After studying this chapter, you will be able to:

- Describe the objectives of U.S. monetary policy and the framework for setting and achieving them
- Explain how the Federal Reserve makes its interest rate decision and achieves its interest rate target
- Explain the transmission channels through which the Federal Reserve influences real GDP, jobs, and inflation
- Explain the Fed's extraordinary policy actions

14

MONETARY POLICY

At eight regularly scheduled meetings a year, and in an emergency between regular meetings, the Federal Reserve decides whether to change its interest rate target. And every business day, the Federal Reserve Bank of New York operates in financial markets to implement the Fed's decision and ensure that its target interest rate is achieved. Financial market traders, journalists, and pundits watch the economy for clues about what the Fed will decide at its next meeting.

How does the Fed make its interest rate decision? Can the Fed speed up economic growth and lower unemployment by lowering the interest rate and keep inflation in check by raising the interest rate?

What special measures can the Fed take in a financial crisis like the one that engulfed the U.S. and global economies in 2008?

This chapter combines what you learned about the functions of the Fed in Chapter 8 and about aggregate demand and aggregate supply in Chapter 10. You will learn how the Fed influences the interest rate and how the interest rate influences the economy. You will also review the extraordinary challenge faced by the Fed today. In *Reading Between the Lines* at the end of the chapter, you will see the Fed's dilemma in the face of stubborn recession and massive monetary stimulus.

Monetary Policy Objectives and Framework

A nation's monetary policy objectives and the framework for setting and achieving those objectives stem from the relationship between the central bank and the government.

We'll describe the objectives of U.S. monetary policy and the framework and assignment of responsibility for achieving those objectives.

Monetary Policy Objectives

The objectives of U.S. monetary policy are set out in the mandate of the Board of Governors of the Federal Reserve System, which is defined by the Federal Reserve Act of 1913 and its subsequent amendments, the most recent of which was passed in 2000.

Federal Reserve Act The Fed's mandate was most recently clarified in amendments to the Federal Reserve Act passed by Congress in 2000. The 2000 law states that mandate in the following words:

> The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long-run growth of the monetary and credit aggregates commensurate with the economy's long-run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.

Goals and Means This description of the Fed's monetary policy objectives has two distinct parts: a statement of the goals, or ultimate objectives, and a prescription of the means by which the Fed should pursue its goals.

Goals of Monetary Policy The goals are "maximum employment, stable prices, and moderate long-term interest rates." In the long run, these goals are in harmony and reinforce each other. But in the short run, these goals might come into conflict. Let's examine these goals a bit more closely.

Achieving the goal of "maximum employment" means attaining the maximum sustainable growth rate of potential GDP and keeping real GDP close to potential GDP. It also means keeping the unemployment rate close to the natural unemployment rate.

Achieving the goal of "stable prices" means keeping the inflation rate low (and perhaps close to zero).

Achieving the goal of "moderate long-term interest rates" means keeping long-term *nominal* interest rates close to (or even equal to) long-term *real* interest rates.

Price stability is the key goal. It is the source of maximum employment and moderate long-term interest rates. Price stability provides the best available environment for households and firms to make the saving and investment decisions that bring economic growth. So price stability encourages the maximum sustainable growth rate of potential GDP.

Price stability delivers moderate long-term interest rates because the nominal interest rate reflects the inflation rate. The nominal interest rate equals the real interest rate plus the inflation rate. With stable prices, the nominal interest rate is close to the real interest rate, and most of the time, this rate is likely to be moderate.

In the short run, the Fed faces a tradeoff between inflation and interest rates and between inflation and real GDP, employment, and unemployment. Taking an action that is designed to lower the inflation rate and achieve stable prices might mean raising interest rates, which lowers employment and real GDP and increases the unemployment rate in the short run.

Means for Achieving the Goals The 2000 law instructs the Fed to pursue its goals by "maintain[ing] long-run growth of the monetary and credit aggregates commensurate with the economy's long-run potential to increase production." You perhaps recognize this statement as being consistent with the quantity theory of money that you studied in Chapter 8 (see pp. 200–201). The "economy's long-run potential to increase production" is the growth rate of potential GDP. The "monetary and credit aggregates" are the quantities of money and loans. By keeping the growth rate of the quantity of money in line with the growth rate of potential GDP, the Fed is expected to be able to maintain full employment and keep the price level stable.

To pursue the goals of monetary policy, the Fed must make the general concepts of price stability and maximum employment precise and operational.

Operational "Stable Prices" Goal

The Fed pays attention to two measures of inflation: the Consumer Price Index (CPI) and the personal consumption expenditure (PCE) deflator. But the *core PCE deflator,* which excludes food and fuel prices, is the Fed's operational guide and the Fed defines the rate of increase in the core PCE deflator as the **core inflation rate**.

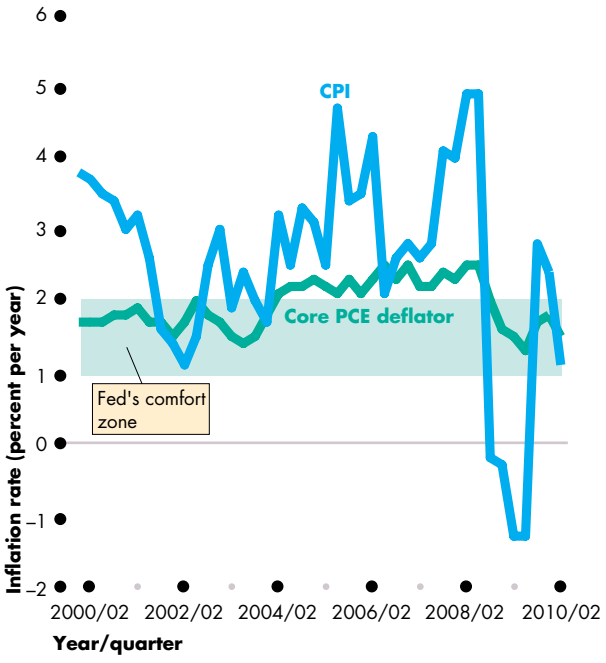
The Fed focuses on the core inflation rate because it is less volatile than the total CPI inflation rate and the Fed believes that it provides a better indication of whether price stability is being achieved.

Figure 14.1 shows the core inflation rate alongside the total CPI inflation rate since 2000. You can see why the Fed says that the core inflation rate is a better indicator. Its fluctuations are smoother and represent a sort of trend through the wider fluctuations in total CPI inflation.

The Fed has not defined price stability, but it almost certainly doesn't regard price stability as meaning a core inflation rate equal to zero. Former Fed Chairman Alan Greenspan suggests that "price stability is best thought of as an environment in which inflation is so low and stable over time that it does not materially enter into the decisions of households and firms." He also believes that a "specific numerical inflation target would represent an unhelpful and false precision."[1]

Ben Bernanke, Alan Greenspan's successor, has been more precise and suggested that a core inflation rate of between 1 and 2 percent a year is the equivalent of price stability. This inflation range might be thought of as the Fed's "comfort zone" for the inflation rate.

FIGURE 14.1 Operational Price Stability Goal: Core Inflation



The CPI inflation rate fluctuates more than the core inflation rate. The core inflation rate was inside the Fed's comfort zone between 2000 and 2004 and after 2008 but above the comfort zone upper limit between 2004 and 2008.

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

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Operational "Maximum Employment" Goal

The Fed regards stable prices (a core inflation rate of 1 to 2 percent a year) as the primary goal of monetary policy and as a means to achieving the other two goals. But the Fed also pays attention to the business cycle and tries to steer a steady course between inflation and recession. To gauge the state of output and employment relative to full employment, the Fed looks at a large number of indicators that include the labor force participation rate, the unemployment rate, measures of capacity utilization, activity in the housing market, the stock market, and regional information gathered by the regional Federal Reserve Banks. All these data that describe the current state of the economy are summarized in the Fed's **Beige Book.**

While the Fed considers a vast range of data, one number stands out as a summary of the overall state of aggregate demand relative to potential GDP. That number is the *output gap*—the percentage deviation of real GDP from potential GDP.

