Chapter 22

Understanding Business Cycle Fluctuations*

Learning Objectives

After reading this chapter, you should be able to:

LO1 Discuss the sources of fluctuations in output and inflation.

LO2 Use AS/AD tools to analyze changes in output and inflation.

LO3 Explain the challenges and tradeoffs that monetary policymakers face in stabilizing the economy.

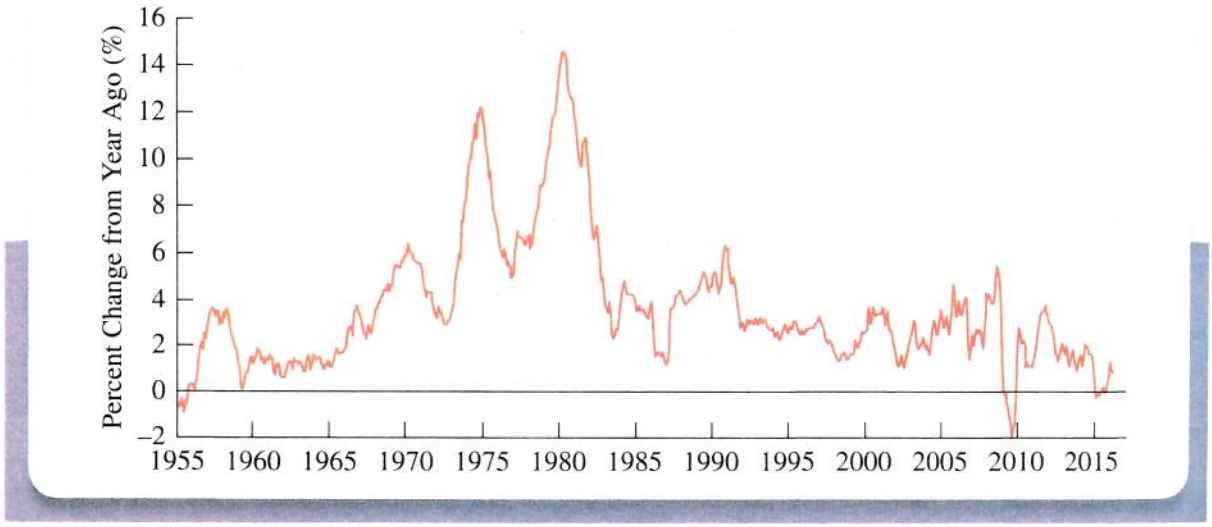
In the last chapter we constructed a framework for understanding fluctuations in output and inflation. We discussed the fact that central bankers respond to rising inflation by increasing the real interest rate, causing interest-sensitive components of aggregate expenditure—especially investment—to fall, driving down the quantity of aggregate output demanded by the people who use it. So, higher inflation means a lower level of demand in the economy as a whole. The *dynamic aggregate demand curve slopes down.*

On the supply side, we saw that the sluggish response of production costs means that higher inflation elicits more production from firms, and is associated with a greater level of output supplied in the short run. The *short-run aggregate supply curve slopes up.* Finally, we learned that in the long run, the economy moves to the point where output equals potential output, so the *long-run aggregate supply curve is vertical.* While the economy can and does move away from this long-run equilibrium, it has a natural self-correcting mechanism that returns it to the point where resources are being used at their normal rates and gaps between current and potential output disappear.

We will now use this framework to improve our understanding of business cycle fluctuations. Why is it that output and inflation vary from quarter to quarter and year to year, and what determines the extent of fluctuations? Figure 22.1 illustrates the long-run trends in the U.S. inflation rate over the past 50 years. In 1965, prices in the United States were rising at an average rate of just 1½ percent per year. Fifteen years later, consumer price inflation had climbed to nearly 14 percent. For the next decade the inflation rate fell, at first sharply and then gradually. By 1991, prices were increasing at a rate of less than 4 percent per year. Finally, amid the financial crisis of 2007–2009, prices began to fall for the first time in more than 50 years.

*The starred sections in the second half of this chapter are more difficult than the nonstarred sections preceding them.

Figure 22.1 Inflation and the Business Cycle, 1955–2016



This figure shows the 12-month change in consumer prices, calculated by the Bureau of Labor Statistics (FRED code: CPIAUCSL). The bars represent recessions, as dated by the National Bureau of Economic Research.

In addition to data on the rate of inflation, Figure 22.1 displays a series of shaded bars representing recessions—periods when the U.S. real GDP was falling. While there is no apparent relationship between the *level* of inflation and these recessions, it does appear that the inflation rate falls when the economy is contracting and rises when it is expanding. At least, that's what happens most of the time. The recession of 1974–1975 is an exception. During that episode, the inflation rate rose dramatically even as the economy was slumping. And during much of the boom of the 1990s, the inflation rate remained below its level at the end of the last recession. But in general, there appears to be a connection between growth and changes in inflation: The lower the growth, the more likely inflation is to fall.

One final point about Figure 22.1 is worth noting. In recent decades, the frequency of recessions has fallen. In the 30 years from 1955 to 1984, there were six recessions; in the 32 years since then, there have been three, including the deep one that ended in 2009. Recessions used to occur once every five years, but more recently, they have occurred on average about every 8 to 10 years. Until the record plunge of 2008–2009, the recessions after 1982 were milder than before as well. This reduction in the volatility of real growth has been called the "Great Moderation." We examine its possible sources later in the chapter and identify factors that could prevent its resumption in coming years.

To help understand the patterns in Figure 22.1, we will start by cataloging the various reasons that the dynamic aggregate demand curve and the aggregate supply curve shift. These are the potential sources of fluctuations in both output and inflation described at the end of the last chapter. We trace the initial impact of shifts in aggregate demand such as an increase in government spending or shifts in short-run aggregate supply such as a movement in oil prices. Next, we examine what happens during the

transition as the economy moves to long-run equilibrium. Our goal is to take the macroeconomic model and use it to understand practical real-world examples.

Then, in the second part of the chapter, we will use the model to understand how central bankers work to achieve their stabilization objectives, together with a series of examples that highlight the pitfalls and limitations that monetary policymakers face. The section is organized around a series of questions of increasing complexity. We will examine how, in practice, policymakers work to achieve their stabilization goals; the appropriate actions to take when potential output changes; and the difficulty central bankers have figuring out why output has fallen, among other things.

Sources of Fluctuations in Output and Inflation

In the earlier discussion we learned that the economy naturally moves toward its long-run equilibrium where output equals potential output ($Y = Y^P$) and inflation equals the central bank's target ($\pi = \pi^T$), which equals the level of inflation firms and individuals expect ($\pi = \pi^e$). This tells us that the long-run aggregate supply curve is vertical at potential output. But because costs of production adjust slowly, higher inflation temporarily means higher profits and more supply; that is, the short-run aggregate supply curve slopes upward. Short-run equilibrium is the point where the dynamic aggregate demand curve intersects this short-run aggregate supply curve. So, immediately after either the short-run aggregate supply curve or the dynamic aggregate demand curve shift, the economy will move away from its long-run equilibrium. This means that understanding short-run fluctuations in output and inflation requires that we study shifts in dynamic aggregate demand and short-run aggregate supply.

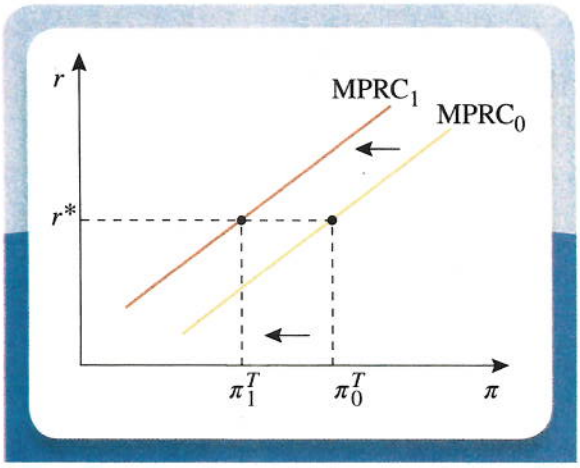
Before moving to an analysis of various demand and supply curve shifts, let's take a brief detour to define one of the few new terms in this chapter: *shock*. Economists use the word *shock* to mean something unexpected. For example, when oil prices rise or when consumers become less confident about the future, these are almost always unpredictable *shocks*. In our framework, a shock shifts the dynamic aggregate demand or short-run aggregate supply curve. Because it affects costs of production, the oil price increase is a **supply shock**, while the shift in consumer confidence, which affects consumption expenditure, is a **demand shock**. So, a shock is something that creates a shift in the demand or supply curve.

Shifts in the Dynamic Aggregate Demand Curve

Recall that a shift in the dynamic aggregate demand curve can be caused by either a shift in the monetary policy reaction curve or a change in components that are not sensitive to the real interest rate (like government purchases) that shifts aggregate expenditure. Let's look at the impact of each of these. We will first look at a decline in the central bank's inflation target that shifts the monetary policy reaction curve, and then at a fiscal policy easing that increases government purchases and shifts the aggregate expenditure curve.

A Decline in the Central Bank's Inflation Target Over the past several decades, numerous countries have succeeded in reducing their inflation rates from fairly high levels to the modest ones we see today. For example, Chile was able to reduce its inflation rate from over 20 percent in the early 1990s to roughly 2 percent today. In the mid-1980s, Israel's inflation rate peaked at nearly 400 percent before it

Figure 22.2 A Decline in the Central Bank's Inflation Target



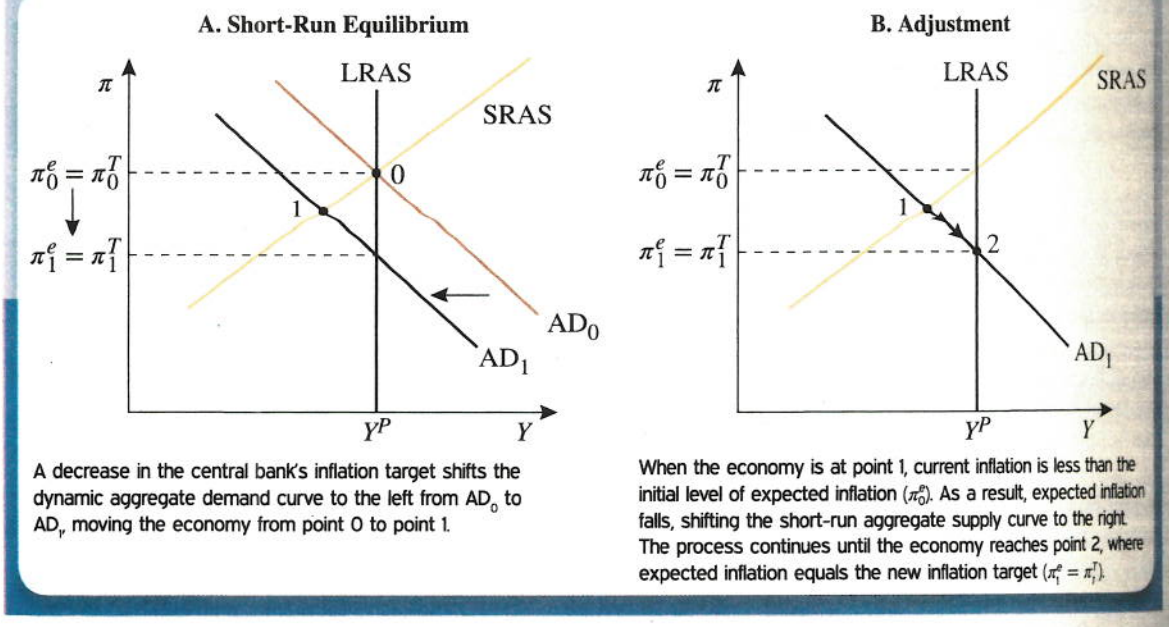
A decline in the inflation target from π_0^T to π_1^T shifts the monetary policy reaction curve to the left from $MPRC_0$ to $MPRC_1$.

was brought down in a series of steps, first to 20 percent and eventually to 2 percent. And Sweden entered the 1990s with an inflation rate that was over 10 percent. The Riksbank, the Swedish central bank, spent a number of years driving the country's inflation rate down below 3 percent, where it has generally stayed. All of these cases involved permanent declines in inflation that must have been a result of a decrease in the central bank's inflation target.

To analyze the impact of a reduction in the policymaker's inflation target, let's begin with the monetary policy reaction curve. A fall in π^T shifts the monetary policy reaction curve to the left, as shown in Figure 22.2 (which reproduces Panel A of Figure 21.8 on page 595). The decrease in the inflation target raises the real interest rate policymakers set at each level of inflation.

