate decided by oil producers. But if the Fed keeps the lid on money growth, the economy remains below full employment.

FIGURE 29.6 A Cost-Push Inflation Spiral



Each time a cost increase occurs, the short-run aggregate supply curve shifts leftward from SAS_0 to SAS_1 to SAS_2, and so on. Each time real GDP decreases below potential GDP, the Fed increases the quantity of money and the aggregate demand curve shifts rightward from AD_0 to AD_1 to AD_2, and so on. The price level rises from 110 to 117, 121, 129, 133, and so on. There is a cost-push inflation spiral. Real GDP fluctuates between $16 trillion and $15.5 trillion.

MyEconLab Animation and Draw Graph

Cost-Push Inflation in Kalamazoo What is going on in the Kalamazoo soda-bottling plant when the economy is experiencing cost-push inflation?

When the oil price increases, so do the costs of bottling soda. These higher costs decrease the supply of soda, increasing its price and decreasing the quantity produced. The soda plant lays off some workers.

This situation persists until either the Fed increases aggregate demand or the price of oil falls. If the Fed increases aggregate demand, the demand for soda increases and so does its price. The higher price of soda brings higher profits, and the bottling plant increases its production. The soda factory rehires the laid-off workers.

Cost-Push Inflation in the United States A cost-push inflation like the one you've just studied occurred in the United States during the 1970s. It began in 1974 when the Organization of the Petroleum Exporting Countries (OPEC) raised the price of oil fourfold. The higher oil price decreased aggregate supply, which caused the price level to rise more quickly and real GDP to shrink. The Fed then faced a dilemma: Would it increase the quantity of money and accommodate the cost-push forces, or would it keep aggregate demand growth in check by limiting money growth? In 1975, 1976, and 1977, the Fed repeatedly allowed the quantity of money to grow quickly and inflation proceeded at a rapid rate. In 1979 and 1980, OPEC was again able to push oil prices higher. On that occasion, the Fed decided not to respond to the oil price hike with an increase in the quantity of money. The result was a recession but also, eventually, a fall in inflation.

Expected Inflation

If inflation is expected, the fluctuations in real GDP that accompany demand-pull and cost-push inflation that you've just studied don't occur. Instead, inflation proceeds as it does in the long run, with real GDP equal to potential GDP and unemployment at its natural rate. Figure 29.7 explains why.

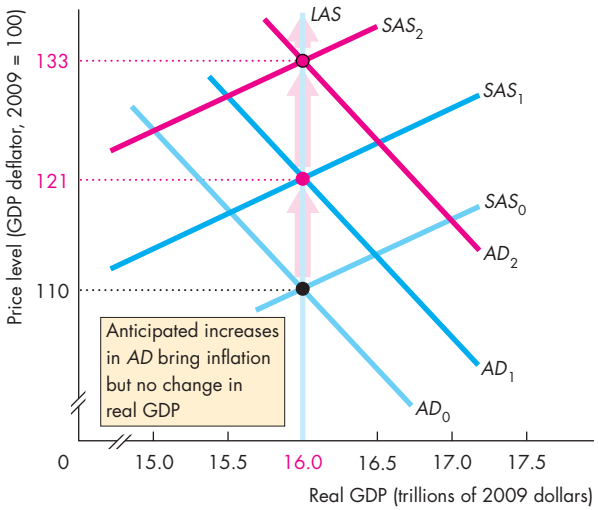
Suppose that last year the aggregate demand curve was AD_0, the aggregate supply curve was SAS_0, and the long-run aggregate supply curve was *LAS*. The price level was 110, and real GDP was $16 trillion, which is also potential GDP.

To keep things as simple as possible, suppose that potential GDP does not change, so the *LAS* curve doesn't shift. Also suppose that aggregate demand is *expected to increase* to AD_1.

In anticipation of this increase in aggregate demand, the money wage rate rises and the short-run aggregate supply curve shifts leftward. If the money wage rate rises by the same percentage as the price level is expected to rise, the short-run aggregate supply curve for next year is SAS_1.

If aggregate demand turns out to be the same as expected, the aggregate demand curve is AD_1. The short-run aggregate supply curve, SAS_1, and AD_1 determine the actual price level at 121. Between last year and this year, the price level increased from 110 to 121 and the economy experienced an inflation rate equal to that expected. If this inflation is ongoing, aggregate demand increases (as expected) in the following year and the aggregate demand curve shifts to AD_2. The money wage rate rises to reflect the expected inflation, and the short-run aggregate

FIGURE 29.7 Expected Inflation



Potential real GDP is $16 trillion. Last year, aggregate demand was AD_0 and the short-run aggregate supply curve was SAS_0. The actual price level was the same as the expected price level: 110. This year, aggregate demand is expected to increase to AD_1 and the price level is expected to rise from 110 to 121. As a result, the money wage rate rises and the short-run aggregate supply curve shifts to SAS_1. If aggregate demand actually increases as expected, the actual aggregate demand curve AD_1 is the same as the expected aggregate demand curve. Real GDP is $16 trillion, and the actual price level rises to 121. The inflation is expected. Next year, the process continues with aggregate demand increasing as expected to AD_2 and the money wage rate rising to shift the short-run aggregate supply curve to SAS_2. Again, real GDP remains at $16 trillion, and the price level rises, as expected, to 133.

MyEconLab Animation and Draw Graph

supply curve shifts to SAS_2. The price level rises, as expected, to 133.

What caused this inflation? The immediate answer is that because people expected inflation, the money wage rate increased and the price level increased. But the expectation was correct. Aggregate demand was expected to increase, and it did increase. It is the actual and expected increase in aggregate demand that caused the inflation.

An expected inflation at full employment is exactly the process that the quantity theory of money predicts. To review the quantity theory of money, see Chapter 25, pp. 646–647.