When the output gap is positive, it is an inflationary gap that brings an increase in the inflation rate. And when the output gap is negative, it is a recessionary gap that results in lost output and in employment being below its full-employment equilibrium level. So the Fed tries to minimize the output gap.

[1] Alan Greenspan, "Transparency in Monetary Policy," *Federal Reserve of St. Louis Review*, 84(4), 5–6, July/August 2002.

Responsibility for Monetary Policy

Who is responsible for monetary policy in the United States? What are the roles of the Fed, Congress, and the president?

The Role of the Fed The Federal Reserve Act makes the Board of Governors of the Federal Reserve System and the Federal Open Market Committee (FOMC) responsible for the conduct of monetary policy. We described the composition of the FOMC in Chapter 8 (see p. 190). The FOMC makes a monetary policy decision at eight scheduled meetings each year and communicates its decision with a brief explanation. Three weeks after an FOMC meeting, the full minutes are published.

The Role of Congress Congress plays no role in making monetary policy decisions but the Federal Reserve Act requires the Board of Governors to report on monetary policy to Congress. The Fed makes two reports each year, one in February and another in July. These reports and the Fed chairman's testimony before Congress along with the minutes of the FOMC communicate the Fed's thinking on monetary policy to lawmakers and the public.

The Role of the President The formal role of the president of the United States is limited to appointing the members and the chairman of the Board of Governors. But some presidents—Richard Nixon was one—have tried to influence Fed decisions.

You now know the objectives of monetary policy and can describe the framework and assignment of responsibility for achieving those objectives. Your next task is to see how the Federal Reserve conducts its monetary policy.

REVIEW QUIZ

1. What are the objectives of monetary policy?
2. Are the goals of monetary policy in harmony or in conflict (a) in the long run and (b) in the short run?
3. What is the core inflation rate and how does it differ from the overall CPI inflation rate?
4. Who is responsible for U.S. monetary policy?

You can work these questions in Study Plan 14.1 and get instant feedback. myeconlab

The Conduct of Monetary Policy

How does the Fed conduct its monetary policy? This question has two parts:

- What is the monetary policy instrument?
- How does the Fed make its policy decisions?

The Monetary Policy Instrument

A **monetary policy instrument** is a variable that the Fed can directly control or at least very closely target. The Fed has two possible instruments: the monetary base or the interest rate at which banks borrow and lend monetary base overnight.

The Fed's choice of monetary policy instrument is the interest rate at which the banks make overnight loans to each other. The market in which the banks borrow and lend overnight is called the *federal funds market* and the interest rate in that market is called the **federal funds rate**.

Figure 14.2 shows the federal funds rate since 2000. You can see that the federal funds rate ranges between a high of 6.5 percent a year and a low of 0.2 percent a year. In 2000 and 2006, when the federal funds rate was high, the Fed's actions were aimed at lowering the inflation rate.

Between 2002 and 2004 and again in and since 2008, the federal funds rate was set at historically low levels. During these years, inflation was well anchored at close to or below 2 percent a year, and the Fed was less concerned about inflation than it was about recession and high unemployment. So the Fed set a low interest rate to fight recession.

Although the Fed can change the federal funds rate by any (reasonable) amount that it chooses, it normally changes the federal funds rate by only a quarter of a percentage point.[2]

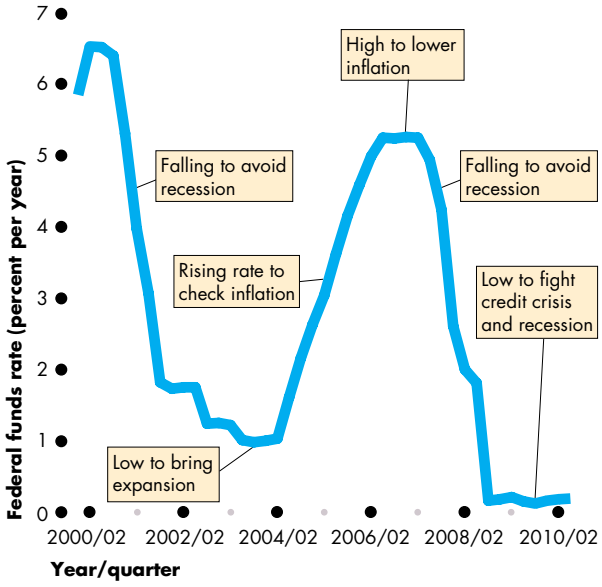
Having decided the appropriate level for the federal funds rate, how does the Fed move the rate to its target level? The answer is by using open-market operations (see pp. 191–193) to adjust the quantity of monetary base.

To see how an open market operation changes the federal funds rate, we need to examine the federal funds market and the market for bank reserves.

In the federal funds market, the higher the federal funds rate, the greater is the quantity of overnight

[2] A quarter of a percentage point is also called 25 *basis points*. A basis point is one hundredth of one percentage point.

FIGURE 14.2 The Federal Funds Rate



The Fed sets a target for the federal funds rate and then takes actions to keep the rate close to its target. When the Fed wants to slow inflation, it takes actions that raise the federal funds rate. When inflation is low and the Fed wants to avoid recession, it takes actions that lower the federal funds rate.

Source of data: Board of Governors of the Federal Reserve System.

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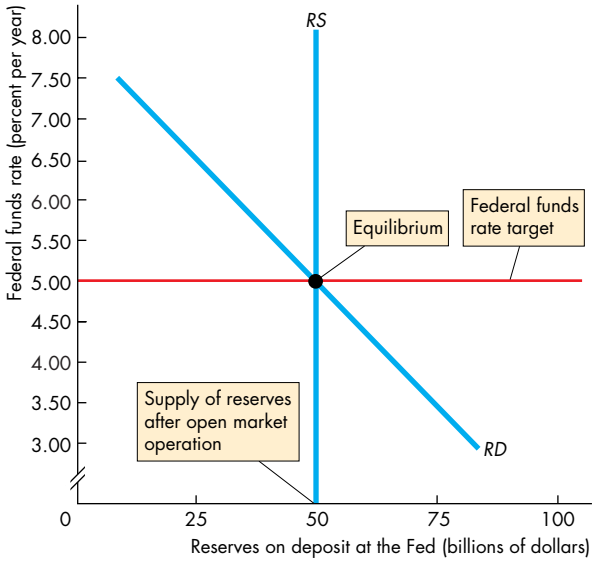
FIGURE 14.3 The Market for Reserves



The demand curve for reserves is *RD*. The quantity of reserves demanded decreases as the federal funds rate rises because the federal funds rate is the opportunity cost of holding reserves. The supply curve of reserves is *RS*. The Fed uses open market operations to make the quantity of reserves supplied equal the quantity of reserves demanded ($50 billion in this case) at the federal funds rate target (5 percent a year in this case).

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loans supplied and the smaller is the quantity of overnight loans demanded. The equilibrium federal funds rate balances the quantities demanded and supplied.

An equivalent way of looking at the forces that determine the federal funds rate is to consider the demand for and supply of bank reserves. Banks hold reserves to meet the required reserve ratio and so that they can make payments. But reserves are costly to hold because they can be loaned in the federal funds market and earn the federal funds rate. So the higher the federal funds rate, the smaller is the quantity of reserves demanded.

Figure 14.3 illustrates the demand for bank reserves. The *x*-axis measures the quantity of reserves that banks hold on deposit at the Fed, and the *y*-axis measures the federal funds rate. The demand for reserves is the curve labeled *RD*.

The Fed's open market operations determine the supply of reserves, which is shown by the supply curve *RS*. Equilibrium in the market for bank reserves determines the federal funds rate where the quantity of reserves demanded by the banks equals the quantity of reserves supplied by the Fed. By using open market operations, the Fed adjusts the supply of reserves to keep the federal funds rate on target.

Next, we see how the Fed makes it policy decisions.