We know from our earlier analysis that shifts in the monetary policy reaction curve shift the dynamic aggregate demand curve in the same direction. A decrease in the central bank's inflation target means a higher real interest rate at every level of inflation, shifting the monetary policy reaction curve to the left. This reduces aggregate expenditure at every level of inflation, shifting the dynamic aggregate demand curve to the left as well, as shown in Panel A of Figure 22.3. You can see that as the dynamic

Figure 22.3 A Decline in the Central Bank's Inflation Target



A decrease in the central bank's inflation target shifts the dynamic aggregate demand curve to the left from AD_0 to AD_1, moving the economy from point 0 to point 1.

When the economy is at point 1, current inflation is less than the initial level of expected inflation (π_0^e). As a result, expected inflation falls, shifting the short-run aggregate supply curve to the right. The process continues until the economy reaches point 2, where expected inflation equals the new inflation target ($\pi_1^e = \pi_1^T$).

aggregate demand curve shifts to the left, from AD_0 to AD_1, the economy moves from the original short-run equilibrium point, 0, to the new short-run equilibrium point, 1. At point 1, inflation and current output are both lower than they were prior to the monetary policy tightening. The immediate consequence of the reduction in the central bank's inflation target is to shift the dynamic aggregate demand curve to the left, moving the economy along the short-run aggregate supply curve (SRAS), driving both current output and inflation down.

Following the policy change, current inflation is less than expected inflation. As a result, expected inflation falls, shifting the short-run aggregate supply curve to the right. Eventually, the economy moves along the new dynamic aggregate demand curve AD_1 from point 1 to the new long-run equilibrium at point 2 in Panel B of Figure 22.3. There, inflation equals the central bank's (new) target and output equals potential output.[1]

An Increase in Government Purchases In response to the deep recession that began in December 2007, President George W. Bush signed legislation in February 2008 to cut income taxes temporarily. One year later, President Barack Obama approved a much larger package of temporary tax cuts and increases in government spending to counter the economic slump. Driven by the recession and these fiscal policy actions, the U.S. federal budget deficit surged from 1.2 percent of GDP in fiscal year 2007 (which ended September 2007) to 9.8 percent in 2009—the largest proportion since 1945. What are the macroeconomic implications of such a large expansionary move in fiscal policy?

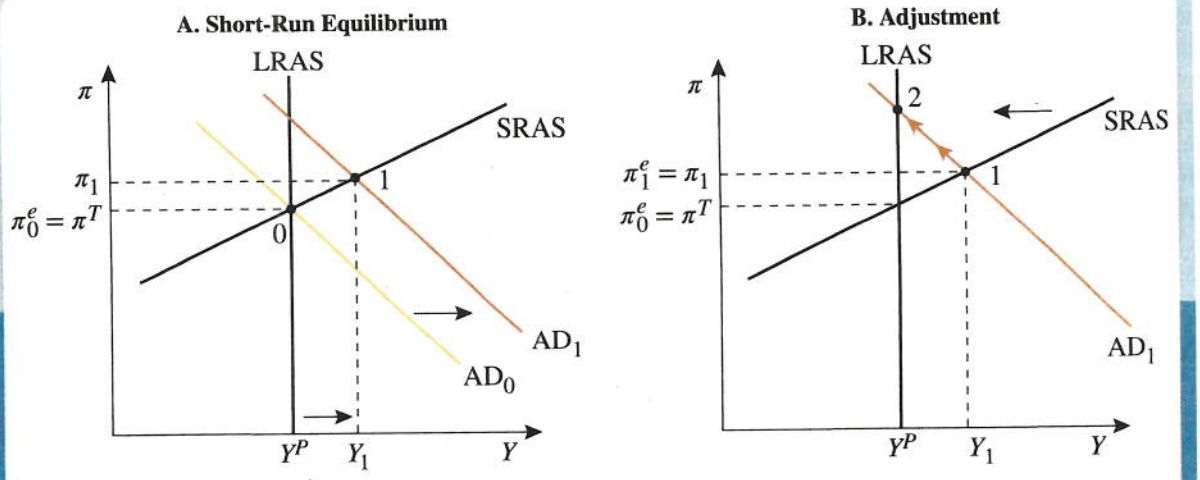
In the last chapter we learned that increases in government purchases and cuts in taxes both represent an increase in components of aggregate expenditure that are not sensitive to the interest rate. For example, an increase in G shifts the dynamic aggregate demand curve to the right. Panel A of Figure 22.4 on page 626 shows how such a change in fiscal policy shifts the dynamic aggregate demand curve from its original position AD_0 to its new position AD_1. As a result, the economy moves from the original short-run equilibrium point 0 to the new short-run equilibrium point 1. Not surprisingly, the immediate impact of this increase in government purchases is to raise both current output and inflation. But, because current inflation exceeds expected inflation, this can't be the long-run effect. Instead, expected inflation rises, shifting the short-run aggregate supply curve to the left. Eventually, as the economy travels along AD_1, current inflation rises and current output falls until the economy reaches the point at which the dynamic aggregate demand curve crosses the long-run aggregate supply curve. At that point, current inflation equals expected inflation and target inflation, while current output equals potential output.

Unless something else happens, the economy settles at point 2 in Panel B of Figure 22.4, where AD_1 crosses the long-run aggregate supply curve (LRAS) and current output once again equals potential output. It is extremely important to realize that at point 2, inflation is above where it started at point 0, and that this is above the policymakers' original inflation target π^T. Unless monetary policy adjusts, when the dynamic aggregate demand curve shifts to the right, inflation will rise. Thus, Panel B shows the central bank acquiescing to a rise of its inflation target to point 2.

While central bankers could allow an increase in government purchases to drive up their inflation target, permanently increasing inflation and the monetary growth rate, it

[1]With a lower inflation target (π^T), we also know that at the new long-run equilibrium, expected inflation (π^e) must be lower as well.

Figure 22.4 An Increase in Government Expenditure



An increase in government expenditure shifts the AD curve to the right from AD_0 to AD_1. This moves the economy from point 0 to point 1. In the short run, output rises to Y_1 while inflation increases to π_1.

When the economy is at point 1, current inflation is initially above expected inflation ($\pi_1 > \pi_{1t}^e$). As expected inflation rises in response, the short-run aggregate supply curve shifts to the left, moving the economy along AD_1 toward point 2.

seems unlikely. So long as monetary policymakers remain committed to their original inflation target, they need to do something to get the economy back to the point where it began—point 0 in Panel A of Figure 22.4, at the intersection of the original dynamic aggregate demand curve with the long-run aggregate supply curve. This is the point where current output equals potential output, and current inflation equals the policymaker's original inflation target.

In Chapter 21, we noted that an increase in government purchases raises the long-term real interest rate. The higher the level of government purchases, the higher the level of the real interest rate needed to equate aggregate expenditure with potential output. (You can look back and see this in Figure 21.5 on page 592.) Realizing this, monetary policymakers react by shifting their monetary policy reaction curve to the left, increasing the real interest rate at every level of inflation. Remember, the central bank controls the real interest rate in the short run. When the monetary policy reaction curve shifts, the dynamic aggregate demand curve shifts with it. In this case, tighter monetary policy shifts the dynamic aggregate demand curve to the left, bringing the economy back to long-run equilibrium where output equals potential output and inflation equals the central bank's target.

We can summarize the path the economy takes after an increase in government purchases as follows: Current inflation rises above expected inflation and current output rises above potential output. Policymakers then react, shifting their monetary policy reaction curve, pushing the economy back to its long-run equilibrium level. From this we can conclude that, without a change in target inflation, *an increase in government purchases causes a temporary increase in both output and inflation.*

The same is true for any factor that shifts the dynamic aggregate demand curve to the right. Immediately following such a shift and in the absence of any monetary policy

Table 22.1 Impact of an Increase in Dynamic Aggregate Demand on Output and Inflation

Source	Shift in the monetary policy reaction curve • Increase in inflation target • Decrease in long-run real interest rate Increase in aggregate expenditure • Consumer confidence up • Business optimism up • Government purchases up • Net exports up
Result	Dynamic aggregate demand shifts right
Short-run impact	Y increases π increases

response, output and inflation both rise (see Table 22.1). If the central bank maintains its inflation target, the monetary policy reaction curve (MPRC) will shift to the left, returning inflation and output to their original long-run levels. In the absence of any monetary policy response, because current inflation exceeds expected inflation, expected inflation rises, shifting the short-run aggregate supply curve to the left, moving the economy along the new dynamic aggregate demand curve. This movement drives inflation up further as current output falls, returning to the level of potential output, but at a higher inflation rate. In effect, the central bank will have raised its inflation target.

A decline in aggregate expenditure, perhaps caused by a fall in consumer or business confidence, has the opposite impact from an increase in government expenditure. The dynamic aggregate demand curve shifts to the left, driving inflation and output down. With time, and in the absence of any monetary policy response, as lower current inflation drives inflation expectations down, the short-run aggregate supply curve shifts to the right, moving the economy along the new dynamic aggregate demand curve. This movement drives inflation down further, and current output begins to rise toward potential output. In effect, the central bank has set a new, lower inflation target. If, instead, policymakers do react, inflation and output will return to their original long-run levels.

Over the years, policymakers have reacted to shifts in aggregate expenditure in different ways, with differing results. In response to increases in government spending during the escalation of the Vietnam War in the late 1960s, when defense expenditure rose from 7.4 percent to 9.4 percent of GDP over a three-year period (twice what it was at the peak of the Iraq war in 2005), the Fed simply allowed inflation to rise. Look back at Figure 22.1 and you can see that inflation rose from less than 2 percent in 1965 to more than 5 percent in 1970. What could have been a temporary increase in inflation became a permanent one, in effect increasing the Fed's inflation target to the point where the new dynamic aggregate demand curve intersected the long-run aggregate supply curve.

Large tax cuts in 2001, and the subsequent rise of defense spending associated with the war in Iraq, did not have the same inflationary impact as the similar policy in the 1960s. There are two reasons for this. First, the fiscal stimulus came at a time when the economy was weakening for other reasons. That is to say, the timing was very fortunate.

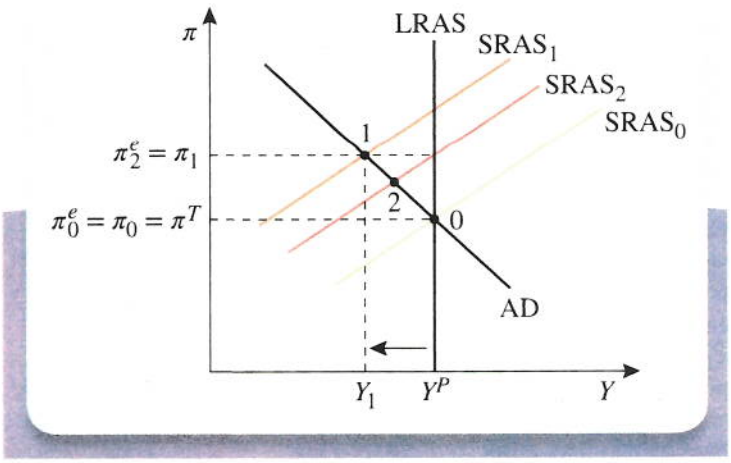
Second, by 2001 the Federal Reserve had learned the important lesson that it may need to raise interest rates to counter the risk of inflation from expansionary fiscal policy. So, a combination of good luck and better understanding meant that inflation stayed low.[2]

This discussion implies that whenever we see a *permanent* increase in inflation, it must be the result of monetary policy. That is, if inflation goes up or down and remains at its new level, the only explanation is that central bankers must be allowing it to happen. They have changed their inflation target, whether or not they acknowledge the change explicitly.

Shifts in the Short-Run Aggregate Supply Curve

Changes in production costs *shift the short-run aggregate supply curve.* Using the aggregate demand–aggregate supply diagram, we can trace the effects of such an increase in the costs of production—a *negative supply shock.* The immediate effect of something like an oil price rise that increases production costs is to move the short-run aggregate supply curve to the left, reducing the amount supplied at every level of inflation. (These bad consequences—higher inflation and lower growth—are why we label such a shock as "negative.") Figure 22.5 shows the result. Short-run equilibrium—the point where the short-run aggregate supply and dynamic aggregate demand curves intersect—moves to point 1 in the figure, where output is lower and inflation is higher. This creates a condition that is sometimes referred to as *stagflation*—economic stagnation coupled with increased inflation (see Table 22.2).