This broader account of the inflation process and its short-run effects shows why the quantity theory of money doesn't explain the *fluctuations* in inflation. The economy follows the course described in Fig. 29.7, but as predicted by the quantity theory, only if aggregate demand growth is forecasted correctly.

Forecasting Inflation

To anticipate inflation, people must forecast it. Some economists who work for macroeconomic forecasting agencies, banks, insurance companies, labor unions, and large corporations specialize in inflation forecasting. The best forecast available is one that is based on all the relevant information and is called a **rational expectation**. A rational expectation is not necessarily a correct forecast. It is simply the best forecast with the information available. It will often turn out to be wrong, but no other forecast that could have been made with the information available could do better.

Inflation and the Business Cycle

When the inflation forecast is correct, the economy operates at full employment. If aggregate demand grows faster than expected, real GDP rises above potential GDP, the inflation rate exceeds its expected rate, and the economy behaves like it does in a demand-pull inflation. If aggregate demand grows more slowly than expected, real GDP falls below potential GDP and the inflation rate slows.

REVIEW QUIZ

1. How does demand-pull inflation begin?
2. What must happen to create a demand-pull inflation spiral?
3. How does cost-push inflation begin?
4. What must happen to create a cost-push inflation spiral?
5. What is stagflation and why does cost-push inflation cause stagflation?
6. How does expected inflation occur?
7. How do real GDP and the price level change if the forecast of inflation is incorrect?

Work these questions in Study Plan 29.2 and get instant feedback. Do a Key Terms Quiz. MyEconLab

Deflation

An economy experiences *deflation* when it has a persistently *falling* price level. Equivalently, during a period of deflation, the inflation rate is negative.

In most economies and for most of the time, the inflation rate is positive—the price level is rising—and deflation is rare. But deflation does happen, and most recently it was present in Japan (see *Economics in Action* on p. 754).

We're going to answer three questions about deflation:

- What causes deflation?
- What are the consequences of deflation?
- How can deflation be ended?

What Causes Deflation?

The starting point for understanding the cause of deflation is to distinguish between a one-time fall in the price level and a persistently falling price level. A one-time *fall* in the price level is not deflation. Deflation is a persistent and ongoing *falling* price level.

A One-Time Fall in the Price Level The price level can fall either because aggregate demand decreases or because short-run aggregate supply increases. So any of the influences on aggregate demand and short-run aggregate supply that you studied in Chapter 27 can bring a one-time fall in the price level.

Some examples on the demand side are a fall in global demand for a country's exports, or a fall in profit expectations that lowers business investment. Some examples on the supply side are an increase in capital or advance in technology that increases potential GDP, or (unlikely but possible) a fall in the money wage rate.

But none of these sources of a decrease in aggregate demand or increase in aggregate supply can bring a persistently falling price level.

A Persistently Falling Price Level The price level falls persistently if aggregate demand increases at a persistently slower rate than aggregate supply. The trend rate of increase in aggregate supply is determined by the forces that make potential GDP grow. These forces are the growth rates of the labor force and capital stock and the growth rate of productivity that results from technological change. Notice that all these variables are real, not monetary, and they have trends that change slowly.

In contrast, the forces that drive aggregate demand include the quantity of money. And this quantity can grow as quickly or as slowly as the central bank chooses.

In most situations, the central bank doesn't have a target for the money stock or its growth rate and instead sets the interest rate. But the money stock is under central bank control, and its growth rate has a powerful effect on the growth rate of aggregate demand. To see the effect of growth in the money stock in the long term, we need to return to the quantity theory of money.

The Quantity Theory and Deflation The quantity theory of money explains the trends in inflation by focusing on the trend influences on aggregate supply and aggregate demand.

The foundation of the quantity theory is the *equation of exchange* (see Chapter 25, p. 646), which in its growth rate version and solved for the inflation rate states

$$\text{Inflation rate} = \text{Money growth rate} + \text{Rate of velocity change} - \text{Real GDP growth rate}$$

This equation, true by definition, derives from the fact that the amount of money spent on real GDP, MV, equals the money value of GDP, PY. (M is the money stock, V is its velocity of circulation, P is the price level, and Y is real GDP.)

The quantity theory adds to the equation of exchange two propositons. First, the trend rate of change in the velocity of circulation does not depend on the money growth rate and is determined by decisions about the quantity of money to hold and to spend. Second, the trend growth rate of real GDP equals the growth rate of potential GDP and, again, is independent of the money growth rate.

With these two assumptions, the equation of exchange becomes the quantity theory of money and predicts that a change in the money growth rate brings an equal change in the inflaton rate.

For example, suppose velocity increases by 2 percent per year and potential GDP grows by 3 percent per year. Then the quantity theory predicts that the trend inflation rate equals the money growth rate minus 1 percent. If the central bank makes the quantity of money grow by 1 percent, the inflation rate will be zero. If money grows at a rate faster than 1 percent, the economy will experience inflation. And if money grows at a slower rate than 1 percent, the economy will experience deflation.

ECONOMICS IN ACTION

Fifteen Years of Deflation in Japan

Japan experienced deflation for the 15 years from 1998 to 2013.

Japan's Deflation Rate

Figure 1 shows the inflation rate in Japan from 1990 to 2013. The inflation rate fluctuated between −1 percent and −2 percent per year and accumulated to a 17 percent fall in the price level.

Cause of Japan's Deflation

Deflation, like its opposite, inflation, is primarily a monetary phenomenon. Japan's money stock grew too slowly during the deflation years.

Figure 2 shows the facts about inflation and money growth in Japan from 1995 to 2013. The relevant money growth rate that brings inflation or deflation is that of money itself *plus* the trend rate of change in the velocity of circulaton *minus* the growth rate of potential GDP. That is the money growth rate shown in Fig. 2 and except for one year, 1997, it is negative, which means that Japan's money stock did not grow fast enough to accommodate the growth of potential GDP and a trend rise in velocity.