The Fed's Decision-Making Strategy

The Fed's decision making begins with the *Beige Book* exercise described in *Economics in Action* on the next page. The Fed then turns to forecasting three key variables: the inflation rate, the unemployment rate, and the output gap.

Inflation Rate The Fed's forecasts of the inflation rate are a crucial ingredient in its interest rate decision. If inflation is above or is expected to move above the top of the comfort zone, the Fed considers raising the

Economics in Action

FOMC Decision Making

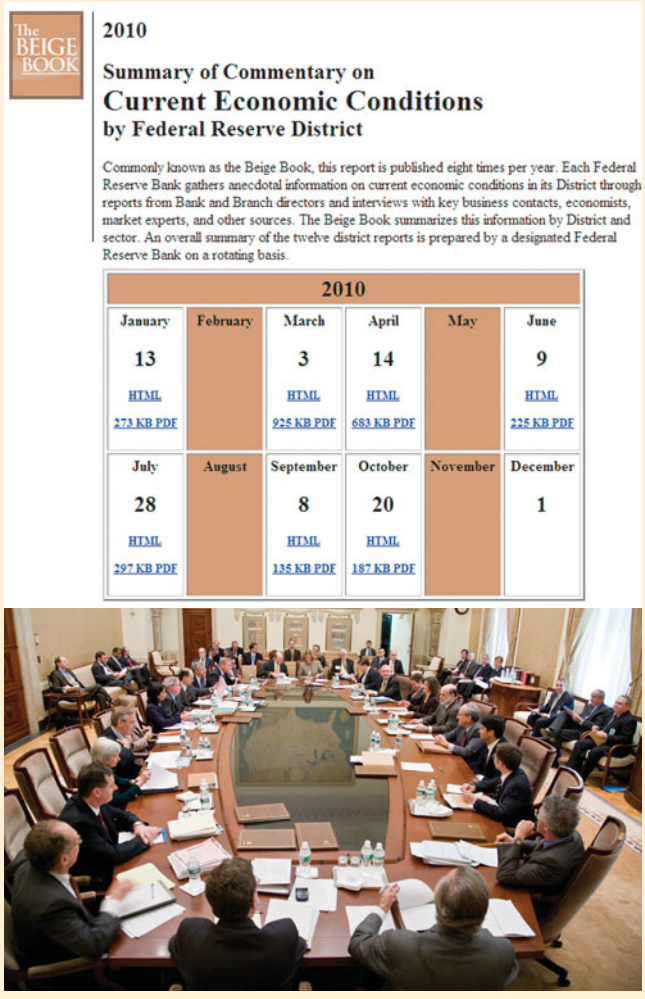
The Fed's decision making begins with an intensive assessment of the current state of the economy, which is conducted by the Federal Reserve districts and summarized in the *Beige Book*. Today, the Beige Book is a web posting at http://www.federalreserve.gov/FOMC/BeigeBook/ (see picture opposite).

The FOMC then turns its attention to the likely near-future evolution of the economy and the interest rate change that will keep inflation in check and the economy expanding at close to full employment. In making this assessment, the FOMC pays close attention to the inflation rate, the unemployment rate, and the output gap.

Balancing the signals that it gets from monitoring the three main features of macroeconomic performance, the FOMC meets in its imposing room (see photo opposite) and makes a decision on whether to change is federal funds rate target and if so, what the new target should be.

Having decided on the appropriate target for the federal funds rate, the FOMC instructs the New York Fed to conduct open market operations aimed at hitting the federal funds rate target.

If the goal is to raise the federal funds rate, the New York Fed sells securities in the open market. If the goal is to lower the federal funds rate, the New York Fed buys securities in the open market.



federal funds rate target; and if inflation is below or is expected to move below the bottom of the comfort zone, it considers lowering the interest rate.

Unemployment Rate The Fed monitors and forecasts the unemployment rate and its relation to the natural unemployment rate (see pp. 113–115). If the unemployment rate is below the natural rate, a labor shortage might put upward pressure on wage rates, which might feed through to increase the inflation rate. So a higher interest rate might be called for. If the unemployment rate is above the natural rate, a lower inflation rate is expected, which indicates the need for a lower interest rate.

Output Gap The Fed monitors and forecasts real GDP and potential GDP and the gap between them, the *output gap* (see pp. 252–253). If the output gap is positive, an *inflationary gap*, the inflation rate will most likely accelerate, so a higher interest rate might be required. If the output gap is negative, a *recessionary gap*, inflation might ease, which indicates room to lower the interest rate.

We next look at the transmission of monetary policy and see how it achieves its goals.

REVIEW QUIZ

1 What is the Fed's monetary policy instrument?
2 How is the federal funds rate determined in the market for reserves?
3 What are the main influences on the FOMC federal funds rate decision?

You can work these questions in Study Plan 14.2 and get instant feedback. myeconlab

Monetary Policy Transmission

You've seen that the Fed's goal is to keep the price level stable (keep the inflation rate around 2 percent a year) and to achieve maximum employment (keep the output gap close to zero). And you've seen how the Fed can use its power to set the federal funds rate at its desired level. We're now going to trace the events that follow a change in the federal funds rate and see how those events lead to the ultimate policy goal. We'll begin with a quick overview of the transmission process and then look at each step a bit more closely.

Quick Overview

When the Fed lowers the federal funds rate, other short-term interest rates and the exchange rate also fall. The quantity of money and the supply of loanable funds increase. The long-term real interest rate falls. The lower real interest rate increases consumption expenditure and investment. And the lower exchange rate makes U.S. exports cheaper and imports more costly, so net exports increase. Easier bank loans reinforce the effect of lower interest rates on aggregate expenditure. Aggregate demand increases, which increases real GDP and the price level relative to what they would have been. Real GDP growth and inflation speed up.

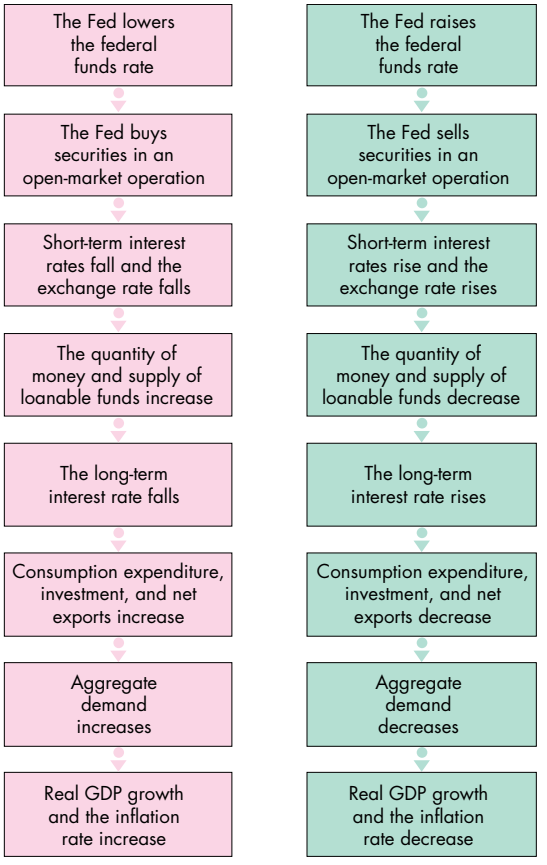
When the Fed raises the federal funds rate, as the sequence of events that we've just reviewed plays out, the effects are in the opposite directions.

Figure 14.4 provides a schematic summary of these ripple effects for both a cut and a rise in the federal funds rate.

These ripple effects stretch out over a period of between one and two years. The interest rate and exchange rate effects are immediate. The effects on money and bank loans follow in a few weeks and run for a few months. Real long-term interest rates change quickly and often in anticipation of the short-term interest rate changes. Spending plans change and real GDP growth changes after about one year. The inflation rate changes between one year and two years after the change in the federal funds rate. But these time lags are not entirely predictable and can be longer or shorter.

We're going to look at each stage in the transmission process, starting with the interest rate effects.