Figure 22.5 A Negative Supply Shock



A negative supply shock shifts the SRAS curve to the left, moving the short-run equilibrium from point 0 to point 1, raising inflation to $\pi_1 > \pi^T$. At point 1, current inflation is *below* the intersection of $SRAS_1$ and LRAS that marks expected inflation in the long run, so the SRAS curve shifts back right to $SRAS_2$, which intersects the LRAS at the point where expected inflation (π_2^e) equals π_1. The SRAS curve continues to shift right until inflation and expected inflation again equal target inflation at point 0.

What happens next? Initially, expected inflation equals the inflation target. So, when inflation rises, and the economy moves from point 0 to point 1 in Figure 22.5, expected inflation rises as well. Recall that the short-run aggregate supply curve intersects the long-run aggregate supply curve at the point where current inflation equals expected inflation in the long run. Because current inflation (π_1) is below this level, the SRAS curve next shifts back to the right. This is shown in Figure 22.5 as a move from $SRAS_1$ to $SRAS_2$. The result is that the economy goes from point 1 to point 2. However, current inflation at point 2 remains below the expected inflation in the long run where $SRAS_2$ intersects the LRAS. Consequently, inflation continues to fall and output continues to rise until current inflation and expected inflation return to the central bank's inflation target, and output equals potential output. Put another way, inflation is at its highest and output at its lowest immediately following a

[2]President George W. Bush initially proposed the personal income tax cuts to fulfill a pledge from the presidential campaign of 2000. Because the pledge occurred before anyone suspected that the economy would weaken the following year, it would seem that a substantial amount of luck was involved.

Table 22.2 Impact of a Decline in Short-Run Aggregate Supply on Output and Inflation

Source	Negative supply shock • Increase in production costs • Increase in expected inflation
Result	Short-run aggregate supply curve shifts left
Short-run impact	Y falls π increases

negative shock to short-run aggregate supply. Over time, self-correcting forces in the economy unwind the shock, restoring long-run equilibrium.

As was the case with the increase in government purchases (when combined with an appropriate monetary policy response), a supply shock has no effect on the economy's long-run equilibrium point. Only a change in either potential output or the central bank's inflation target can accomplish that. Instead, a negative supply shock moves output and inflation temporarily away from potential output and the inflation target. Over time, as expected inflation first rises and then falls, the short-run aggregate supply curve shifts back to the right. As it does, the economy moves along the dynamic aggregate demand curve until output and inflation finally return to the initial equilibrium point 0 in Figure 22.5. Thus, a supply shock causes inflation to rise temporarily and then fall, at the same time that current output falls temporarily and then rises. But, as always, in the long run the economy returns to the point where output equals potential output and inflation equals the central bank's target.

Using the Aggregate Demand–Aggregate Supply Framework

We are now ready to use the macroeconomic framework to address a series of interesting questions. We examine the following (in increasing order of complexity):

1. How do policymakers achieve their stabilization objectives?
2. What accounts for what has been called the "Great Moderation," the time period from the mid-1980s until 2007 (and possibly beyond) when U.S. growth and inflation were less volatile than they were historically?
3. What happens when potential output changes?
4. What are the implications of globalization for monetary policy?
5. Can policymakers stabilize output and inflation simultaneously?

How Do Policymakers Achieve Their Stabilization Objectives?

The aggregate demand–aggregate supply framework is useful in understanding how monetary and fiscal policymakers seek to stabilize output and inflation using what is called *stabilization policy*. In thinking about the way monetary policy can be used

TOOLS OF THE TRADE

Defining a Recession: The NBER Reference Cycle

From reading the business press, you might conclude that a recession is any episode in which real gross domestic product (GDP) declines for two consecutive quarters. While that casual definition may work in most instances, it has some drawbacks. One is that because GDP is computed and published quarterly, a definition that is based on GDP cannot indicate the specific months in which a recession started and ended. To determine that information, we need a definition that is based on measures like production, employment, sales, and income—all of which are available monthly and provide valuable information about the health of the economy.

Ultimately, the arbiter for declaring "official" recessions in the United States is the National Bureau of Economic Research (NBER). The NBER, founded in 1920, is a research organization devoted to studying how the economy works. Early work at the NBER led to the construction of much of the economic data we use today. Two of the NBER's pioneering researchers, Wesley Mitchell and Arthur Burns, dated the beginning and end of all the recessions in the United States from the Civil War through World War II.* In their book *Measuring Business Cycles* (1946), they called this dating a "reference cycle."

The NBER's definition of a recession is as follows:

> *"A recession is a significant decline in activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale–retail sales. A recession begins just after the economy reaches a peak of activity and ends as the economy reaches its trough. Between trough and peak, the economy is in an expansion."*

This definition has three important implications. First, a recession is a decline in activity, not just a dip in the growth rate. Second, the exact length of the economic contraction is

Table 22.3 NBER Business Cycle Reference Dates, 1946–2016

Peak	Trough	Length of Recession in Months Peak to Trough	Length of Expansion in Months Previous Trough to Peak
November 1948	October 1949	11	37
July 1953	May 1954	10	45
August 1957	April 1958	8	39
April 1960	February 1961	10	24
December 1969	November 1970	11	106
November 1973	March 1975	16	36
January 1980	July 1980	6	58
July 1981	November 1982	16	12
July 1990	March 1991	8	92
March 2001	November 2001	8	120
December 2007	June 2009	19	73

SOURCE: www.nber.org. The FRED code is USREC (which represents a recession month as a 1 and an expansion month as a 0).

ambiguous. A severe decline in economic activity that lasted less than two quarters could still be considered a recession according to this definition. And third, because key economic indicators often change direction at different times, there is an element of judgment in dating the peaks and troughs of business cycles. As a result, the NBER's Business Cycle Dating Committee takes its time in declaring the beginning and end of a recession. Delays of six months to a year are common.

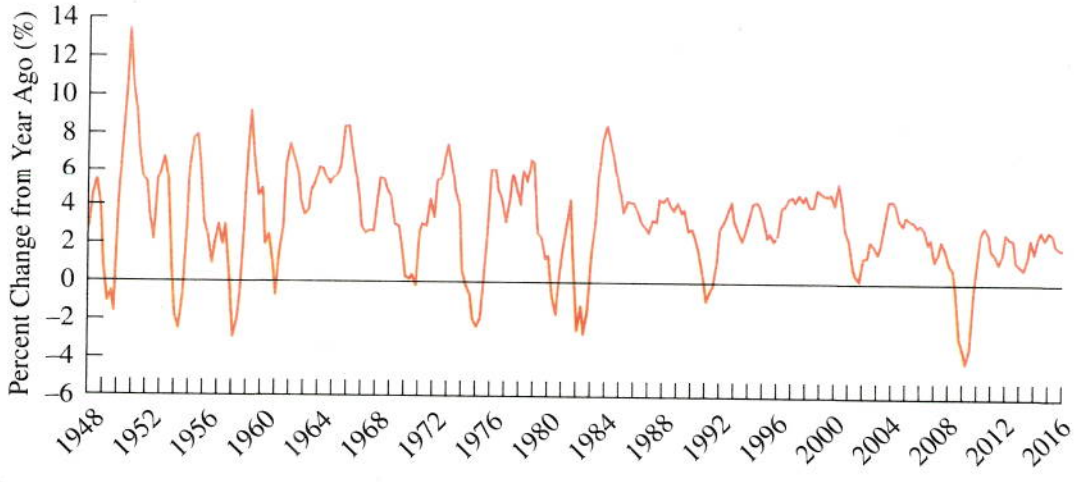
The term *business cycle* is somewhat misleading when used to refer to fluctuations in economic activity. The word *cycle* calls up images of recurring waves that rise and fall in a periodic pattern. Economic fluctuations aren't like that. Both the length of recessions and the time between them are irregular. As Burns and Mitchell wrote in their book, "A cycle consists of expansions . . . followed by contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic. . ."

Table 22.3 displays the results of the NBER's analyses of the business cycle since the end of World War II. Figure 22.6 plots the bureau's business cycle reference dates against the growth in real GDP over the period. The figure clearly shows the tendency for real growth to be low—usually below zero—during recessions. Recessions differ along several dimensions, including the so-called 3 D's: depth, duration, and diffusion across business sectors, geographic regions, or markets. The table illustrates the remarkable fact that recessions are much shorter than expansions in the U.S. economy. Most people credit this fact to a combination of successful policy and the economy's capacity for self-correction.

For more information on the procedures used to date business cycles, go to the NBER's website at www.nber.org.

*Burns later became Chairman of the Federal Reserve Board, serving from 1970 to 1978.

Figure 22.6 Growth in Real GDP over the Business Cycle



The figure shows the four-quarter percentage change in real GDP from the Bureau of Economic Analysis, and the shaded bars represent recessions as determined by the NBER. (FRED codes: GDPC1 for GDP and USREC for recession dates.)

to reduce economic fluctuations, recall that movements in output and inflation can be caused both by shifts in the dynamic aggregate demand curve and in the short-run aggregate supply curve. But when shifting their reaction curve, central bankers shift the dynamic aggregate demand curve. They cannot shift the short-run aggregate supply curve. What this means is that monetary policymakers can neutralize demand shocks, but they cannot offset supply shocks. That is to say, they can counter aggregate expenditure changes that shift the dynamic aggregate demand curve, but they cannot eliminate the effects of changes in production costs that shift the short-run aggregate supply curve. Nevertheless, as we will see, positive supply shocks that raise output and lower inflation provide policymakers with an opportunity. If they wish, following a positive supply shock, central bankers can guide the economy to a new, lower inflation target without inducing a recessionary output gap.

As for fiscal policy, our macroeconomic framework allows us to study the impact of changes in government taxes and expenditures as well. As we have seen in the previous section, these shift the dynamic aggregate demand curve. This means that fiscal policy can work to stabilize the economy. While this is true in principle, as we will discuss, the active use of fiscal policy faces great challenges. The conclusion is that stabilization policy is usually best left to central bankers.

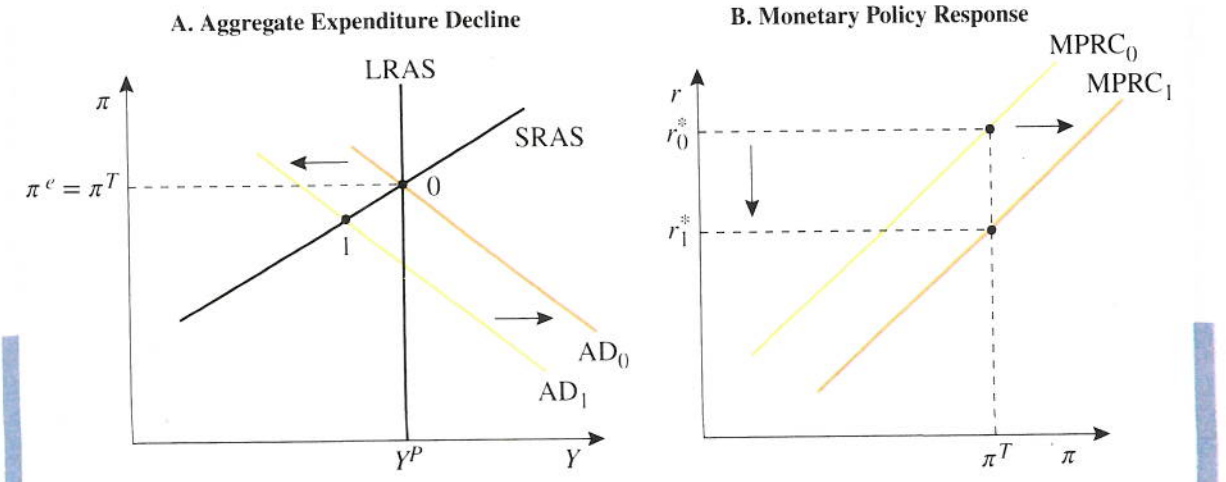
Monetary Policy To see how monetary policy can stabilize the economy following a shift in the dynamic aggregate demand curve, consider what happens when consumers and businesses suddenly become more pessimistic about the future. Such a change reduces consumption and investment, shifting the dynamic aggregate demand curve to the left. In the absence of any change in monetary policy, this drop in consumer and business confidence would cause current inflation to fall below expected inflation and current output to fall below potential output. Panel A of Figure 22.7 shows the dynamic aggregate demand curve shifting to the left (from AD_0 to AD_1) and the economy moving to a new short-run equilibrium point where current output falls short of potential output (at point 1, where AD_1 crosses SRAS).