Consequences of Japan's Deflation

At first, Japan's deflation was unexpected and loan and wage contracts had been entered into that anticipated an ongoing low but positive inflation rate. So when the price level started to fall, the real value of debt increased and the real wage rate increased.

With higher real debt and wages, businesses cut back on both investment and hiring labor and cut production. Real GDP fell and the recessionary gap increased.

Because investment decreased, the capital stock increased more slowly and the growth rate of potential GDP slowed. From being one of the world's most dynamic rich economies, Japan became the world's most sluggish.

Figure 3 tells the story. The 1960s saw Japan doubling its real GDP in seven years. The growth rate slowed in the 1970s and 1980s but remained one of the world's fastest. Then, during the deflation years, the growth rate dropped to 1.5 percent (in the 1990s) and 0.5 percent (in the 2000s).

Japan's inflation rate turned positive in 2014, and real GDP growth picked up, but money growth rate remained too low. Without a sustained increase in money growth, deflation cannot end.

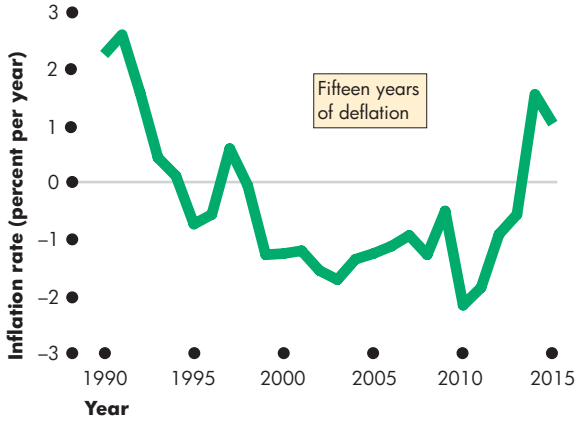


Figure 1 Japan's Long Deflation

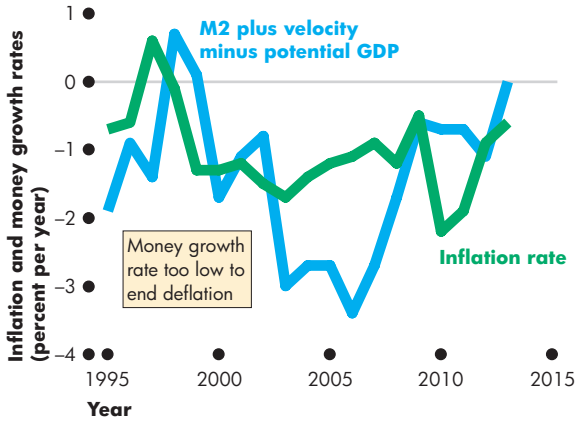


Figure 2 Money Growth Rate Too Low

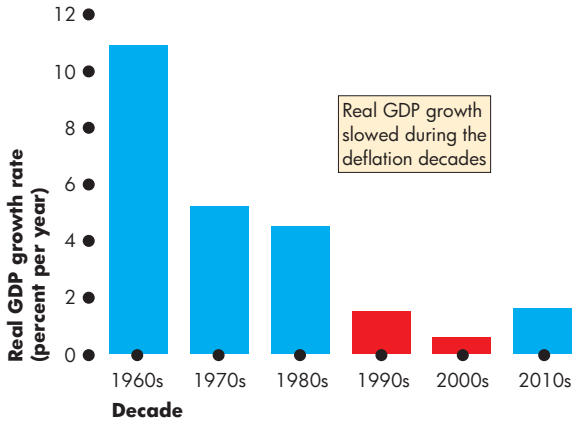


Figure 3 Japan's Decade Average Real GDP Growth Rates

Sources of data: *Financial Statistics* and *World Economic Outlook*, International Monetary Fund, Washington, DC.

Japan Example In the example of Japan during the 1990s and 2000s (see *Economics in Action* on previous page), the money (M2) growth rate during the 15 years 1998–2013 was 2.5 percent per year. The velocity growth rate was negative and it *decreased* at a rate of 3 percent per year. Potential GDP grew at an average rate of 0.8 percent per year. Combining these numbers, the quantity theory predicts an inflation rate equal to –1.3 percent per year:

$$+2.5 + (-3) - 0.8 = -1.3.$$

In fact, the average inflation rate was −1.2 percent per year. So the quantity theory prediction is not exactly correct, but it is close. Its prediction of the deflation rate of 1.3 percent per year is off by only 0.1.

You now know what causes deflation. Let's turn to its consequences.

What are the Consequences of Deflation?

Chapter 22 (p. 562) discusses why deflation and inflation are problems. But with what you now know about aggregate supply and aggregate demand and the determinants of potential GDP and its growth rate, you can gain deeper insight into the costs of deflation (and the related costs of inflation.)

The effects of deflation (like those of inflation) depend on whether it is anticipated or unanticipated. But because inflation is normal and deflation is rare, when deflation occurs, it is usually unanticipated.

Unanticipated deflation redistributes income and wealth, lowers real GDP and employment, and diverts resources from production.

Workers with long-term wage contracts find their real wages rising. But on the other side of the labor market, employers respond to a higher and rising real wage by hiring fewer workers. So the level of employment and output falls.

With lower output and profits, firms re-evaluate their investment plans and cut back on projects that they now see as unprofitable. This fall in investment slows the pace of capital accumulation and slows the growth rate of potential GDP.

Another consequence of deflation is a low nominal interest rate, which, in turn, brings an increase in the quantity of money that people plan to hold and a decrease in the velocity of circulation. A lower velocity adds to the deflationary forces and, if unattended to, lowers the inflation rate yet further.

So, what is the cure for deflation?

How Can Deflation be Ended?

Deflation can be ended by removing its cause: The quantity of money is growing too slowly. If the central bank ensures that the quantity of money grows at the target inflation rate *plus* the growth rate of potential GDP *minus* the growth rate of the velocity of circulation, then, on average, the inflation rate will turn out to be close to target.