FIGURE 14.4 The Ripple Effects of a Change in the Federal Funds Rate



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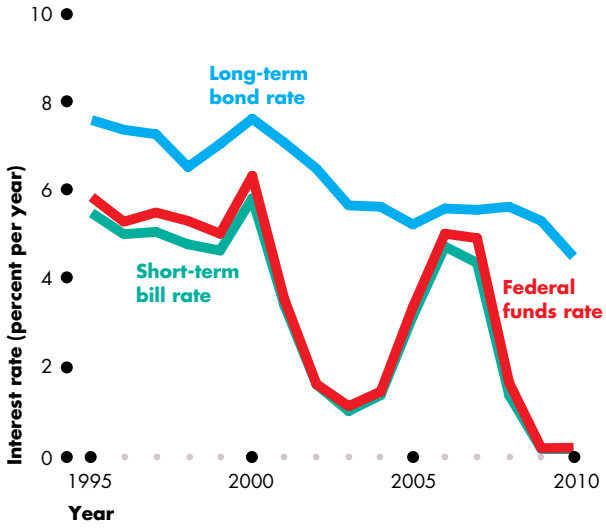
Interest Rate Changes

The first effect of a monetary policy decision by the FOMC is a change in the federal funds rate. Other interest rates then change. These interest rate effects occur quickly and relatively predictably.

Figure 14.5 shows the fluctuations in three interest rates: the federal funds rate, the short-term bill rate, and the long-term bond rate.

Federal Funds Rate As soon as the FOMC announces a new setting for the federal funds rate, the New York Fed undertakes the necessary open market operations to hit the target. There is no doubt about where the interest rate changes shown in Fig. 14.5 are generated. They are driven by the Fed's monetary policy.

FIGURE 14.5 Three Interest Rates



The short-term interest rates—the federal funds rate and the short-term bill rate—move closely together. The long-term bond rate is higher than the short-term rates, and it fluctuates less than the short-term rates.

Source of data: Board of Governors of the Federal Reserve System.

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Short-Term Bill Rate The short-term bill rate is the interest rate paid by the U.S. government on 3-month Treasury bills. It is similar to the interest rate paid by U.S. businesses on short-term loans. Notice how closely the short-term bill rate follows the federal funds rate. The two rates are almost identical.

A powerful substitution effect keeps these two interest rates close. Commercial banks have a choice about how to hold their short-term liquid assets, and an overnight loan to another bank is a close substitute for short-term securities such as Treasury bills. If the interest rate on Treasury bills is higher than the federal funds rate, the quantity of overnight loans supplied decreases and the demand for Treasury bills increases. The price of Treasury bills rises and the interest rate falls.

Similarly, if the interest rate on Treasury bills is lower than the federal funds rate, the quantity of overnight loans supplied increases and the demand for Treasury bills decreases. The price of Treasury bills falls, and the interest rate rises.

When the interest rate on Treasury bills is close to the federal funds rate, there is no incentive for a bank to switch between making an overnight loan and buying Treasury bills. Both the Treasury bill market and the federal funds market are in equilibrium.

The Long-Term Bond Rate The long-term bond rate is the interest rate paid on bonds issued by large corporations. It is this interest rate that businesses pay on the loans that finance their purchase of new capital and that influences their investment decisions.

Two features of the long-term bond rate stand out: It is higher than the short-term rates, and it fluctuates less than the short-term rates.

The long-term interest rate is higher than the two short-term rates because long-term loans are riskier than short-term loans. To provide the incentive that brings forth a supply of long-term loans, lenders must be compensated for the additional risk. Without compensation for the additional risk, only short-term loans would be supplied.

The long-term interest rate fluctuates less than the short-term rates because it is influenced by expectations about future short-term interest rates as well as current short-term interest rates. The alternative to borrowing or lending long term is to borrow or lend using a sequence of short-term securities. If the long-term interest rate exceeds the expected average of future short-term interest rates, people will lend long term and borrow short term. The long-term interest rate will fall. And if the long-term interest rate is below the expected average of future short-term interest rates, people will borrow long term and lend short term. The long-term interest rate will rise.

These market forces keep the long-term interest rate close to the expected average of future short-term interest rates (plus a premium for the extra risk associated with long-term loans). The expected average future short-term interest rate fluctuates less than the current short-term interest rate.

Exchange Rate Fluctuations

The exchange rate responds to changes in the interest rate in the United States relative to the interest rates in other countries—*the U.S. interest rate differential*. We explain this influence in Chapter 9 (see p. 217).

When the Fed raises the federal funds rate, the U.S. interest rate differential rises and, other things remain-

ing the same, the U.S. dollar appreciates, and when the Fed lowers the federal funds rate, the U.S. interest rate differential falls and, other things remaining the same, the U.S. dollar depreciates.

Many factors other than the U.S. interest rate differential influence the exchange rate, so when the Fed changes the federal funds rate, the exchange rate does not usually change in exactly the way it would with other things remaining the same. So while monetary policy influences the exchange rate, many other factors also make the exchange rate change.

Money and Bank Loans

The quantity of money and bank loans change when the Fed changes the federal funds rate target. A rise in the federal funds rate decreases the quantity of money and bank loans, and a fall in the federal funds rate increases the quantity of money and bank loans. These changes occur for two reasons: The quantity of deposits and loans created by the banking system changes and the quantity of money demanded changes.

You've seen that to change the federal funds rate, the Fed must change the quantity of bank reserves. A change in the quantity of bank reserves changes the monetary base, which in turn changes the quantity of deposits and loans that the banking system can create. A rise in the federal funds rate decreases reserves and decreases the quantity of deposits and bank loans created; and a fall in the federal funds rate increases reserves and increases the quantity of deposits and bank loans created.

The quantity of money created by the banking system must be held by households and firms. The change in the interest rate changes the quantity of money demanded. A fall in the interest rate increases the quantity of money demanded, and a rise in the interest rate decreases the quantity of money demanded.

A change in the quantity of money and the supply of bank loans directly affects consumption and investment plans. With more money and easier access to loans, consumers and firms spend more. With less money and loans harder to get, consumers and firms spend less.

The Long-Term Real Interest Rate

Demand and supply in the market for loanable funds determine the long-term *real interest rate*, which equals the long-term *nominal* interest rate minus the expected inflation rate. The long-term real interest rate influences expenditure decisions.

In the long run, demand and supply in the loanable funds market depend only on real forces—on saving and investment decisions. But in the short run, when the price level is not fully flexible, the supply of loanable funds is influenced by the supply of bank loans. Changes in the federal funds rate change the supply of bank loans, which changes the supply of loanable funds and changes the interest rate in the loanable funds market.

A fall in the federal funds rate that increases the supply of bank loans increases the supply of loanable funds and lowers the equilibrium real interest rate. A rise in the federal funds rate that decreases the supply of bank loans decreases the supply of loanable funds and raises the equilibrium real interest rate.

These changes in the real interest rate, along with the other factors we've just described, change expenditure plans.

Expenditure Plans

The ripple effects that follow a change in the federal funds rate change three components of aggregate expenditure:

- Consumption expenditure
- Investment
- Net exports

Consumption Expenditure Other things remaining the same, the lower the real interest rate, the greater is the amount of consumption expenditure and the smaller is the amount of saving.

Investment Other things remaining the same, the lower the real interest rate, the greater is the amount of investment.

Net Exports Other things remaining the same, the lower the interest rate, the lower is the exchange rate and the greater are exports and the smaller are imports.

So eventually, a cut in the federal funds rate increases aggregate expenditure and a rise in the federal funds rate curtails aggregate expenditure. These changes in aggregate expenditure plans change aggregate demand, real GDP, and the price level.

The Change in Aggregate Demand, Real GDP, and the Price Level

The final link in the transmission chain is a change in aggregate demand and a resulting change in real GDP and the price level. By changing real GDP and the price level relative to what they would have been without a change in the federal funds rate, the Fed influences its ultimate goals: the inflation rate and the output gap.