Realizing that consumer and business confidence have fallen, driving down the consumption and investment components of aggregate expenditure, policymakers will conclude that the long-run real interest rate has gone down. Assuming that their inflation target remains the same, the drop in aggregate expenditure prompts them to shift their monetary policy reaction curve to the right, reducing the level of the real interest rate at every level of inflation. This is the shift from $MPRC_0$ to $MPRC_1$ shown in Panel B of Figure 22.7. Recall that when the monetary policy reaction curve shifts, the dynamic aggregate demand curve shifts in the same direction. This means that the policymakers' action shifts the dynamic aggregate demand curve back to its initial position as shown in Panel A of Figure 22.7. So, in the absence of a policy response, following the decline in aggregate expenditure, output would fall. But instead, the policy response means that the dynamic aggregate demand curve remains at its initial position, so output remains equal to potential output and inflation remains steady at the central bank's target.[3]

While central bankers can offset aggregate demand shocks in theory, in practice it is extremely difficult to keep inflation and output from fluctuating when aggregate expenditure changes. There are two reasons for this. First, it takes time to recognize what has happened. Fluctuations in the quantity of aggregate output demanded arising

[3]Stabilizing aggregate demand shocks in this way also ensures that expected inflation remains equal to the central bank's inflation target.

Figure 22.7 Stabilizing a Shift in Dynamic Aggregate Demand



Following a drop in consumer or business confidence the dynamic aggregate demand shifts to the left from AD_0 to AD_1, moving the economy from point 0 to point 1. Realizing this, monetary policymakers shift their MPRC to the right, shifting the dynamic aggregate demand curve back to where it started and returning the economy to point 0.

Following a drop in consumer confidence, the long-run real interest rate falls from r_0^* to r_1^*. Policymakers respond by shifting their reaction curve from $MPRC_0$ to $MPRC_1$, shifting the AD curve back to its original position, AD_0.

from things like changes in consumer or business confidence can be very difficult to recognize as they are occurring. Second, changes in interest-rates—the tool monetary policymakers use to offset aggregate demand shocks—do not have an immediate impact on the economy. Instead, when interest rates rise or fall, it takes time for output and inflation to respond. A good rule of thumb is that interest-rate changes start to influence output in 6 to 9 months and inflation after 18 months, but our knowledge is not all that precise. In short, while in theory we can neutralize aggregate demand shocks, in reality they create short-run fluctuations in output and inflation.

Discretionary Fiscal Policy There are two very different types of fiscal policy. One is automatic, operating without any further actions on the part of government officials, and the other is discretionary, relying on fiscal policymakers' decisions. Automatic stabilizers, including unemployment insurance and the proportional nature of the tax system, are in the first group. These adjust mechanically to stimulate an economy that is slowing down and put the brakes on an economy that is speeding up. They operate countercyclically to eliminate fluctuations in aggregate expenditure and keep the economy stable. But there are times when automatic stabilizers are not enough; and that's when politicians face the temptation to enact temporary expenditure increases and tax reductions—what is called *discretionary* fiscal policy. Discretionary fiscal policy changes aggregate expenditure, shifting the dynamic aggregate demand curve.

As noted earlier in the chapter, a rise in government purchases or a decrease in taxes drives up aggregate expenditure, shifting the dynamic aggregate demand curve to the right. Thus, fiscal policy can act just like monetary policy to offset shifts in the

YOUR FINANCIAL WORLD

Stabilizing Your Consumption

Stability improves welfare. That's the fifth core principle of money and banking, and it is what guides the work of central bankers. A less volatile overall economy makes it easier for each of us to stabilize our own financial lives. As individuals, we care about paying our bills and stabilizing our standard of living. As the deep recession that ended in 2009 highlighted, individual incomes still rise and fall in ways that can make it difficult for a person to stabilize his or her consumption.

In earlier chapters we learned how to use the financial system to help reduce the risks we face in our everyday lives. We discussed life insurance, automobile insurance, and disability insurance, as well as the need for an emergency reserve in case of disaster. But even so, there are still times things don't quite work out, and for these times there is credit.

Individuals use credit in two ways. First, they borrow to purchase expensive things like cars and houses without having to save the full amount and pay cash. Absent a mortgage, very few young people could afford to purchase a home. And many students also borrow to finance their higher education, helping them to build skills that they expect will generate a higher income over the long run. Second, the ability to borrow means that an unemployed person who has run through his or her savings will still have something to eat and a place to sleep. Borrowing allows individuals to keep their purchases of consumer goods and services—their consumption—smooth, despite fluctuations in income.

While credit can help us to smooth our consumption, it is only a stopgap measure that we should use for as short a time as possible. Loans do need to be repaid, and borrowing for current consumption is something you should repay as quickly as possible. The financial crisis of 2007–2009, including the record volume of mortgage and other personal credit defaults, demonstrates how risky credit can be.

dynamic aggregate demand curve and stabilize inflation and output. In fact, it has been used exactly this way on a number of occasions. As we discussed earlier, for example, the 2008–2009 federal tax cuts and spending increases boosted aggregate expenditure, helping to moderate the recession.

At least in principle, then, discretionary fiscal policy offers a clear alternative to monetary policy. On closer examination, however, it has at least two shortcomings. First, discretionary fiscal policy works slowly, and second, it is very difficult to implement effectively. Most recessions are short, lasting a year or less. Until the financial crisis of 2007–2009, the longest post–World War II recession in the United States spanned 16 months (see Table 22.3 on page 630). Furthermore, because economic data only become available several months after they are collected, the economy is often halfway through a recession before there is a consensus that a downturn has actually started. Under most circumstances, Congress can't pass new legislation in less than several months. And fiscal policies do not have an immediate impact on the economy. Even after a tax cut has been passed, individual consumption and corporate investment tend to remain sluggish. Odds are that, by the time the spending does start, the typical recession will be over. This means that discretionary fiscal policy is likely to have its biggest impact when it is no longer needed.

The problems with discretionary fiscal policy don't end there because economists don't write economic stimulus packages; politicians do. And economics clearly collides with politics where fiscal stimulus is concerned. From an economic point of view, the best policies are the ones that influence a few key people to change their behavior, without rewarding people for doing what they would have done anyway. Examples of economically efficient fiscal policies include temporary investment incentives and tax reductions targeted toward those who are prone to spend an extra dollar of income, either because they cannot borrow or are less well off. Politicians have a different set of incentives. They

want to be reelected, so they look for programs that reward the largest number of people possible, to ensure their reelection. This means that discretionary fiscal policy is likely to be based more on political calculation than on economic logic. Though we can't hold public officials' opportunism against them, we need to recognize its existence. Because politicians want to remain popular with their constituencies, economic slowdowns—when some voters are suffering and the rest are worried—play to their worst instincts. In short, discretionary fiscal policy is a poor stabilization tool. While an economically sensible stimulus package can be designed, such legislation does not often become law.

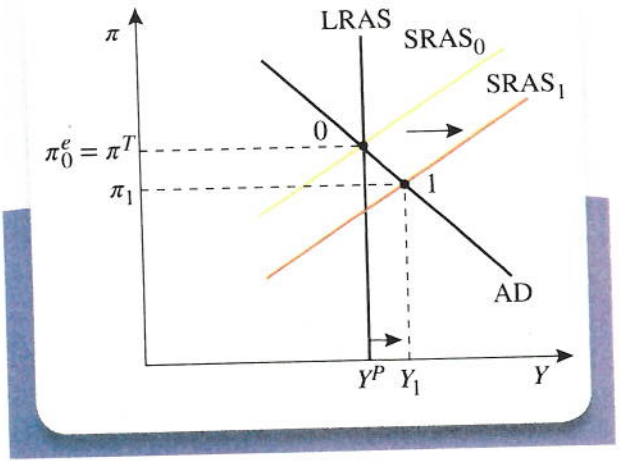
Under most circumstances, then, stabilization policy is probably best left to the central bankers. They have both the ability to act quickly and the independence to put the economy before politics. Fiscal policy's automatic stabilizers are clearly important parts of the economic landscape, but discretionary government expenditure and tax changes only have a role after monetary policy has run its course—that is, when conditions are so bad that using every available tool makes sense.

From this perspective, the deep recession of 2007–2009 provided the strongest case in many decades for discretionary fiscal stimulus in the United States and other countries. The downturn was the longest since the 1930s, providing fiscal policymakers time to respond. It also was the deepest and most widespread, while the subsequent recovery was the weakest, posing an unusual risk of deflation in several economies. As we saw in Chapter 11 (Applying the Concept: Deflation, Net Worth, and Information Costs), deflation can be highly destabilizing. Finally, and perhaps most importantly, central banks had lowered their policy interest rates close to zero, limiting their scope for further conventional policy stimulus. Consequently, it should come as no surprise that many industrial countries undertook large-scale discretionary fiscal stimulus in this episode. The 2008 and 2009 U.S. tax cuts and spending increases and the massive 2009 budget deficit that we previously discussed fit in this category.

Positive Supply Shocks and the Opportunity They Create Next, let's consider what happens when production costs fall, creating a positive supply shock. This shifts the short-run aggregate supply curve to the right, from $SRAS_0$ to $SRAS_1$, as shown in Figure 22.8. The immediate impact of this is to drive inflation down and output up. We know that at this new short-run equilibrium (point 1 in Figure 22.8), current inflation (π_1) is below expected inflation (π_0^e). In the absence of any other change, inflation expectations initially fall. But at the next stage, inflation is above expected inflation (where the $SRAS_1$ curve intersects the LRAS), and expectations start to rise. This shifts the short-run aggregate supply curve to the left until the economy returns to the original long-run equilibrium at point 0, where output equals potential output and inflation equals the central bank's target.

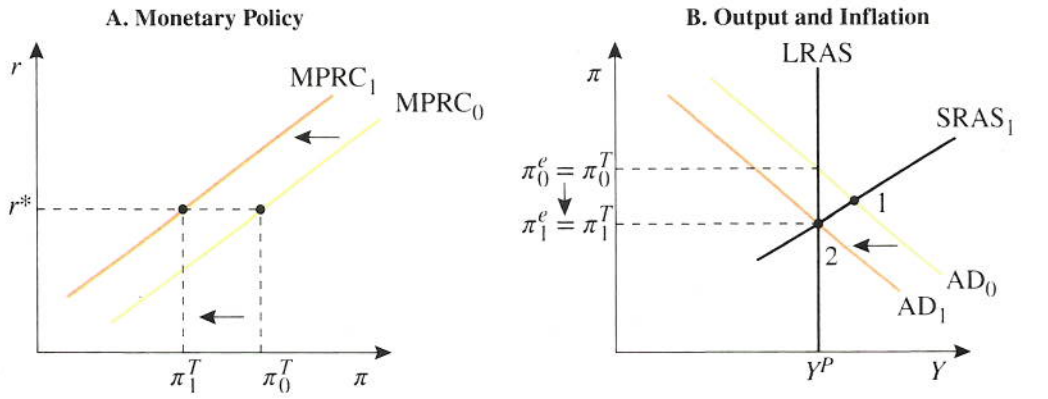
While policymakers could simply allow the economy to take its natural course, with inflation falling to π_1 (at point 1) and then rising back to π^T (at point 0), there is an alternative. A positive supply shock creates an opportunity for policymakers

Figure 22.8 A Positive Supply Shock



A positive supply shock shifts the short-run aggregate supply curve to the right, moving the short-run equilibrium from point 0 to point 1. Inflation falls and output rises.

Figure 22.9 Lowering the Inflation Target



A decline in the inflation target from π_0^T to π_1^T shifts the monetary policy reaction curve to the left from $MPRC_0$ to $MPRC_1$.

Following a positive supply shock, policymakers can reduce their inflation target by shifting the dynamic aggregate demand curve from AD_0 to AD_1. This lowers expected inflation from π_0^e to π_1^e. Instead of going to point 1, the economy moves to point 2.

to guide the economy to a new, lower inflation target without inducing a recession. The standard mechanism for permanently reducing inflation is to raise the real interest rate at every level of inflation. Central bankers do this by shifting the monetary policy reaction curve to the left, which then shifts the dynamic aggregate demand curve to the left as well. This drives inflation down, and inflation expectations will follow. (Look back at Figures 22.2 and 22.3 on page 624.) As a result, inflation falls to the new, lower target level. This is the mechanism that links monetary policy to economic downturns and inflation declines as shown in Figure 22.1 on page 622.