In the example of Japan, if the Bank of Japan, the central bank, wanted to get a 2 percent inflation rate, and other things remaining the same, it would have needed to make the quantity of money grow at an annual average rate of 5.8 percent. (Money growth 5.8 *plus* velocity growth of −3 *minus* potential GDP growth of 0.8 equals target inflation of 2 percent.) If raising the inflation rate brought faster potential GDP growth, a yet higher money growth rate would be needed to sustain the higher inflation rate.

Money Growth, Not Quantity Notice that it is an increase in the *growth rate* of the money stock, not a one-time increase in the quantity of money, that is required to end deflation. Central banks sometimes increase the quantity of money and fail to increase its growth rate. An increase in the *level* with no change in the *growth rate* brings a temporary inflation as the price level adjusts but not ongoing inflation, so it does not end deflation.

REVIEW QUIZ

1. What is deflation?
2. What is the distinction between deflation and a one-time fall in the price level?
3. What causes deflation?
4. How does the quantity theory of money help us to understand the process of deflation?
5. What are the consequences of deflation?
6. How can deflation be ended?

Work these questions in Study Plan 29.3 and get instant feedback. MyEconLab

In the final section of this chapter, we're going to look at an alternative model of short-run fluctuations and one that focuses on inflation and unemployment.

The Phillips Curve

The *Phillips curve* is a relationship between inflation and unemployment. It is so named because it was first suggested by New Zealand economist A.W. (Bill) Phillips. We distinguish between two time frames for the Phillips curve (similar to the two aggregate supply time frames). We study

- The short-run Phillips curve
- The long-run Phillips curve

The Short-Run Phillips Curve

The **short-run Phillips curve** is the relationship between inflation and unemployment, holding constant

1. The expected inflation rate
2. The natural unemployment rate

You've seen what determines the expected inflation rate earlier in this chapter (see p. 752) and the influences on the natural unemployment rate were explained in Chapter 22 (pp. 559–560).

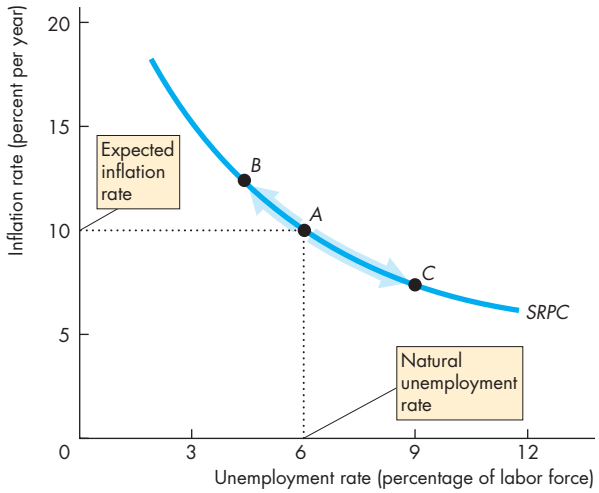
Figure 29.8 shows a short-run Phillips curve, *SRPC*. Suppose that the expected inflation rate is 10 percent a year and the natural unemployment rate is 6 percent, point *A* in the figure. A short-run Phillips curve passes through this point. If inflation rises above its expected rate, unemployment falls below its natural rate in a movement up along the short-run Phillips curve from point *A* to point *B*. Similarly, if inflation falls below its expected rate, unemployment rises above its natural rate in a movement down along the short-run Phillips curve from point *A* to point *C*.

The Long-Run Phillips Curve

The **long-run Phillips curve** is the relationship between inflation and unemployment when the actual inflation rate equals the expected inflation rate. The long-run Phillips curve is vertical at the natural unemployment rate because, in the long run, any expected inflation rate is possible. In Fig. 29.9(a), the long-run Phillips curve is the vertical line *LRPC*.

Change in Expected Inflation A change in the expected inflation rate shifts the short-run Phillips curve, but it does not shift the long-run Phillips curve. In Fig. 29.9(a), if the expected inflation rate is 10 percent a year, the short-run Phillips curve is $SRPC_0$. If the expected inflation rate falls to 6 percent a year, the short-run Phillips curve shifts downward to

FIGURE 29.8 A Short-Run Phillips Curve



The short-run Phillips curve, *SRPC*, is the relationship between inflation and unemployment at a given expected inflation rate and a given natural unemployment rate. Here, the expected inflation rate is 10 percent a year and the natural unemployment rate is 6 percent at point *A*.

A change in the actual inflation rate brings a movement along the short-run Phillips curve from *A* to *B* or from *A* to *C*.

MyEconLab Animation

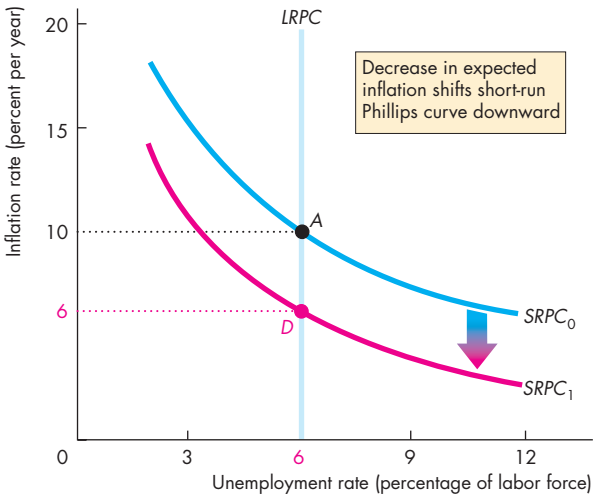
$SRPC_1$. The vertical distance by which the short-run Phillips curve shifts from point *A* to point *D* is equal to the change in the expected inflation rate. If the actual inflation rate also falls from 10 percent to 6 percent, there is a movement down the long-run Phillips curve from *A* to *D*. An increase in the expected inflation rate has the opposite effect to that shown in Fig. 29.9(a).