The Fed Fights Recession

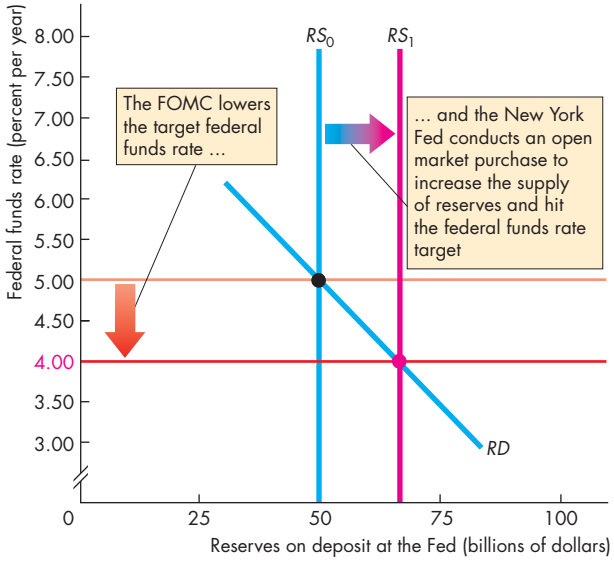
If inflation is low and real GDP is below potential GDP, the Fed takes actions that are designed to restore full employment. Figure 14.6 shows the effects of the Fed's actions, starting in the market for bank reserves and ending in the market for real GDP.

Market for Bank Reserves In Fig. 14.6(a), which shows the market for bank reserves, the FOMC lowers the target federal funds rate from 5 percent to 4 percent a year. To achieve the new target, the New York Fed buys securities and increases the supply of reserves of the banking system from RS_0 to RS_1.

Money Market With increased reserves, the banks create deposits by making loans and the supply of money increases. The short-term interest rate falls and the quantity of money demanded increases. In Fig. 14.6(b), the supply of money increases from MS_0 to MS_1, the interest rate falls from 5 percent to 4 percent a year, and the quantity of money increases from $3 trillion to $3.1 trillion. The interest rate in the money market and the federal funds rate are kept close to each other by the powerful substitution effect described on p. 354.

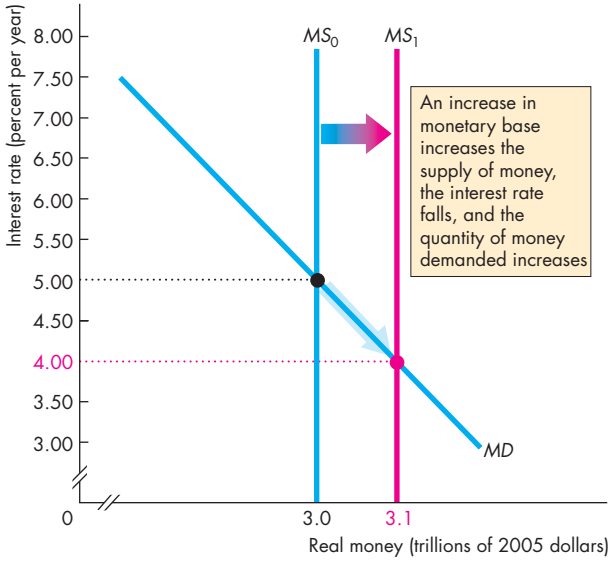
Loanable Funds Market Banks create money by making loans. In the long run, an increase in the supply of bank loans is matched by a rise in the price level and the quantity of *real* loans is unchanged. But in the short run, with a sticky price level, an increase in the supply of bank loans increases the supply of (real) loanable funds.

FIGURE 14.6 The Fed Fights Recession



(a) The market for bank reserves

In part (a), the FOMC lowers the federal funds rate target from 5 percent to 4 percent. The New York Fed buys securities in an open market operation and increases the supply of reserves from RS_0 to RS_1 to hit the new federal funds rate target.



(b) Money market

In part (b), the supply of money increases from MS_0 to MS_1, the short-term interest rate falls, and the quantity of money demanded increases. The short-term interest rate and the federal funds rate change by similar amounts.

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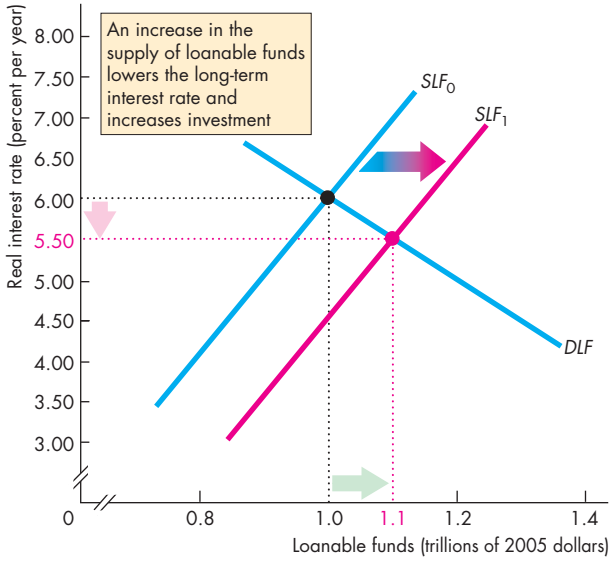
In Fig. 14.6(c), the supply of loanable funds curve shifts rightward from SLF_0 to SLF_1. With the demand for loanable funds at *DLF*, the real interest rate falls from 6 percent to 5.5 percent a year. (We're assuming a zero inflation rate so that the real interest rate equals the nominal interest rate.) The long-term interest rate changes by a smaller amount than the change in the short-term interest rate for the reason explained on p. 760.

The Market for Real GDP Figure 14.6(d) shows aggregate demand and aggregate supply—the demand for and supply of real GDP. Potential GDP is $13 trillion, where *LAS* is located. The short-run aggregate supply curve is *SAS*, and initially, the aggregate demand curve is AD_0. Real GDP is $12.8 trillion, which is less than potential GDP, so there is a recessionary gap. The Fed is reacting to this recessionary gap.

The increase in the supply of loans and the decrease in the real interest rate increase aggregate planned expenditure. (Not shown in the figure, a fall in the interest rate lowers the exchange rate, which increases net exports and aggregate planned expenditure.) The increase in aggregate expenditure, ΔE, increases aggregate demand and shifts the aggregate demand curve rightward to $AD_0 + \Delta E$. A multiplier process begins. The increase in expenditure increases income, which induces an increase in consumption expenditure. Aggregate demand increases further, and the aggregate demand curve eventually shifts rightward to AD_1.

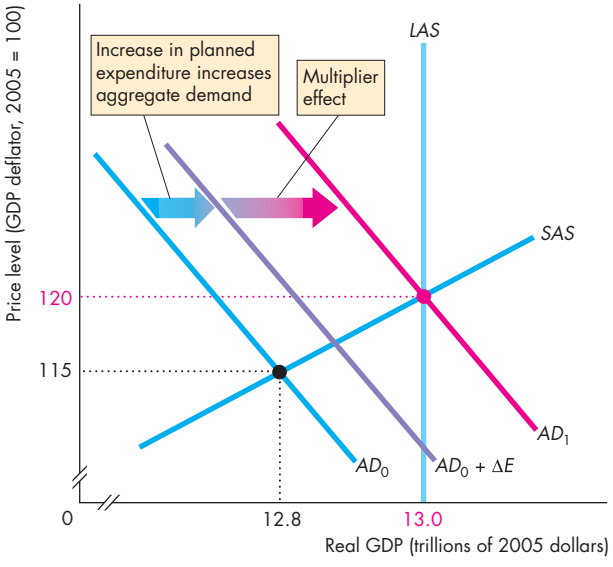
The new equilibrium is at full employment. Real GDP is equal to potential GDP. The price level rises to 120 and then becomes stable at that level. So after a one-time adjustment, there is price stability.

In this example, we have given the Fed a perfect hit at achieving full employment and keeping the price level stable. It is unlikely that the Fed would be able to achieve the precision of this example. If the Fed stimulated demand by too little and too late, the economy would experience a recession. And if the Fed hit the gas pedal too hard, it would push the economy from recession to inflation.