Here's how central bankers can exploit the opportunity created by a positive supply shock. Because potential output is unchanged following the fall in production costs, the long-run real interest rate hasn't changed either. This means that a lower inflation target requires a higher real interest rate at every level of current inflation (that's a leftward shift in the monetary policy reaction curve as shown in Panel A of Figure 22.9). So, policymakers wishing to lower their inflation target in response to a positive supply shock will raise interest rates, shifting the dynamic aggregate demand curve to the left until it reaches the point where the new short-run aggregate supply curve ($SRAS_1$) intersects the long-run aggregate supply curve (LRAS). If policymakers choose this course, as shown in Panel B of Figure 22.9, output will not rise above potential.[4]

What Accounts for the Great Moderation?

By any measure, the 1990s were remarkable. Information technology came of age, bringing the benefits of computerization into our lives through everything from cars to dishwashers. Because of the Internet, incredible libraries are now available to us in

[4]Again, recall that at the long-run equilibrium, inflation must equal expected inflation. So, if following a positive supply shock, policymakers choose to reduce their inflation target, inflation expectations must fall as well.

our homes and offices. That includes FRED, the Federal Reserve Bank of St. Louis' online database that is the source for many figures and end-of-chapter problems in this book.

What may be even more extraordinary is that the 1990s brought unprecedented economic stability—the "Great Moderation" in the volatility of real growth. In the decade from 1991 to 2001, the U.S. economy did not suffer a single decline in output. During these 10 years of solid growth, inflation fell steadily, from more than 5 percent in 1991 to less than 2 percent by the end of the decade. Comparing the 1980s with the 1990s, researchers find that the volatility of inflation and growth dropped by more than half.[5] And if you look back at Figures 22.1 and 22.6 you can see that both inflation and growth were substantially less variable between 1982 and 2007 than in the prior period.

"Please stand by for a series of tones. The first indicates the official end of the recession, the second indicates prosperity, and the third the return of the recession."

SOURCE: *1991 © Robert Mankoff/The New Yorker Collection/www.cartoonbank.com.*

This prosperity and stability was shared across the industrialized world. Looking at a broad cross-section of the 63 countries for which we have reliable data, we can see that inflation dropped dramatically between the 1980s and the 1990s. Median inflation fell from an annual rate of 7 percent in the period 1985–1994 to 3 percent in the period 1995–1999. The decline in average inflation was even sharper, from 83 percent to just 8½ percent. Inflation rose in only 10 of the 63 countries.

There are three possible explanations for this phenomenal worldwide economic performance. One is that everyone was extremely lucky, and the 1990s were simply an exceptionally calm period. The second is that economies became more flexible in absorbing external economic disturbances. And the third is that monetary policymakers figured out how to do their job more effectively. Which one of these is most likely?

It's difficult to argue that the stability of the 1990s was mere good fortune. Surely, the decade was not a calm one for the financial markets. Major economic crises occurred in Latin America and Asia, and long-term capital management nearly collapsed, paralyzing the bond markets. Raw materials prices fluctuated wildly. The price of oil spiked above $35 a barrel late in 1990 and then plunged below $12 a barrel at the end of 1998 before beginning a steady rise to $30 a barrel by the beginning of 2000.

If the size and frequency of external disturbances did not diminish, something must be cushioning the blows. Advances in information technology have increased manufacturers' flexibility in responding to changes in demand. The result has been a dramatic decline in inventories at every stage of the production process. In durable manufacturing, the new supply method called "just-in-time" cut the ratio of inventories to sales in half in the period from the early 1990s, to the beginning of 2002. Today, an automobile assembly plant keeps only a few hours worth of parts on hand; the rest are in transit to the factory, timed to arrive at just the right moment. Similarly, a supermarket or superstore like Walmart or Target holds only one to two days' supply of most products. The result is a great deal of flexibility in responding to changes in demand and sales.

[5]This decline in volatility, along with the rebound of volatility during the financial crisis of 2007–2009, is documented by Todd Clark in "Is the Great Moderation Over? An Empirical Analysis," Federal Reserve Bank of Kansas City *Economic Review*, 4th Quarter, 2009.

APPLYING THE CONCEPT
DATA: BIG AND SMALL

Everyone is talking about "big data"—using massive quantities of small bits of information to analyze everything from the weather to the concentration of matter in the universe. Economists like big data, too. For example, PriceStats collects price data from web retailers to create better inflation measures. And Google Trends is being used to track everything from unemployment to flu epidemics—with varying degrees of accuracy!

It doesn't take much imagination to think of ways to use more data to track economic activity more precisely—think of the hundreds of millions of payments transacted every day by credit card, debit card, and so on. Would the results be worth the effort? The jury is still out.

Let's focus on GDP, where revisions to preliminary estimates still tend to be large (see Chapter 18, Your Financial World: GDP: Seasons and Revisions, pages 504–505). It's unclear that more detailed, higher-frequency data would help us to anticipate these revisions much in advance. The main reason is that some crucial information—such as measures of income, investment, and corporate profits—are available only with a substantial lag. And because the composition of economic activity changes over time, we also have to wait for the periodic surveys that tell us how to weight all this information properly to form a snapshot of the economy.

Another difficulty arises because the largest GDP revisions tend to occur at cyclical turning points—the beginnings of recessions and recoveries. These revisions are related to components of business investment, not consumer spending. But to measure changes in corporate investment more accurately in real time, the government would need detailed proprietary information that firms do not disclose (and that is not available from the individual payments information or Google).

As a result, the initial GDP estimates are subject to potentially large revisions when nonproprietary, aggregate data on investment (say, from tax records) becomes available. For example, the biggest GDP revision on record concerned the fourth quarter of 2008, just after the Lehman debacle. In the mid-2011 revision for that quarter, which incorporated more extensive data on investment, the reported decline in GDP was 8.9 percent at an annual rate, more than double the initial estimate of 3.8 percent.

It is surely possible to improve further. But GDP estimates already have become more accurate. For example, comparing the initial estimate for each quarter with the most recent revision shows that the average size of the difference has shrunk by roughly 20 percent over the past decade. Better information technology has helped data gathering. Over time, however, the benefits from faster and more detailed data collection probably diminish. It's a bit like photos from cameras whose image capacity increases from 8 to 12 to 16 megapixels: the resolution gets better, but the marginal improvement declines as the individual pixels get smaller and the data set gets bigger. After a while, it doesn't change the big picture very much.

While improvements in inventory management are part of the explanation for the long period of prosperity in the 1990s, they aren't the whole story. Every description of the recession that began in March 2001 points to the impact of an inventory adjustment. The most persistent problems emerged in the high-technology sector—semiconductors, computers, and communications equipment. Inventories also plunged sharply in the recession that began in 2007. So while the U.S. economy has become more flexible, it hasn't changed enough to prevent fluctuations caused by unexpected events.

Financial innovation probably played some role in reducing economic volatility after the early 1980s—that is, until the financial crisis of 2007–2009. Innovations in mortgages and other forms of personal credit made it easier for households and businesses to borrow. As a result, they were better able to smooth their spending during periods of temporary income fluctuations (see Your Financial World: Stabilizing Your Consumption on page 634).[6] As we now know, however, rising levels of risky debt eventually led to record defaults on mortgages and other forms of personal credit during the financial crisis. And the loss of credit availability during the crisis helps explain the depth and duration of the recession that began in December 2007.

That leaves monetary policy as the only remaining explanation for the improved economic performance. Economists now have a much better understanding of how to implement monetary policy than they did as recently as 25 years ago. To succeed in

[6]See, for example, Karen E. Dynan, Douglas W. Elmendorf, and Daniel Sichel, "Can Financial Innovation Help Explain the Reduced Volatility of Economic Activity?" Federal Reserve Board, FEDs Working Paper No. 2005-54, August 2006.

keeping inflation low and stable while at the same time keeping real growth high and stable, central bankers must focus on raising real interest rates when inflation goes up and lowering them when inflation goes down. One example is the Taylor rule (see Chapter 18) that raises the policy interest rate by 1.5 percentage points for every 1 percent rise of inflation. By focusing on long-run inflation, policymakers have succeeded in bringing the inflation rate down and keeping it low.

Yet, while keeping inflation low and stable is *necessary* for reducing economic volatility, the deep recession that began in December 2007 shows that it is not *sufficient*. Low inflation did not prevent the financial crisis of 2007–2009, and history shows that such crises often are associated with deep recessions (the Great Depression being the most extreme example). It remains to be seen whether the crisis marks the end of the Great Moderation or whether it was simply a huge exception in an otherwise stable period. If households and businesses are no longer able or willing to use credit to smooth their spending over time, it may not be possible for Fed policymakers to sustain the low economic volatility of the 1985–2007 period, even if they remain effective in keeping inflation low.

What Happens When Potential Output Changes?*

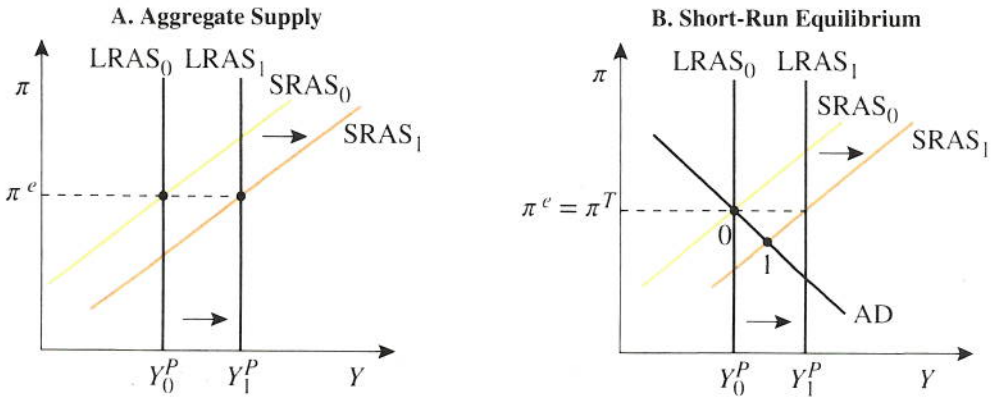
In order to concentrate on the impact of shifts in dynamic aggregate demand and short-run supply, we have neglected movements in potential output. But potential output does change, and the consequences are important both for short-run movements in output and inflation and for long-run equilibrium.

To understand what happens when potential output changes, let's trace out the consequences of a rise in Y^P brought on by an increase in productivity. First, recall that the long-run aggregate supply curve (LRAS) is vertical at the point where current output equals potential output, so when potential output rises this curve shifts to the right. But that's not all. An increase in productivity reduces costs of production, so it is a positive supply shock as well. This shifts the short-run aggregate supply curve (SRAS) to the right. But how far does SRAS shift? To see, recall from Chapter 21 that the short-run aggregate supply curve intersects the long-run aggregate supply curve at the point where current inflation equals expected inflation (π^e)—that's where production costs are not changing. Immediately following the increase in potential output, expected inflation does not change, so the SRAS shifts the same horizontal distance as the LRAS does. From this we can conclude that an *increase in potential output shifts both the long- and short-run aggregate supply curves to the right* as shown in Panel A of Figure 22.10 on page 640.

The short-run impact of an increase in potential output is straightforward. Assuming the central bank recognizes the change in potential output only with a lag, we can trace out the short-term impact of a change. First, because policymakers are slow to recognize the increase in Y^P, MPRC does not shift immediately: It still passes through the old level of potential output (Y_0^P). As a result, the AD curve also is unchanged until the MPRC shifts.[7] In the short run, output and inflation are determined by the intersection of the short-run aggregate supply (SRAS) curve and the dynamic aggregate demand (AD) curve. Because the central bank recognizes the increase in potential output only with a lag, the MPRC and AD curves are initially unchanged. Panel B of Figure 22.10 shows what happens. The economy starts at point 0 where the original short-run aggregate supply curve ($SRAS_0$) intersects the dynamic aggregate demand curve (AD). At this original

[7]This "lagged recognition" assumption allows us to trace out graphically the impact over time of the policy response to the change in potential output. It does not alter the direction of the eventual shifts in MPRC and AD, but it makes them easier to explain. In the remainder of the chapter, we use this simplifying assumption to help illustrate the impact of changes in potential output.