The other source of a shift in the Phillips curve is a change in the natural unemployment rate.

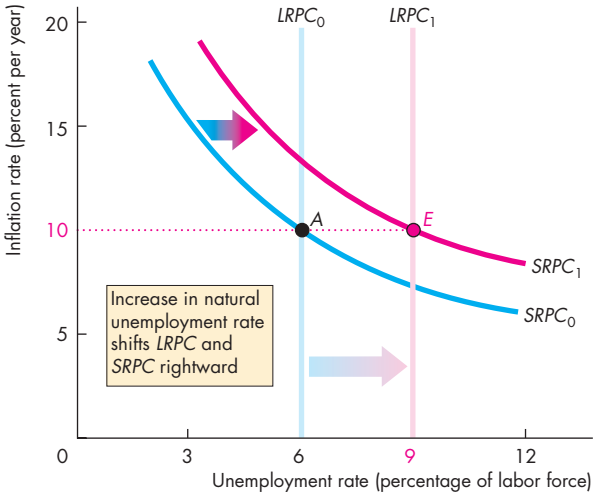
Change in Natural Unemployment Rate A change in the natural unemployment rate shifts both the short-run and long-run Phillips curves. Figure 29.9(b) illustrates such shifts.

If the natural unemployment rate increases from 6 percent to 9 percent, the long-run Phillips curve shifts from $LRPC_0$ to $LRPC_1$, and if expected inflation is constant at 10 percent a year, the short-run Phillips curve shifts from $SRPC_0$ to $SRPC_1$. Because the expected inflation rate is constant, $SRPC_1$ intersects the long-run curve $LRPC_1$ (point *E*) at the same inflation rate at which $SRPC_0$ intersects the long-run curve $LRPC_0$ (point *A*).

FIGURE 29.9 Short-Run and Long-Run Phillips Curves



(a) A change in expected inflation



(b) A change in natural unemployment

In part (a), the long-run Phillips curve is *LRPC*. A fall in expected inflation shifts the short-run Phillips curve downward from $SRPC_0$ to $SRPC_1$. The long-run Phillips curve does not shift. In part (b), a change in the natural unemployment rate shifts both the short-run and long-run Phillips curves.

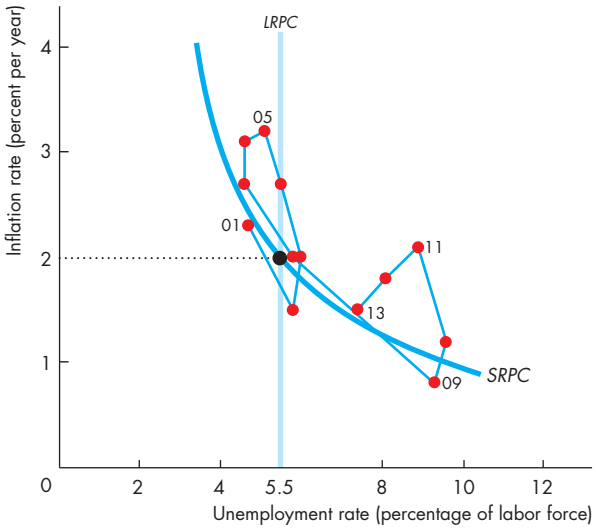
MyEconLab Animation

Economics in Action above looks at the U.S. Phillips curve from 2001 to 2013, a period through which the expected inflation rate and the natural unemployment rate didn't change much. Over longer periods, big changes in the expected inflation rate have shifted the U.S. Phillips curve.

ECONOMICS IN ACTION

The U.S. Phillips Curve

The figure below is a scatter diagram of the U.S. inflation rate (measured by the GDP deflator) and the unemployment rate since 2001. *LRPC* is at a natural unemployment rate of 5.5 percent and *SRPC* at an expected inflation rate of 2 percent. The dots for each year (five of which are identified) show that the *SRPC* jumps around as inflation expectations change.



The U.S. Phillips Curve in the 2000s

Sources of data: Bureau of Labor Statistics and Bureau of Economic Analysis.

REVIEW QUIZ

1. How would you use the Phillips curve to illustrate an unexpected change in inflation?
2. If the expected inflation rate increases by 10 percentage points, how do the short-run Phillips curve and the long-run Phillips curve change?
3. If the natural unemployment rate increases, what happens to the short-run Phillips curve and the long-run Phillips curve?
4. Does the United States have a stable short-run Phillips curve? Explain why or why not.

Work these questions in Study Plan 29.4 and get instant feedback. Do a Key Terms Quiz. MyEconLab

Economics in the News on pp. 758–759 looks at the stagnating economy of Europe and the plans of the European Central Bank to revive it.

The Stagnating Eurozone

Draghi Launches His Counter Attack

The Financial Times
September 4, 2014

When Mario Draghi departed from his script at the central bankers' gathering at Jackson Hole last month, the world took note.

The president of the European Central Bank did not quite promise to do "whatever it takes" to stave off deflation in the eurozone. But he said enough for investors to believe the Frankfurt-based institution had finally woken up to the threat of stagnation.

Mr. Draghi yesterday threw more troops into his counter-offensive. Admitting that eurozone inflation would fall short of expectations in each of the next three years, he committed the ECB to a series of measures designed to sustain flagging demand.

Mr. Draghi drew a final line under conventional monetary measures as he announced a cut in the repo rate from 0.15 percent to 0.05 percent and increased the amount the ECB would charge lenders for deposits to 0.2 percent.

More importantly, he said the ECB would launch purchases of asset-backed securities.

While this is not the full-scale quantitative easing which many market observers were looking for, it has merits in a world in which eurozone banks have yet to restore their balance sheets. Reducing sovereign yields in such circumstances may do little to increase the propensity of financial institutions to lend.