(c) The market for loanable funds

In part (c), an increase in the supply of bank loans increases the supply of loanable funds and shifts the supply curve from SLF_0 to SLF_1. The real interest rate falls and investment increases.



(d) Real GDP and the price level

In part (d), the increase in investment increases aggregate planned expenditure. The aggregate demand curve shifts to $AD_0 + \Delta E$ and eventually it shifts rightward to AD_1. Real GDP increases to potential GDP, and the price level rises.

The Fed Fights Inflation

If the inflation rate is too high and real GDP is above potential GDP, the Fed takes actions that are designed to lower the inflation rate and restore price stability. Figure 14.7 shows the effects of the Fed's actions starting in the market for reserves and ending in the market for real GDP.

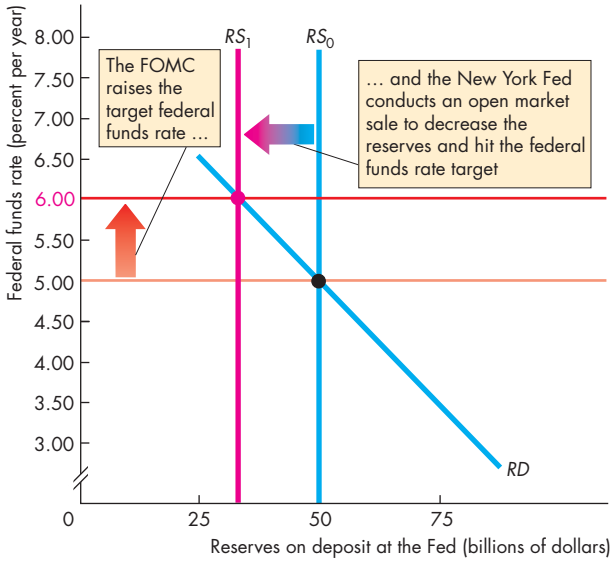
Market for Bank Reserves In Fig. 14.7(a), which shows the market for bank reserves, the FOMC raises the target federal funds rate from 5 percent to 6 percent a year. To achieve the new target, the New York Fed sells securities and decreases the supply of reserves of the banking system from RS_0 to RS_1.

Money Market With decreased reserves, the banks shrink deposits by decreasing loans and the supply of money decreases. The short-term interest rate rises and the quantity of money demanded decreases. In Fig. 14.7(b), the supply of money decreases from MS_0 to MS_1, the interest rate rises from 5 percent to 6 percent a year, and the quantity of money decreases from $3 trillion to $2.9 trillion.

Loanable Funds Market With a decrease in reserves, banks must decrease the supply of loans. The supply of (real) loanable funds decreases, and the supply of loanable funds curve shifts leftward in Fig. 14.7(c) from SLF_0 to SLF_1. With the demand for loanable funds at *DLF*, the real interest rate rises from 6 percent to 6.5 percent a year. (Again, we're assuming a zero inflation rate so that the real interest rate equals the nominal interest rate.)

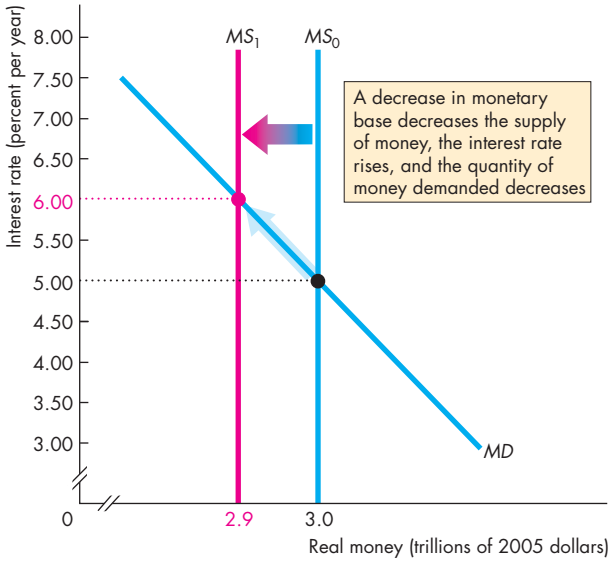
The Market for Real GDP Figure 14.7(d) shows aggregate demand and aggregate supply in the market for real GDP. Potential GDP is $13 trillion where *LAS* is located. The short-run aggregate supply curve is *SAS* and initially the aggregate demand is AD_0. Now, real GDP is $13.2 trillion, which is greater than potential GDP, so there is an inflationary gap. The Fed is reacting to this inflationary gap.

FIGURE 14.7 The Fed Fights Inflation



(a) The market for bank reserves

In part (a), the FOMC raises the federal funds rate from 5 percent to 6 percent. The New York Fed sells securities in an open market operation to decrease the supply of reserves from RS_0 to RS_1 and hit the new federal funds rate target.



(b) Money market

In part (b), the supply of money decreases from MS_0 to MS_1, the short-term interest rate rises, and the quantity of money demanded decreases. The short-term interest rate and the federal funds rate change by similar amounts.

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The increase in the short-term interest rate, the decrease in the supply of bank loans, and the increase in the real interest rate decrease aggregate planned expenditure. (Not shown in the figures, a rise in the interest rate raises the exchange rate, which decreases net exports and aggregate planned expenditure.)

The decrease in aggregate expenditure, ΔE, decreases aggregate demand and shifts the aggregate demand curve to $AD_0 - \Delta E$. A multiplier process begins. The decrease in expenditure decreases income, which induces a decrease in consumption expenditure. Aggregate demand decreases further, and the aggregate demand curve eventually shifts leftward to AD_1.

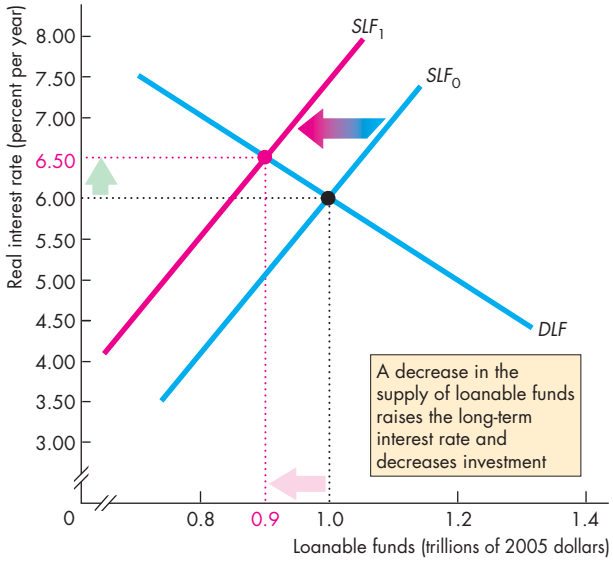
The economy returns to full employment. Real GDP is equal to potential GDP. The price level falls to 120 and then becomes stable at that level. So after a one-time adjustment, there is price stability.

Again, in this example, we have given the Fed a perfect hit at achieving full employment and keeping the price level stable. If the Fed decreased aggregate demand by too little and too late, the economy would have remained with an inflationary gap and the inflation rate would have moved above the rate that is consistent with price stability. And if the Fed hit the brakes too hard, it would push the economy from inflation to recession.

Loose Links and Long and Variable Lags

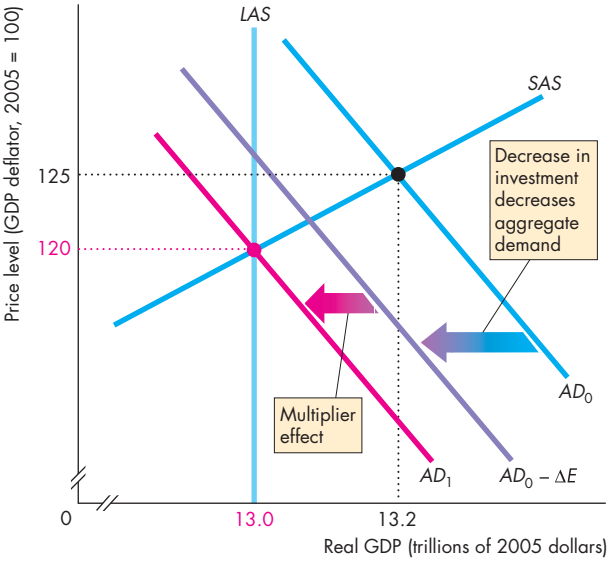
The ripple effects of monetary policy that we've just analyzed with the precision of an economic model are, in reality, very hard to predict and anticipate.