Figure 22.10 An Increase in Potential Output



An increase in potential output shifts both the short- and long-run aggregate supply curves to the right. Before and after the shift, the short-run aggregate supply curve crosses the long-run aggregate supply curve at the point where $\pi = \pi^e$.

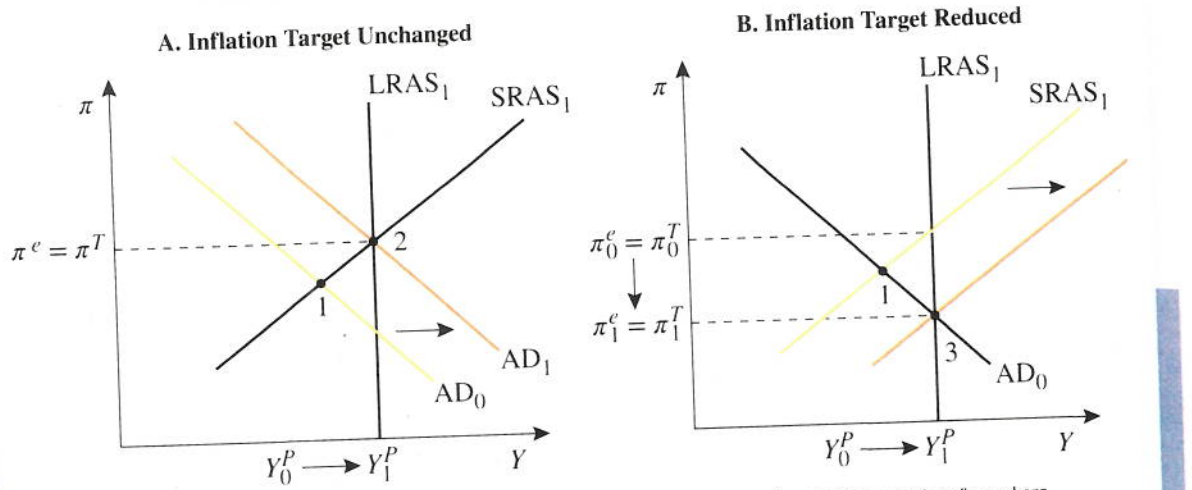
In the short run, the economy moves from point 0 to point 1.

equilibrium point, output equals the initial level of potential (Y_0^P) and inflation equals the central bank's target (π^T), which equals expected inflation (π^e). When potential output increases to Y_1^P, the short-run and long-run aggregate supply curves shift to $SRAS_1$ and $LRAS_1$. In the short run, the new equilibrium is at point 1 where $SRAS_1$ intersects AD. We can see from the figure, initially output is higher and inflation is lower.

What happens next? After a lag, the central bank realizes potential output has risen to Y_1^P. The path that the economy follows to the new level of potential output depends on what monetary policymakers do. If policymakers are happy with their inflation target—it could already be low enough—then they will work to move the economy to the point on the new long-run aggregate supply curve ($LRAS_1$) consistent with that initial target. But because the higher level of potential output comes along with a lower long-run real interest rate (look back at Figure 21.5), returning inflation to its initial (higher) level means shifting the monetary policy reaction curve to the right. This change in monetary policy shifts the dynamic aggregate demand curve to the right. The policy adjustment will drive output and inflation up until they reach their new long-run equilibrium levels where output equals Y_1^P and inflation equals its original target π^T (which equals expected inflation). This case is shown in Panel A of Figure 22.11, which continues the sequential numbering scheme from Panel B of Figure 22.10.

But as we saw earlier, a positive supply shock creates an opportunity for policymakers to reduce their inflation target. Without a conscious shift in monetary policy, at point 1 in Panel B of Figure 22.11 expected inflation exceeds current inflation, so it starts to fall, shifting the short-run aggregate supply curve to the right, driving inflation down even further. We know that the SRAS continues to shift until expected inflation equals current inflation and current output equals potential output. Looking at Panel B of Figure 22.11, which continues sequentially from Panel B of Figure 22.10, we see that this process naturally brings us to point 3, where output equals the new higher level of potential output Y_1^P and inflation is below the original target level π_0^T. With inflation

Figure 22.11 Policy Options Following an Increase in Potential Output



If, following an increase in potential output, policymakers' inflation target is unchanged, they must shift the dynamic aggregate demand curve to the right, bringing output and inflation to point 2.

If, following an increase in potential output, policymakers wish to lower their inflation target, they will allow the economy to move to point 3.

now lower, monetary policymakers have the opportunity to lower their inflation target to the level labeled π_1^T. They can do this by ensuring that the AD curve doesn't shift, which means leaving their monetary policy reaction curve where it started.[8]

Federal Reserve policymakers took advantage of an increase in potential output to drive the U.S. inflation rate down during the 1990s. Looking back at Figure 22.1, we see that inflation fell gradually from 5 percent at the end of the 1990–91 recession to 1½ percent in 1998. This drop in inflation occurred during an economic boom. Over the last half of the 1990s, economic growth averaged 1½ percentage points above the rate for the preceding 20 years. That is, U.S. productivity (and potential output) grew more rapidly from 1996 to 1999 than it did from 1975 to 1995. In effect, the economy's long-run aggregate supply curve shifted to the right, and when it did the Federal Reserve took the opportunity to reduce its implicit inflation target from near 5 percent to 2 percent. At the time, this was referred to as *opportunistic disinflation*. **Disinflation** is the term used to describe declines in inflation; the word *opportunistic* indicates an opportunity to reduce the target inflation level.[9] During the 1990s, Fed policymakers exploited the opportunity afforded them by positive supply shocks to permanently lower inflation.

Throughout our discussion of business cycle fluctuations, we have assigned a major role to shifts in the quantity of aggregate output demanded. This has led us to focus on how shifts in the dynamic aggregate demand curve change its point of intersection with an upward-sloping short-run aggregate supply curve and lead to movements in output and inflation.

[8]Recall that a decline in the central bank's inflation target shifts the monetary policy reaction curve to the left. But in this case, that will exactly offset the rightward shift resulting from the decline in the long-run real interest rate caused by the rise in potential output, leaving the position of the monetary policy reaction curve unchanged.

[9]*Disinflation* is very different from *deflation*, which is the opposite of inflation. *Deflation* means that aggregate prices are consistently *falling*; *disinflation* means falling inflation. (See Chapter 21, Your Financial World: Distinguishing Inflation, Deflation, and Disinflation, page 584.)

An alternative explanation for business cycle fluctuations focuses on shifts in potential output. This view, known as **real-business-cycle theory**, starts with the assumption that prices and wages are flexible, so that inflation adjusts rapidly. That is to say, the short-run aggregate supply curve shifts rapidly in response to deviations of current inflation from expected inflation. This assumption renders the short-run aggregate supply curve irrelevant. Equilibrium output and inflation are determined by the point of intersection of the dynamic aggregate demand curve and the long-run aggregate supply curve, where current inflation equals expected inflation and current output equals potential output. Thus, any shift in the dynamic aggregate demand curve, regardless of its source, influences inflation but not output. Neither changes in aggregate expenditure nor changes in monetary policy have any impact on the level of output. Because inflation ultimately depends on the level of money growth, it is determined by monetary policy.

To explain recessions and booms, real-business-cycle theorists look to fluctuations in potential output. They focus on changes in productivity and their impact on GDP. Productivity is a measure of output at a fixed level of inputs. An increase in productivity means an increase in GDP for a given quantity of capital and number of workers. Shifts in productivity can be either temporary or permanent. Examples of such shifts would include changes in the availability of raw materials, changes in government regulation of labor and product markets, and inventions or management innovations that improve the economy's productive capacity. Any of these events will shift potential output. According to real-business-cycle theory, they are the only sources of fluctuations in output.[10]

What Are the Implications of Globalization for Monetary Policy?*

If you look at the label of the shirt or blouse you are wearing, chances are it was imported from India, the Philippines, Vietnam, or somewhere else in Asia. The reason is that it is less costly to manufacture clothing in places where labor is inexpensive. The result is that clothes are cheaper in the United States: trade lowers prices. But does it also lower inflation?

The simplest way to understand the macroeconomic impact of international trade is to think about it as a source of productivity-enhancing technological progress. Shifting production of clothes from domestic factories to foreign ones is the same as U.S. producers finding a new, cheaper technology for producing the same things at home. And improvements in technology increase potential output. That is something we understand.

Recall from the previous section that an increase in potential output shifts both the long-run and short-run aggregate supply curves to the right. This has the immediate impact of shifting the economy along its dynamic aggregate demand curve to a point where output is higher and inflation is lower. All of this is shown in Figure 22.10 on page 640. In the long run, we know that output goes to the new, higher level of potential output. But, as we discussed in the previous section, the long-run level of inflation depends on how monetary policymakers respond. Our conclusion is that globalization and trade do reduce inflation in the short run and just like any positive supply shock they provide an opportunity to reduce inflation permanently.

Is globalization likely to have a sizeable impact on inflation even in the short run? Economists estimate that nearly 14 percent of personal consumption expenditures reflect the direct cost of imported final goods (excluding the contribution from U.S. services) combined with the imported content of U.S.-made goods and services.[11]

[10]For a more detailed discussion of real-business-cycle theory, see Charles Plosser, "Understanding Real Business Cycles," *Journal of Economic Perspectives* 3, no. 3 (Summer 1989), pp. 51–77.

[11]See Galina Hale and Bart Hobijn, "The U.S. Content of 'Made in China,'" FRBSF *Economic Letter*, August 8, 2011.

YOUR FINANCIAL WORLD

The Problem with Measuring Nominal GDP

In order to set their policy-controlled interest rate as accurately as possible, central bankers need to know the size of the output gap. This requires measuring the level (and growth rate) of both current and potential real gross domestic product (GDP) accurately. Unfortunately, this is made difficult by the fact that estimates of GDP for a specific quarter are revised for many years after the fact; and the revisions tend to be large (see Your Financial World: GDP: Seasons and Revisions in Chapter 18 on pages 504–505). One of the reasons for these revisions is that government statisticians have to reconcile two methods of measuring *nominal* GDP that are supposed to give the same answer. Here's the problem.

Looking at the economy as a whole, we know that expenditures must equal income. Eventually, every dollar that is earned as income must be spent on something. This means that one way to calculate nominal GDP is to divide it into the various categories for which the product is used—consumption, investment, government purchases, and net exports—and then measure expenditure on each of these.

But because one person's expenditure is another's income, total expenditure equals total income. This means that we can also measure nominal GDP by dividing income into categories and computing what economists call gross domestic income (GDI). Income categories would include wages, rental income, interest income, and dividend income. And because everyone is supposed to pay taxes on their income, measuring it should be straightforward.

The fact that income and expenditure are supposed to be equal doesn't mean that they are, however. Looking at tables constructed by the Department of Commerce's Bureau of Economic Analysis, we find a line labeled "Statistical discrepancy." The amount on this line, which represents GDP calculated from expenditures data minus GDI computed from the income data, is quite large. From 1990 to 2015, the statistical discrepancy between the two measures was between −1.6 and +2.2 percent of nominal GDP. Table 22.4 shows some examples for recent years. Because nominal GDP usually grows from 3 to 5 percent a year—that figure includes inflation plus real growth—changes in the statistical discrepancy can have a big impact on official estimates of overall economic performance.

Although it directly affects nominal GDP, the practical implication of the statistical discrepancy is that it makes us unsure about the current level of real output. Uncertainty about something so crucial adds to the difficulty of making monetary policy.

Table 22.4 Nominal Gross Domestic Product and Income (US$ billions except as noted)

	1993	1997	2006	2015
Nominal gross domestic product	6,878.7	8,608.5	13,855.9	17,947.0
Nominal gross domestic income	6,726.4	8,596.2	14,073.2	18,153.9
Statistical discrepancy	152.3	12.3	−217.3	−206.9
Statistical discrepancy (percent of GDP)	2.2%	0.1%	−1.6%	−1.2%
Nominal GDP growth from previous year	5.2%	6.3%	5.8%	3.5%

SOURCE: *Bureau of Economic Analysis, Department of Commerce, National Income and Product Accounts Tables 1.1.5 and 1.10.*

If import prices are stable and then start dropping at 5 percent per year, which is what happened in 2001, this would reduce the rate of inflation by about 0.7 percentage point per year. With inflation averaging 2 percent per year, that is a moderate but temporary impact. In the long run, $MV = PY$, so (assuming velocity is constant) the inflation rate equals the money growth rate less the growth rate of potential output ($\pi = \%\Delta M - \%\Delta Y^P$). We just can't get away from the fact that domestic inflation is tied to domestic monetary policy.