Mr. Draghi's plans are not without their difficulties. Purchases of asset-backed securities will only make a difference if the pool of underlying assets is large enough and if loans are genuinely taken off strained bank balance sheets, freeing space for new lending. …

ESSENCE OF THE STORY

- Mario Draghi, the president of the European Central Bank (ECB), is fighting stagnation.
- Eurozone inflation is forecast to be lower than desired for the next three years.
- The ECB lowered its policy interest rate from 0.15 percent to 0.05 percent per year.
- The ECB also increased the interest rate it makes banks pay on reserves to 0.2 percent per year.
- The ECB also planned to launch purchases of asset-backed securities.
- ECB purchases of asset-backed securities need to be large enough to take bad assets from the banks and free them to increase loans.

MyEconLab More Economics in the News

ECONOMIC ANALYSIS

- The Eurozone is the group of 18 European countries that use the euro as their money and for which the European Central Bank (ECB) makes monetary policy decisions.
- The Eurozone economy is stagnating and has a high unemployment rate.
- Figure 1 shows the Eurozone unemployment rate compared with that of the United States.
- The Eurozone unemployment rate has been persistently higher than that of the United States and the average difference is structural, not cyclical.
- A high structural unemployment rate in the Eurozone results from high minimum wages, generous unemployment benefits and welfare payments, and extensive regulation of the labor market.
- ECB monetary policy can do nothing to lower the structural unemployment rate. But it can act to lower the cyclical unemployment rate.
- Eurozone also has a low inflation rate that is below the ECB target rate of 2 percent per year.
- Figure 2 shows the Eurozone inflation rate compared with that of the United States. Both economies had inflation rates below 2 percent per year in 2013, but in the Eurozone inflation had been below 2 percent for 6 years.
- The high unemployment and stagnating real GDP result from real structural problems that make the Eurozone natural unemployment rate high and from high cyclical unemployment and below-target inflation that result from insufficient aggregate demand.
- The aggregate demand problem arises from the fact that the ECB has not expanded the money stock quickly enough.
- Figure 3 shows the growth rate of money plus the growth rate of velocity minus the growth rate of potential GDP.
- The growth rate of money plus the growth rate of velocity minus the growth rate of potential GDP equals the inflation rate that can be sustained at full employment.
- To lower cyclical unemployment, the growth rate of money plus the growth rate of velocity minus the growth rate of potential GDP must *exceed* the target and expected inflation rate.
- If, as in 2009 and 2010, the growth rate of money plus the growth rate of velocity minus the growth rate of potential GDP decreases, cyclical unemployment will increase and inflation will decrease.
- To end stagnation, the ECB must buy assets and increase the growth rate of money. A big one-off asset purchase will not do the job required.

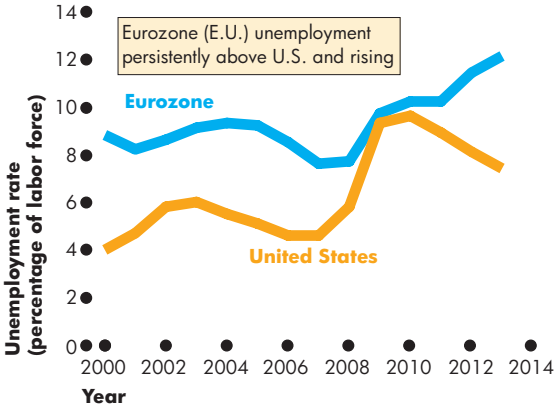


Figure 1 The Stagnating Eurozone Economy

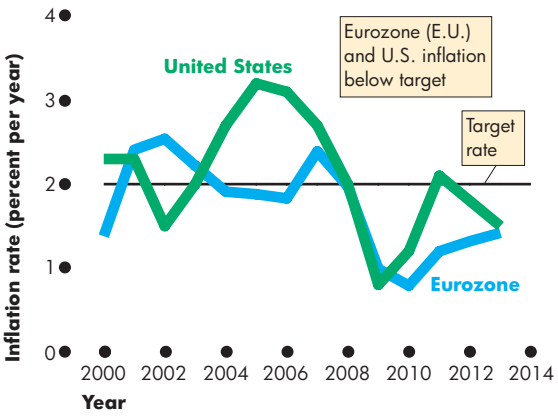


Figure 2 Inflation Rates Miss Targets

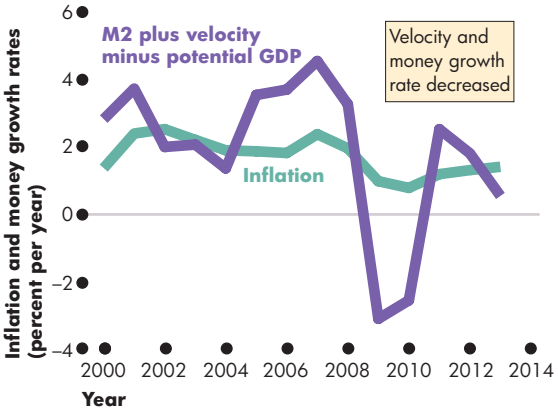


Figure 3 Money Growth Rate Too Low

SUMMARY

Key Points

The Business Cycle (pp. 742–746)

- The mainstream business cycle theory explains the business cycle as fluctuations of real GDP around potential GDP and as arising from a steady expansion of potential GDP combined with an expansion of aggregate demand at a fluctuating rate.
- Real business cycle theory explains the business cycle as fluctuations of potential GDP, which arise from fluctuations in the influence of technological change on productivity growth.

Working Problem 1 will give you a better understanding of the business cycle.

Inflation Cycles (pp. 747–752)

- Demand-pull inflation is triggered by an increase in aggregate demand and fueled by ongoing money growth. Real GDP cycles above full employment.
- Cost-push inflation is triggered by an increase in the money wage rate or raw material prices and is fueled by ongoing money growth. Real GDP cycles below full employment in a stagflation.
- When the forecast of inflation is correct, real GDP remains at potential GDP.