To achieve price stability and full employment, the Fed needs a combination of good judgment and good luck. Too large an interest rate cut in an underemployed economy can bring inflation, as it did during the 1970s. And too large an interest rate rise in an inflationary economy can create unemployment, as it did in 1981 and 1991. Loose links between the federal funds rate and the ultimate policy goals make unwanted outcomes inevitable and long and variable time lags add to the Fed's challenges.



(c) The market for loanable funds

In part (c), a decrease in the supply of bank loans decreases the supply of loanable funds and the supply curve shifts from SLF_0 to SLF_1. The real interest rate rises and investment decreases.



(d) Real GDP and the price level

In part (d), the decrease in investment decreases aggregate planned expenditure. Aggregate demand decreases and the *AD* curve shifts leftward from AD_0 to AD_1. Real GDP decreases to potential GDP, and the price level falls.

Economics in Action

A View of the Long and Variable Lag

You've studied the theory of monetary policy. Does it really work in the way we've described? It does, and the figure opposite provides some evidence to support this claim.

The blue line in the figure is the federal funds rate that the Fed targets *minus* the long-term bond rate. (When the long-term bond rate exceeds the federal funds rate, this gap is negative.)

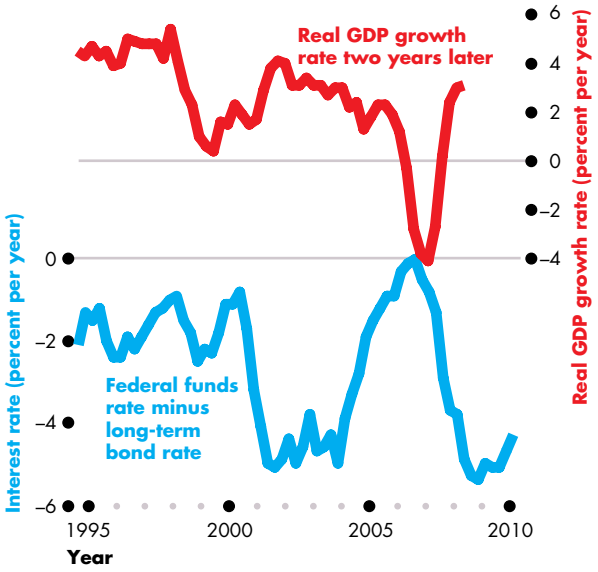
We can view the gap between the federal funds rate and the long-term bond rate as a measure of how hard the Fed is trying to steer a change in course.

When the Fed is more concerned about recession than inflation and is trying to stimulate real GDP growth, it cuts the federal funds rate target and the gap between the long-term bond rate and the federal funds rate widens.

When the Fed is more concerned about inflation than recession and is trying to restrain real GDP growth, it raises the federal funds rate target and the gap between the long-term bond rate and the federal funds rate narrows.

The red line in the figure is the real GDP growth rate *two years later.* You can see that when the FOMC raises the federal funds rate, the real GDP growth rate slows two years later. And when the Fed lowers the federal funds rate, the real GDP growth rate speeds up two years later.

Not shown in the figure, the inflation rate increases and decreases corresponding to the fluctuations in the real GDP growth rate. But the effects on the inflation rate take even longer and are not as strong as the effects on the real GDP growth rate.



Interest Rates and Real GDP Growth

Sources of data: Interest rates, see Fig. 14.5; real GDP growth rate, Bureau of Economic Analysis.

Loose Link from Federal Funds Rate to Spending

The real long-term interest rate that influences spending plans is linked only loosely to the federal funds rate. Also, the response of the *real* long-term interest rate to a change in the nominal interest rate depends on how inflation expectations change. And the response of expenditure plans to changes in the real interest rate depend on many factors that make the response hard to predict.

Time Lags in the Adjustment Process The Fed is especially handicapped by the fact that the monetary policy transmission process is long and drawn out. Also, the economy does not always respond in exactly the same way to a policy change. Further, many factors other than policy are constantly changing and bringing new situations to which policy must respond.

REVIEW QUIZ

1. Describe the channels by which monetary policy ripples through the economy and explain how each channel operates.
2. Do interest rates fluctuate in response to the Fed's actions?
3. How do the Fed's actions change the exchange rate?
4. How do the Fed's actions influence real GDP and how long does it take for real GDP to respond to the Fed's policy changes?
5. How do the Fed's actions influence the inflation rate and how long does it take for inflation to respond to the Fed's policy changes?

You can work these questions in Study Plan 14.3 and get instant feedback.

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Extraordinary Monetary Stimulus

During the financial crisis and recession of 2008–2009, the Fed lowered the federal funds rate target to the floor. The rate can't go below zero, so what can the Fed do to stimulate the economy when it can't lower the interest rate any further?

The Fed has answered this question with some extraordinary policy actions. To understand those actions, we need to dig a bit into the anatomy of the financial crisis to which the Fed is responding. That's what we'll now do. We'll look at the key elements in the financial crisis and then look at the Fed's response.

The Key Elements of the Crisis

We can describe the crisis by identifying the events that changed the values of the assets and liabilities of banks and other financial institutions.

Figure 14.8 shows the stylized balance sheet of a bank: deposits plus equity equals reserves plus loans and securities (see Chapter 8, p. 188). Deposits and own capital —equity—are the bank's sources of funds (other borrowing by banks is ignored here). Deposits are the funds loaned to the bank by households and firms. Equity is the capital provided by the bank's stockholders and includes the bank's undistributed profits (and losses). The bank's reserves are currency and its deposit at the Fed. The bank's loans and securities are the loans made by the bank and government bonds, private bonds, asset-backed bonds, and other securities that the bank holds.

Three main events can put a bank under stress:

1. Widespread fall in asset prices
2. A significant currency drain
3. A run on the bank

Figure 14.8 summarizes the problems that each event presents to a bank. A widespread fall in asset prices means that the bank suffers a *capital loss*. It must write down the value of its assets and the value of the bank's equity decreases by the same amount as the fall in the value of its securities. If the fall in asset prices is large enough, the bank's equity might fall to zero, in which case the bank is insolvent. It fails.

A significant currency drain means that depositors withdraw funds and the bank loses reserves. This event puts the bank in a liquidity crisis. It is short of cash reserves.

A run on the bank occurs when depositors lose confidence in the bank and massive withdrawals of deposits occur. The bank loses reserves and must call in loans and sell off securities at unfavorable prices. Its equity shrinks.

The red arrows in Fig. 14.8 summarize the effects of these events and the problems they brought in the 2007–2008 financial crisis. A widespread fall in asset prices was triggered by the bursting of a house-price bubble that saw house prices switch from rapidly rising to falling. With falling house prices, sub-prime mortgage defaults occurred and the prices of mortgage-backed securities and derivatives whose values are based on these securities began to fall.

People with money market mutual fund deposits began to withdraw them, which created a fear of a massive withdrawal of these funds analagous to a run on a bank. In the United Kingdom, one bank, Northern Rock, experienced a bank run.

With low reserves and even lower equity, banks turned their attention to securing their balance sheets and called in loans. The loanable funds market and money market dried up.

Because the loanable funds market is global, the same problems quickly spread to other economies, and foreign exchange markets became highly volatile.

Hard-to-get loans, market volatility, and increased uncertainty transmitted the financial and monetary crisis to real expenditure decisions.