Can Policymakers Stabilize Output and Inflation Simultaneously?*

Our analysis of business cycles has been based on the idea that short-run fluctuations in output and inflation are caused by either demand shifts or supply shifts. And, as we have seen repeatedly, dynamic aggregate demand curve shifts move inflation and output in the same direction; while short-run aggregate supply shifts move inflation and output in opposite directions. Early in this chapter, we discussed how, by shifting their monetary policy reaction curve, policymakers offset demand shocks. (This is shown in Figure 22.7 on page 633.)

Unfortunately, supply shocks are a different story. There is no way to neutralize them. For instance, take the case of a negative supply shock like an oil price increase that raises production costs. This has the immediate effect of driving output down and inflation up (see Figure 22.5 on page 628). Now consider the tools that are available to policymakers. By shifting the monetary policy reaction curve, central bankers can shift the dynamic aggregate demand curve. Is there any way to use this tool to bring the economy back to its original long-run equilibrium point quickly and painlessly? The answer is no. Monetary policymakers can shift the dynamic aggregate demand curve, but they are powerless to move the short-run aggregate supply curve. And there is no shift in the dynamic aggregate demand curve that can quickly move the economy back to its long-run equilibrium point, where current output equals potential output and current inflation equals the central bank's target.

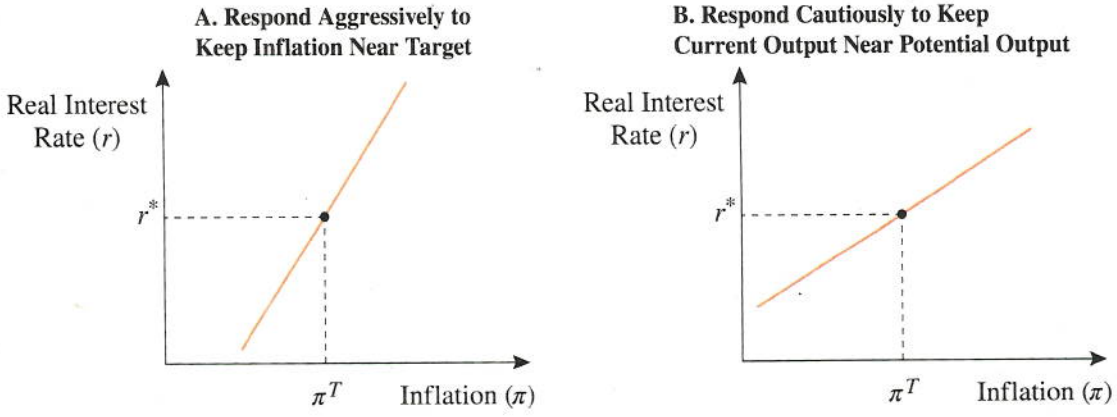
But that's not the end of the story. Central bankers can choose how aggressively they react to deviations of inflation from their target caused by supply shocks. They can do this by picking the slope of their monetary policy reaction curve, which then determines the slope of the dynamic aggregate demand curve. The more aggressive policymakers are in keeping current inflation close to target, the steeper their monetary policy reaction curve and the flatter the dynamic aggregate demand curve. And by controlling the slope of the dynamic aggregate demand curve policymakers choose the extent to which supply shocks translate into changes in output or changes in inflation. This means that the slope of the monetary policy reaction curve—how aggressively to react to deviations of inflation from their target—is really a choice about the relative volatility of inflation and output. The more central bankers stabilize inflation, the more volatile output will be, and vice versa. There is a tradeoff.

To see why policymakers face a tradeoff between inflation and output volatility, we can compare two policymakers, one with a relatively steep monetary policy reaction curve (as in Panel A of Figure 22.12), and one with a relatively flat monetary policy reaction curve (as in Panel B of Figure 22.12). The first policymaker cares more about keeping inflation close to its target level than the second one does.

Turning to the dynamic aggregate demand curve, Panel A of Figure 22.13 shows the relatively flat AD curve implied by the steep monetary policy reaction curve in which small deviations in inflation from the target level elicit large changes in the real interest rate. A flat dynamic aggregate demand curve, corresponding to the steep monetary policy reaction curve in Panel A of Figure 22.12, means that a negative supply shock prompts a large decline in current output and only a small increase in current inflation. By reacting aggressively, policymakers ensure that inflation (and inflation expectations) remain close to their target. The cost of following this path, however, is that stable inflation means volatile output. This is depicted in Panel A of Figure 22.13.

Panel B of Figure 22.13 shows what happens when policymakers are less concerned about keeping inflation close to target in the short run, and more concerned about keeping current output near potential output. When policymakers worry more about short-run fluctuations in output than about temporary movements in

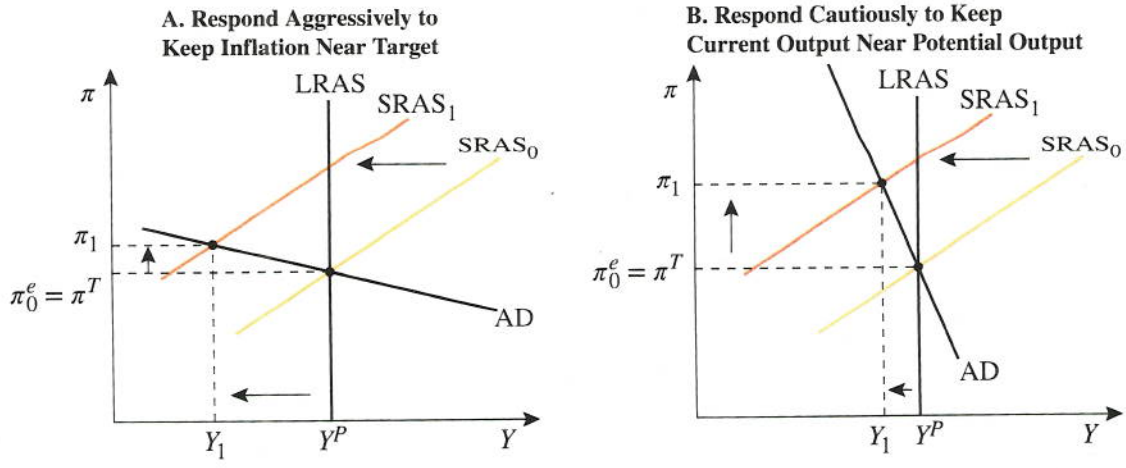
Figure 22.12 The Slope of the Monetary Policy Reaction Curve



Central bankers who are intent on keeping inflation close to the target will move interest rates aggressively when inflation rises.

Central bankers more concerned about keeping output close to potential will move interest rates by less in reaction to an inflation increase.

Figure 22.13 The Policymaker's Choice



Central bankers intent on keeping inflation close to the target will move interest rates aggressively when inflation rises and create bigger fluctuations in output.

Policymakers more concerned about keeping output close to potential will move interest rates by less in reaction to an inflation change, resulting in bigger fluctuations in inflation.

MONEY & BANKING

IN THE BLOG

Is 2 Percent Still the Right Inflation Target?

Policymakers in Europe, Japan, and the United States have struggled over the past decade to stimulate their weak economies and stabilize prices with near-zero or even modestly negative nominal interest rates and a range of unconventional monetary policies. Along the way, observers have increasingly wondered whether policymakers should reconsider the level of their inflation target. Should they raise it in order to reduce the odds of having to engage in unconventional policies in the future?

The concept of inflation targeting became widely accepted after the 1970s and early 1980s, when a number of advanced economies experienced inflation as high as 20 percent. Economic stability requires stable inflation expectations. A broad consensus developed that, if central banks adopted an inflation target, they would be more accountable for their performance, and in turn people would have more confidence that inflation would stay under control. Today, roughly two-thirds of world GDP (measured at PPP) is produced in either official or de facto inflation-targeting jurisdictions. Almost all the advanced economies have chosen 2 percent as their desired level of inflation, even though the inflation-targeting concept says nothing about what, exactly, the target should be.*

So, why 2 percent? First of all, a target of zero percent would require policy to continually flirt with deflation, which conventional policy tools are ill-suited to address (see Chapter 21, Applying the Concept: Zero Matters, page 612). Second, research has convinced many policymakers that inflation is commonly overstated by 1 percentage point or more (see Chapter 20, In the Blog: We Are Still Overstating Inflation, pages 574–575). At a measured inflation rate of about 2 percent, actual inflation would be about 1 percent, low but less likely to risk deflation in a recession. Once a small group of central banks began to pick 2 percent as their objective, others soon followed.

Then why are some policy experts now questioning the 2 percent inflation target? Despite ultra-low policy interest rates, the weak postcrisis recovery has kept inflation below 2 percent. Relying in part on the Taylor rule guide to setting the nominal policy interest rate (see Chapter 18, pages 500–506), central bankers used to think that lowering the policy rate to zero would be more than sufficient to recover from a severe recession if the inflation target before, during, and after the recession was 2 percent. But they are no longer so sure.

To illustrate the connection between the inflation target, economic activity (represented by the unemployment rate), and the policy interest rate, we can use a version of the Taylor rule based on the unemployment rate (instead of real GDP). Under this rule, the proper level of the policy interest rate is the sum of (1) the neutral real interest rate (also called the natural or equilibrium rate of interest), (2) the inflation target, (3) one-half of the difference between current inflation and the inflation target, and (4) –1 times the **unemployment gap**, which is the difference between the current unemployment rate and what is called the frictional, equilibrium, or **natural rate of unemployment**.

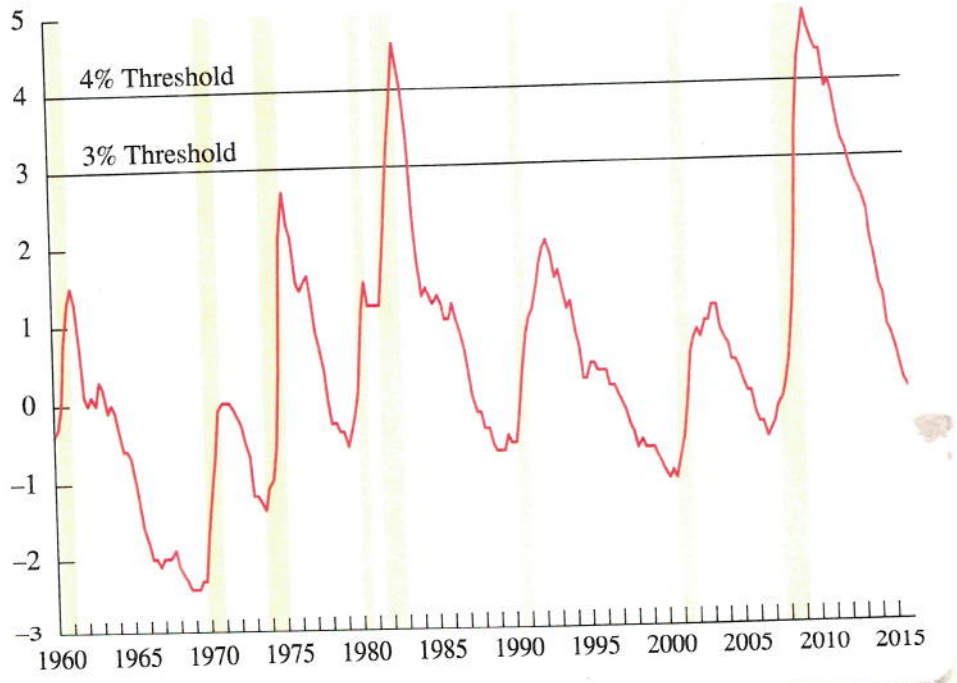
In the long run, item 3 in the Taylor rule will be zero because current inflation will be at the target rate, and item 4 will be zero because the current jobless rate will equal the natural rate. If the neutral real interest rate (the neutral nominal rate minus the expected inflation rate) is 2 percent, and the target inflation rate is 2 percent, then the equation tells us that the policy interest rate in the long run should be set to 4 percent. Starting from this long-run position and with the inflation rate at the target of 2 percent, a rise in the unemployment rate to 4 percentage points above the natural rate yields a nominal policy rate of zero. (To see why nominal interest rates cannot decline far below zero, see Chapter 17, Applying the Concept: Negative Nominal Interest Rates: Blast from the Past?, page 472).