Working Problems 2 to 5 will give you a better understanding of inflation cycles.

Deflation (pp. 753–755)

- Deflation is a falling price level or negative inflation rate.
- Deflation is caused by a money growth rate that is too low to accommodate the growth of potential GDP and changes in the velocity of circulation.
- Unanticipated deflation brings stagnation.
- Deflation can be ended by increasing the money growth rate to a rate that accommodates the growth of potential GDP and changes in the velocity of circulation.

Working Problem 6 will give you a better understanding of deflation.

The Phillips Curve (pp. 756–757)

- The short-run Phillips curve shows the tradeoff between inflation and unemployment when the expected inflation rate and the natural unemployment rate are constant.
- The long-run Phillips curve, which is vertical, shows that when the actual inflation rate equals the expected inflation rate, the unemployment rate equals the natural unemployment rate.

Working Problems 7 and 8 will give you a better understanding of the Phillips curve.

Key Terms

MyEconLab Key Terms Quiz

Cost-push inflation, 749
Demand-pull inflation, 747
Keynesian cycle theory, 743
Long-run Phillips curve, 756
Monetarist cycle theory, 743
New classical cycle theory, 743
New Keynesian cycle theory, 743
Rational expectation, 752
Real business cycle theory, 743
Short-run Phillips curve, 756
Stagflation, 750

WORKED PROBLEM

MyEconLab You can work this problem in Chapter 29 Study Plan.

The table shows the aggregate demand and short-run aggregate supply schedules of Shell Island in which potential GDP is $600 billion. The economy is at full-employment.

Price level	Real GDP demanded	Real GDP supplied in the short run
	(billions of 2009 dollars)	
100	650	550
110	625	575
120	600	600
130	575	625
140	550	650

Questions

1. An unexpected increase in exports increases aggregate demand by $50 billion. What happens to the price level and real GDP? Has Shell Island experienced inflation or deflation and what type of output gap does it now have?
2. The price of oil falls unexpectedly and aggregate supply increases by $50 billion. What type of output gap appears? If the central bank responds to close the output gap, does Shell Island experience inflation or deflation?
3. The government of Shell Island announces an increase in spending of $50 billion a year and the central bank will increase the quantity of money to pay for the spending. Does the economy go into a boom? Will there be inflation?

Solutions

1. When aggregate demand increases by $50 billion, the price level rises from 120 to 130 and real GDP increases from $600 billion to $625 billion. The economy is at an above full-employment equilibrium.

   Shell Island experiences a one-time change in the price level and *not* inflation. The output gap is an inflationary gap, but it was unexpected. Demand-pull inflation does not take off until businesses respond to the labor shortage by raising the money wage rate.

Key Point: For an increase in aggregate demand to create demand-pull inflation, the shortage of labor must put pressure on the money wage rate to rise to close the inflationary gap.

2. When the price of oil falls unexpectedly, aggregate supply increases. The price level falls from 120 to 110 and real GDP increases from $600 billion to $625 billion. The economy is at an above full-employment equilibrium. An inflationary gap arises. Shell Island experiences a one-time change in the price level and not inflation.

   If the central bank responds to close the output gap, it cuts the quantity of money. Aggregate demand shifts leftward and a cost-push deflation is created. See the figure.

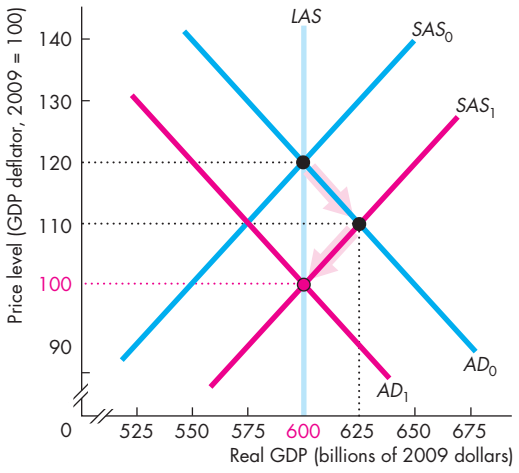
Key Point: Cost-push deflation is created if the central bank responds to a fall in costs by decreasing the quantity of money.

3. When the government announces an increase in spending of $50 billion a year, aggregate demand increases and the increase in aggregate demand is anticipated. Because the central bank increases the quantity of money, businesses anticipate the rise in the price level, so the money wage rises. Aggregate supply decreases.

   Real GDP remains at $600 billion and no output gap is created, but an anticipated inflation occurs.

Key Point: An anticipated increase in aggregate demand accompanied by an increase in the quantity of money creates an anticipated inflation spiral with the economy at full employment.

Key Figure



MyEconLab Interactive Animation

STUDY PLAN PROBLEMS AND APPLICATIONS

MyEconLab You can work Problems 1 to 8 in Chapter 29 Study Plan and get instant feedback.

The Business Cycle (Study Plan 29.1)

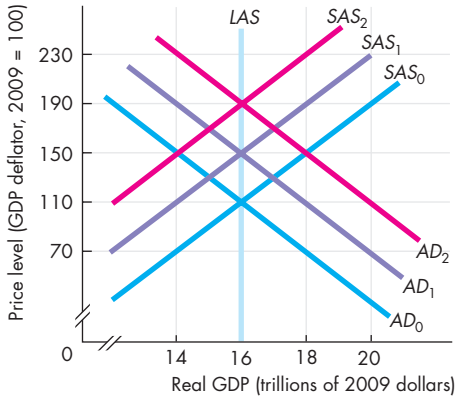
1. **Debate on Causes of Joblessness Grows**
   What is the cause of the high unemployment rate? One side says there is not enough government spending. The other says it's a structural problem—people who can't move to take new jobs because they are tied down to burdensome mortgages or firms that can't find workers with the requisite skills to fill job openings.
   Source: *The Wall Street Journal*, September 4, 2010
   Which business cycle theory would say that most of the unemployment is cyclical? Which would say it is an increase in the natural rate? Why?