FIGURE 14.8 The Ingredients of a Financial and Banking Crisis

Event	Deposits	+	Equity	=	Reserves	+	Loans and securities	*Problem*
Widespread fall in asset prices			▼				▼	Solvency
Currency drain	▼				▼			Liquidity
Run on bank	▼		▼		▼		▼	Liquidity and solvency

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The Policy Actions

Policy actions in response to the financial crisis dribbled out over a period of more than a year. But by November 2008, eight groups of policies designed to contain the crisis and minimize its impact on the real economy were in place. Figure 14.9 summarizes them, describes their effects on a bank's balance sheet (red and blue arrows), and identifies the problem that each action sought to address.

An open market operation is the classic policy (see pp. 191–192) for providing liquidity and enabling the Fed to hit its interest rate target. With substantial interest rate cuts, open market operations were used on a massive scale to keep the banks well supplied with reserves. This action lowered bank holdings of securities and increased their reserves.

By extending deposit insurance (see p. 188), the FDIC gave depositors greater security and less incentive to withdraw their bank deposits. This action increased both deposits and reserves.

Three actions by the Fed provided additional liquidity in exchange for troubled assets. Term auction credit, primary dealer and broker credit, and the asset-backed commercial paper money market mutual fund liquidity facility enabled institutions to swap troubled assets for reserves or safer assets. All of these actions decreased bank holdings of securities and increased reserves.

The Troubled Asset Relief Program (TARP) was an action by the U.S. Treasury, so technically it isn't a monetary policy action, but it has a direct impact on banks and other financial institutions. The program was funded by $700 billion of national debt.

The original intent (we'll call it TARP 1) was for the U.S. Treasury to buy troubled assets from banks and other holders and replace them with U.S. government securities. Implementing this program proved more difficult than initially anticipated and the benefits of the action came to be questioned.

So instead of buying troubled assets, the Treasury decided to buy equity stakes in troubled institutions (we'll call it TARP 2). This action directly increased the institutions reserves and equity.

The final action was neither monetary policy nor fiscal policy but a change in accounting standards. It relaxed the requirement for institutions to value their assets at current market value—called "mark-to-market"—and permitted them, in rare conditions, to use a model to assess "fair market value."

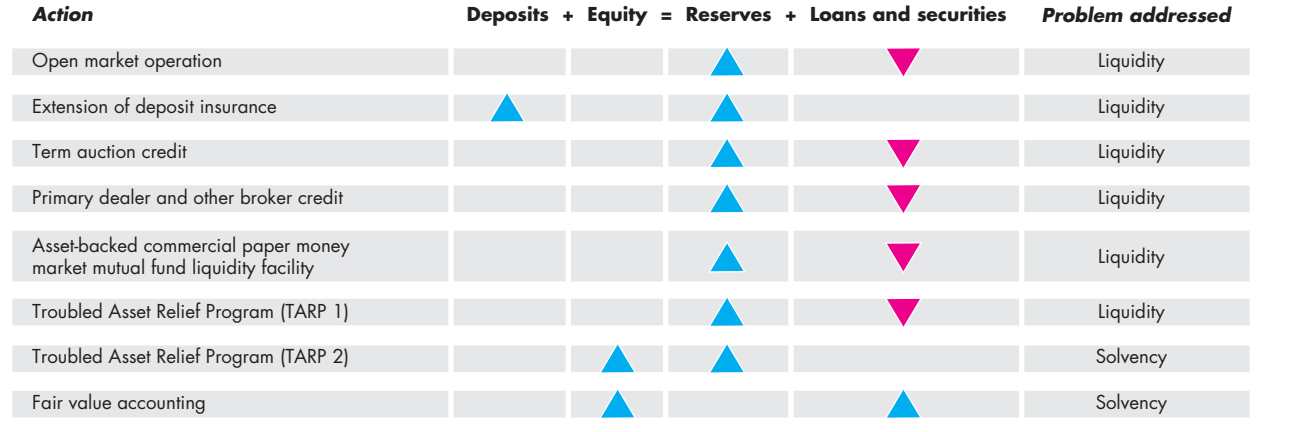
Taken as a whole, a huge amount of relief was thrown at the financial crisis but the economy continued to perform poorly through 2009 and 2010.

Persistently Slow Recovery

Despite extraordinary monetary (and fiscal) stimulus, at the end of 2010, the U.S. economy remained stuck with slow real GDP growth and an unemployment rate close to 10 percent. Why?

No one knows for sure, but the Fed's critics say that the Fed itself contributed to the problem more than to the solution. That problem is extreme uncertainty about the future that is keeping business investment low. Critics emphasize the need for greater clarity about monetary policy *strategy*. We'll conclude this review of monetary policy by looking at two suggested policy strategies.

FIGURE 14.9 Policy Actions in a Financial and Banking Crisis



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Policy Strategies and Clarity

Two alternative approaches to monetary policy have been suggested and one of them has been used in other countries. They are

- Inflation rate targeting
- Taylor rule

Inflation Rate Targeting A monetary policy strategy in which the central bank makes a public commitment to achieve an explicit inflation target and explain how its policy actions will achieve it is called **inflation rate targeting**. Australia, Canada, New Zealand, Sweden, the United Kingdom, and the European Union have been targeting inflation since the 1990s.

Inflation targeting focuses the public debate on what monetary policy can achieve and the best contribution it can make to attaining full employment and sustained growth. The central fact is that monetary policy is about managing inflation expectations. An explicit inflation target that is taken seriously and toward which policy actions are aimed and explained is a sensible way to manage those expectations.

It is when the going gets tough that inflation targeting has the greatest benefit. It is difficult to imagine a serious inflation-targeting central bank permitting inflation to take off in the way that it did during the 1970s. And it is difficult to imagine deflation and ongoing recession such as Japan has endured for the past 10 years if monetary policy is guided by an explicit inflation target.

Taylor Rule One way to pursue an inflation target is to set the policy interest rate (for the Fed, the federal funds rate) by using a rule or formula. The most famous and most studied interest rate rule is the *Taylor rule* described in *Economics in Action*.

Supporters of the Taylor rule argue that in computer simulations, the rule works well and limits fluctuations in inflation and output. By using such a rule, monetary policy contributes toward lessening uncertainty—the opposite of current monetary policy. In financial markets, labor markets, and markets for goods and services, people make long-term commitments. So markets work best when plans are based on correctly anticipated inflation. A well-understood monetary policy helps to create an environment in which inflation is easier to forecast and manage.

The debates on inflation targeting and the Taylor rule will continue!

Economics in Action

The Taylor Rule

The *Taylor rule* is a formula for setting the federal funds rate. Calling the federal funds rate *FFR*, the inflation rate *INF*, and the output gap *GAP* (all percentages), the Taylor rule formula is

$$FFR = 2 + INF + 0.5(INF - 2) + 0.5GAP.$$

In words, the Taylor rule sets the federal funds rate at 2 percent plus the inflation rate plus one half of the deviation of inflation from 2 percent, plus one half of the output gap.

Stanford University economist John B. Taylor, who devised this rule, says inflation and real GDP would fluctuate much less if the FOMC were to use it—the Taylor rule beats the FOMC's historical performance.

The Taylor rule implies that the Fed caused the boom and bust of the past decade. The federal funds rate was 1.5 percentage points (on average) too low from 2001 through 2005, which fuelled the boom; and the rate was 0.5 percentage points (on average) too high in 2006 and 2007, which triggered the bust.

In the conditions of 2009, the Taylor rule delivered a negative interest rate, a situation that wouldn't have arisen if the rule had been followed.

REVIEW QUIZ

1. What are the three ingredients of a financial and banking crisis?
2. What are the policy actions taken by the Fed and the U.S. Treasury in response to the financial crisis?
3. Why was the recovery from the 2008–2009 recession so slow?
4. How might inflation targeting improve the Fed's monetary policy?
5. How might using the Taylor rule improve the Fed's monetary policy?

You can work these questions in Study Plan 14.4 and get instant feedback. myeconlab

To complete your study of monetary policy, take a look at *Reading Between the Lines* on pages 364–365, which examines the Fed's aggressive monetary stimulus in 2010.