Put another way, a policy interest rate of zero when the actual and expected inflation rate is 2 percent should restore full employment to an economy in which unemployment is 4 percentage points above the minimum rate. What if unemployment is more than 4 points above the natural rate? Since 1960, that has happened twice, in the recession of 1982–1983 and during the Great Recession, 2009–2010, accounting for 4 percent of the period (see Figure 22.14). In these episodes, a central bank with a 2 percent inflation target might consider using unconventional policy tools after cutting the policy rate to zero.

Other things equal, raising the inflation target by even 1 percentage point, to 3 percent, would accommodate an unemployment gap of 5 percentage points—and even in the Great Recession, the U.S. unemployment gap did not reach 5 percentage points.

But other things may not be equal. Two important factors would favor an even higher inflation target. First, the neutral real rate may be lower than 2 percent. And when

Figure 22.14 U.S. Unemployment Gap, 1960 to 2016 (percentage points)



Note: Shaded areas denote recessions. The gap is the civilian unemployment rate (UNRATE) less the natural rate *of* unemployment (NROU).

SOURCE: *FRED*.

the unemployment rate begins to rise in some future cycle, inflation could be below the 2 percent target, reducing the unemployment gap that could be cured by a zero policy rate. Putting all of this together, even a 3 percent inflation target may not be high enough to avoid the occasional need for negative interest rates or unconventional monetary policies.

For these reasons, policymakers might wish they had initially chosen a higher target rate of inflation. But having educated their publics that the right inflation target is 2 percent, and having settled on that level internationally as a useful form of monetary policy coordination, making such a fundamental change in the policy framework seems unlikely.

*Emerging market economies have picked higher targets—in 2014, for example, India chose 4 percent. The difference is sensible. Advanced economies have higher wages and hence higher price levels than do emerging economies. As the latter catch up with the former, they are likely to face a transitional period of higher inflation for nontraded goods and services.

inflation, they will choose a relatively flat monetary policy reaction curve in which movements in the real interest rate are small, even when inflation strays far from its target level. The result is a steep dynamic aggregate demand curve like the one drawn in the right panel of the figure. Notice what happens in this case following a negative supply shock. Once more, inflation rises and output falls. But the output gap is small, while the deviation of inflation from expected inflation is large. The consequence is that expected inflation rises significantly, and adjusts only slowly back to the target. Stable output means volatile inflation.

When choosing how aggressively to respond to supply shocks, central bankers are deciding how to conduct stabilization policy. Do they want to ensure that inflation remains near target, or that output remains close to potential? When faced with a supply shock, policymakers cannot stabilize both output and inflation. And by stabilizing one, the other becomes more volatile. Monetary policymakers face an inflation-output volatility tradeoff.

Key Terms

demand shock, 623
disinflation, 641
natural rate of unemployment, 646
real-business-cycle theory, 642
supply shock, 623
unemployment gap, 646

Using FRED: Codes for Data in This Chapter

Data Series	FRED Data Code
U.S. consumer price index	CPIAUCSL
Real GDP	GDPC1
NBER recession dates (0 = expansion, 1 = recession)	USREC
Recession periods, Germany	DEURECM
Recession periods, Italy	ITARECM
Recession periods, Spain	ESPRECM
Estimated probability of U.S. recession	RECPROUSM156N
Ratio of manufacturers' inventories to shipments	AMTMIS
Total credit market debt owed by households	HSTCMDODNS
Nominal GDP	GDP
Real potential GDP	GDPPOT
Gross domestic income	GDI
Chile consumer price index	CHLCPIALLMINMEI
Israel consumer price index	ISRCPIALLMINMEI
U.S. federal deficit (percent of GDP)	FYFSGDA188S

Chapter Lessons

1. Short-run fluctuations in output and inflation arise from shifts in either the dynamic aggregate demand curve or the short-run aggregate supply curve.
   a. A decrease in the central bank's inflation target shifts the dynamic aggregate demand curve to the left.
      i. In the short run, this decreases both output and inflation.
      ii. It drives current inflation below expected inflation.
      iii. In the long run, inflation and expected inflation fall to the new target as output returns to potential output.
   b. A government expenditure increase shifts the dynamic aggregate demand curve to the right.
      i. In the short run, this increases both output and inflation.
      ii. It drives current inflation above expected inflation.
      iii. To keep inflation from rising, monetary policymakers shift their reaction curve to the left, raising the real interest rate at every level of inflation.
      iv. Unless the central bank's target inflation changes, the economy eventually returns to its original long-run equilibrium point.
   c. A negative supply shock shifts the short-run aggregate supply curve to the left.
      i. In the short run, this decreases output and increases inflation.
      ii. The rise of inflation initially drives expected inflation up, but both inflation and expected inflation then begin to decline.
      iii. Unless the central bank's target inflation changes, the economy returns to its original long-run equilibrium point.
2. Applying the dynamic aggregate demand–aggregate supply framework we see that:
   a. Stabilization policy is the use of monetary and fiscal policy tools to stabilize output and inflation.
      i. Monetary policy can be used to shift the dynamic aggregate demand curve to offset changes in the quantity of aggregate output demanded. In practice, lack of information and lags in the impact of policy changes make this very difficult.
      ii. Fiscal policy can shift the dynamic aggregate demand curve as well, but it is difficult to do in a timely and effective way.
      iii. A positive supply shock that lowers production costs and shifts the short-run aggregate supply curve to the right creates an opportunity for policymakers to permanently lower inflation.
   b. Better monetary policy is the most likely explanation for the increased stability of the U.S. economy from the mid-1980s until 2007.
   c. An increase in potential output shifts both the short- and long-run aggregate supply curves to the right, driving output up and inflation down, resulting in expected inflation being above current inflation.
   d. Globalization has the same impact as an increase in potential output. In the long run it raises output but inflation only changes if the central bank adjusts its target.
   e. When confronted with a shift in the short-run aggregate supply curve, central bankers face a tradeoff between output and inflation volatility.

connect Conceptual and Analytical Problems

1. Define the term *stabilization policy* and describe how it can be used to reduce the volatility of economic growth and inflation. Do stabilization policies improve everyone's welfare? *(LO2)*
2. Explain why stabilization policies are usually pursued using monetary rather than fiscal policy. *(LO3)*
3. Explain why fiscal policy played a greater role than usual in the response to the 2007–2009 recession. *(LO3)*
4. Explain why monetary policymakers cannot restore the original long-run equilibrium of the economy if, in the short run, the economy has moved to a point where inflation is above target inflation and output is below potential output. *(LO2)*
5. Explain why the rise in oil prices in 2008 created a particularly difficult situation for Federal Reserve policymakers. *(LO2)*
6. Will changes in technology affect the rate at which the short-run aggregate supply curve shifts in response to an output gap? Why or why not? Provide some specific examples of how technology will change the rate of adjustment. *(LO1)*
7. After examining Figure 22.6, explain the potential link between innovations in financial markets and output volatility since the 1980s. You should consider both the "Great Moderation" and the recession of 2007–2009 in your answer. *(LO1)*
8.* According to real-business-cycle theory, can monetary policy affect equilibrium output in either the short run or the long run? *(LO1)*
9. The economy has been sluggish, so in an effort to increase output in the short run, government officials have decided to cut taxes. They are considering two possible temporary tax cuts of equal size in terms of lost revenue. The first would reduce the taxes on people with incomes *above* the median for one year. The second would cut taxes on people with incomes *below* the median for one year. Which change would shift the aggregate demand curve further to the right? Why? *(LO2)*
10. Starting with the economy in long-run equilibrium, use the aggregate demand–aggregate supply framework to illustrate what would happen to inflation and output in the short run if there were a rise in consumer confidence in the economy. Assuming the central bank takes no action to offset this rise in confidence, what would happen to inflation and output in the long run? What policy adjustment is the central bank undertaking? *(LO2)*
11. Consider again the rise in consumer confidence described in Problem 10. What would happen to inflation and output in the long run if the central bank remained committed to its original inflation target and responded with an immediate policy tightening? Compare the outcome to that in Problem 10 using the aggregate demand–aggregate supply framework. *(LO2)*
12. Suppose that consumer confidence unexpectedly rises six months before the central bank detects the change. Compared to your answer to Problem 11, what happens to inflation and output in that interval? How does monetary policy return the economy to long-run equilibrium at the initial inflation target? *(LO2)*
13. How would a shock that reduces production costs in the economy (a positive

supply shock) affect equilibrium output and inflation in both the short run and the long run? Illustrate your answer using the aggregate demand–aggregate supply framework. You should assume that the shock does not affect the potential output of the economy. *(LO2)*

14. Suppose, instead of waiting for the economy described in Problem 13 to return to long-run equilibrium, the central bank opted to use the positive supply shock as an opportunity to move to a lower inflation target. Illustrate the impact of this change in the inflation target using an aggregate demand–aggregate supply diagram. Compare this with a graph of a situation where the central bank lowers its inflation target in the absence of a positive supply shock. *(LO3)*

15.* Suppose a natural disaster reduces the productive capacity of the economy. How would the equilibrium long-run real interest rate be affected? Assuming the central bank maintains its existing inflation target, illustrate the impact on the monetary policy reaction function and on equilibrium inflation and output both in the short run and in the long run. *(LO1)*

16.* Monetary policymakers observe an increase in output in the economy and believe it is a result of an increase in potential output. If they were correct, what would the appropriate policy response be to maintain the existing inflation target? If they were incorrect and the increase in output resulted simply from a positive supply shock, what would the long-run impact be of their policy response? *(LO3)*

17.* Consider a previously closed economy that opens up to international trade. Use the aggregate demand–aggregate supply framework to illustrate a situation where this would lead to lower inflation in this economy in the long run. *(LO2)*

18.* How could you use the aggregate demand–aggregate supply (AD/AS) framework to explain the impact of the financial crisis of 2007–2009 on inflation and output in the economy? *(LO1)*

19.* Changes in oil prices shift the short-run aggregate supply curve (SRAS). Consider how *volatility* in oil prices may influence the economy's short-run equilibrium, which occurs at the intersection of the dynamic aggregate demand (AD) curve and the SRAS curve. *(LO3)*

a. Suppose the monetary policy reaction curve is relatively steep. What does this imply about the slope of the AD curve? What does it imply about the variability of output and inflation when the SRAS curve shifts? Explain.

b. Suppose the monetary policy reaction curve is relatively flat. What does this imply about the slope of the AD curve? What does it imply about the variability of output and inflation when the SRAS curve shifts? Explain.

20. You are asked to advise a central bank of an advanced economy that is about to set an inflation target for the first time. Officials are leaning toward adopting a 2 percent target, in line with the practice in many other countries. Suggest two factors that the central bank should consider before settling on 2 percent. *(LO3)*

21.* Suppose that a government imposes trade barriers that raise the domestic cost of production and lower potential output. What would you expect to happen to inflation and output in the short run and the long run, assuming monetary policymakers only recognize the fall in potential output with a lag and keep their inflation target unchanged? *(LO1)*

*Indicates more difficult problems

22. High debt ratios led many countries in recent years to reduce government spending. Suppose the cut in spending started from a point with the economy at long-run equilibrium. How might monetary policymakers react, assuming their inflation target remained unchanged? *(LO1)*

Data Exploration

For general information on using Federal Reserve Economic Data (FRED) online, visit www.mhhe.com/moneyandbanking5e.com *and refer to the FRED resources.*

1. Display as a bar chart the periods since 1854 that are designated as U.S. recessions by the National Bureau of Economic Research (FRED code: USREC). Why has the frequency of recessions declined over time? Could improvements in monetary policy have played a role? Improvements in fiscal policy? Can you think of any other causes? *(LO1)*
2. In the past, policymakers occasionally became aware of a recession only well after it began. Can they do better? Plot the probability of a recession from a statistical model (FRED code: RECPROUSM156N). To what extent could this model help improve monetary or fiscal policy or both? *(LO3)*
3. Compare the frequency and timing of recessions in key European economies since 1960. Make separate bar charts for Germany (FRED code: DEURECM), Italy (FRED code: ITARECM), and Spain (FRED code: ESPRECM). Do their business cycles appear sufficiently well aligned to make them operate easily in a single currency area with a common monetary policy? *(LO3)*
4. To keep inflation low and steady, central banks would like to keep output reasonably close to its potential level, but can they anticipate changes in potential GDP? Plot since 1960 the percent change from a year ago of the Congressional Budget Office's estimate of potential GDP (FRED code: GDPPOT). Suppose that the FOMC assumed that the growth rate of potential GDP remained permanently at its 1960s average. What would you expect to happen to inflation? Why? *(LO1)*