Inflation Cycles (Study Plan 29.2)

2. **High Food and Energy Prices Here to Stay**
   On top of rising energy prices, a severe drought, bad harvests, and a poor monsoon season in Asia have sent grain prices soaring. Globally, this is the third major food price shock in five years.
   Source: *The Telegraph*, August 29, 2012
   Explain what type of inflation the news clip is describing and provide a graphical analysis of it.

Use the following figure to work Problems 3 to 5.

The economy starts out on the curves labeled AD_0 and SAS_0.



3. Some events occur and the economy experiences a demand-pull inflation. What might those events have been? Describe their initial effects and explain how a demand-pull inflation spiral results.
4. Some events occur and the economy experiences a cost-push inflation. What might those events have been? Describe their initial effects and explain how a cost-push inflation spiral develops.
5. Some events occur and the economy is expected to experience inflation. What might those events have been? Describe their initial effects and what happens as an expected inflation proceeds.

Deflation (Study Plan 29.3)

6. Suppose that the velocity of circulation of money is constant and real GDP is growing at 3 percent a year.
   a. To achieve an inflation target of 2 percent a year, at what rate would the central bank grow the quantity of money?
   b. At what growth rate of the quantity of money would deflation be created?

The Phillips Curve (Study Plan 29.4)

7. **Eurozone Unemployment Hits Record High As Inflation Rises Unexpectedly**
   Eurozone unemployment rose to 10.7 percent. At the same time, eurozone inflation unexpectedly rose to 2.7 percent a year, up from the previous month's 2.6 percent a year.
   Source: *Huffington Post*, March 1, 2012
   a. How does the Phillips curve model account for a very high unemployment rate?
   b. Explain the change in unemployment and inflation in the eurozone in terms of what is happening to the short-run and long-run Phillips curves.
8. **From the Fed's Minutes**
   Members expected real GDP growth to be moderate over coming quarters and then to pick up very gradually, with the unemployment rate declining only slowly. With longer-term inflation expectations stable, members anticipated that inflation over the medium run would be at or below 2 percent a year.
   Source: FOMC Minutes, June 2012
   Are FOMC members predicting that the U.S. economy will move along a short-run Phillips curve or that the short-run Phillips curve will shift through 2012 and 2013? Explain.

ADDITIONAL PROBLEMS AND APPLICATIONS

MyEconLab You can work these problems in MyEconLab if assigned by your instructor.

The Business Cycle

Use the following information to work Problems 9 to 11.

Suppose that the business cycle in the United States is best described by RBC theory and that a new technology increases productivity.

9. Draw a graph to show the effect of the new technology in the market for loanable funds.
10. Draw a graph to show the effect of the new technology in the labor market.
11. Explain the when-to-work decision when technology advances.
12. **U.K. Treasury Chief Zeros In on Productivity**

    In 2013, U.K. productivity, measured in terms of output per hour worked, was 17 percent lower than the average of the G7. In response, U.K. Treasury Chief said the government will invest in new infrastructure, including roads and airports, boost worker skills through education reforms, and publish a more detailed productivity plan.

    Source: *The Wall Street Journal*, May 20, 2015

    Explain the relationship between real wages and productivity in this news clip in terms of real business cycle theory.

Inflation Cycles

Use the following news clip to work Problems 13 and 14.

Food Costs Are Stoking Asia Inflation

Prices for foodstuffs, including essential items such as rice and milk, have risen in recent months, causing higher inflation rates in Asian countries, such as India, China, Thailand, and Indonesia. Food-price increases have significantly pushed inflation rates across the region. A 20 percent increase in rice prices regionally is estimated to add 1.5 percentage points to inflation. Shortage in supply is seen as the major reason for the price hike. In Indonesia, the central bank has called the inflation "temporary" and expects the next harvest season to increase the supply. Therefore, the central bank has kept its benchmark interest rate constant. In fact, akin to Indonesia, policy makers across Asia are banking on a good harvest to fight inflation over the short term. A bad harvest, on the other hand, will spur governments to react seriously.

Source: *The Wall Street Journal*, Feb 11, 2010

13. What type of inflation process is referred to in this news clip? Explain how the central bank's decision to keep the benchmark interest-rate constant could be effective in curbing the inflation.
14. Explain what would happen to the economy if inflationary expectations are formed on the basis of a prolonged shortage in supply and increasing food-prices?

Deflation

15. **Europe's Deflation Risk**

    The United States is planning to push Europe toward new and more aggressive efforts to boost aggregate demand given a renewed risk of deflation in the euro zone.

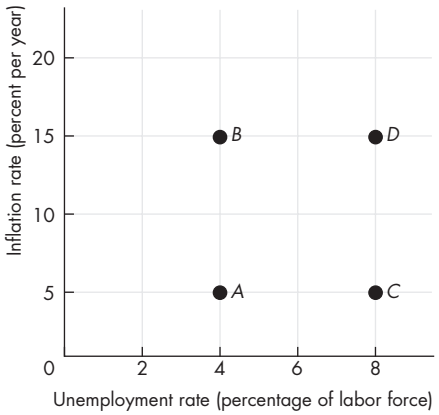
    Source: Reuters, September 12, 2014

    a. Explain the process by which deflation occurs.
    b. How might Europe boost its aggregate demand? Might the boost to aggregate demand create demand-pull inflation?

The Phillips Curve

Use the following data to work Problems 16 and 17.

An economy has an unemployment rate of 4 percent and an inflation rate of 5 percent a year at point *A* in the figure. Then some events occur that move the economy from *A* to *B* to *D* to *C* and back to *A*.



16. Describe the events that could create this sequence. Has the economy experienced demand-pull inflation, cost-push inflation, expected inflation, or none of these?
17. Draw in the figure the sequence of the economy's short-run and long-run Phillips curves.