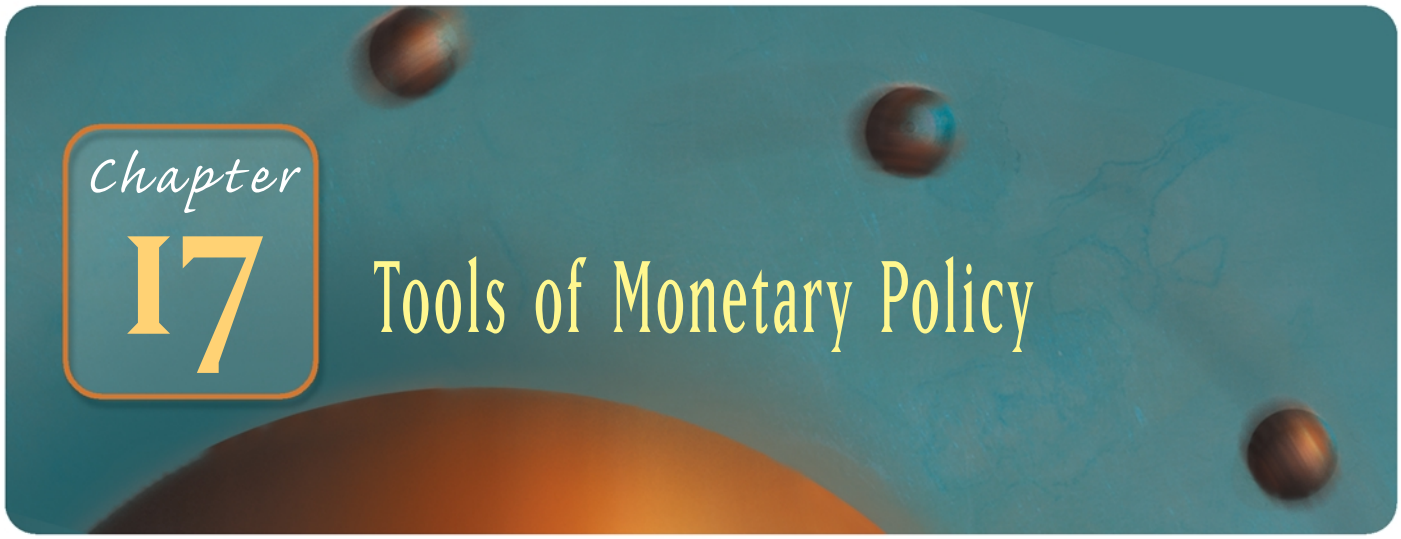


Chapter 17

Tools of Monetary Policy

PREVIEW

In the chapters describing the structure of the Federal Reserve System and the money supply process, we mentioned three policy tools that the Fed can use to manipulate the money supply and interest rates: open market operations, which affect the quantity of reserves and the monetary base; changes in discount lending, which affect the monetary base; and changes in reserve requirements, which affect the money multiplier. Because the Fed's use of these policy tools has such an important impact on interest rates and economic activity, it is important to understand how the Fed wields them in practice and how relatively useful each tool is.

In recent years, the Federal Reserve has increased its focus on the **federal funds rate** (the interest rate on overnight loans of reserves from one bank to another) as the primary indicator of the stance of monetary policy. Since February 1994, the Fed announces a federal funds rate target at each FOMC meeting, an announcement that is watched closely by market participants because it affects interest rates throughout the economy. Thus, to fully understand how the Fed's tools are used in the conduct of monetary policy, we must understand not only their effect on the money supply, but their direct effects on the federal funds rate as well. The chapter thus begins with a supply-and-demand analysis of the market for reserves to explain how the Fed's settings for the three tools of monetary policy determine the federal funds rate. We then go on to look in more detail at each of the three tools—open market operations, discount rate policy, and reserve requirements—to see how they are used in practice and to ask whether the use of these tools could be modified to improve the conduct of monetary policy.

The Market for Reserves and the Federal Funds Rate

In Chapter 15, we saw how open market operations and discount lending affect the balance sheet of the Fed and the amount of reserves. The market for reserves is where the federal funds rate is determined, and this is why we turn to a supply-and-demand analysis of this market to analyze how all three tools of monetary policy affect the federal funds rate.

Supply and Demand in the Market for Reserves

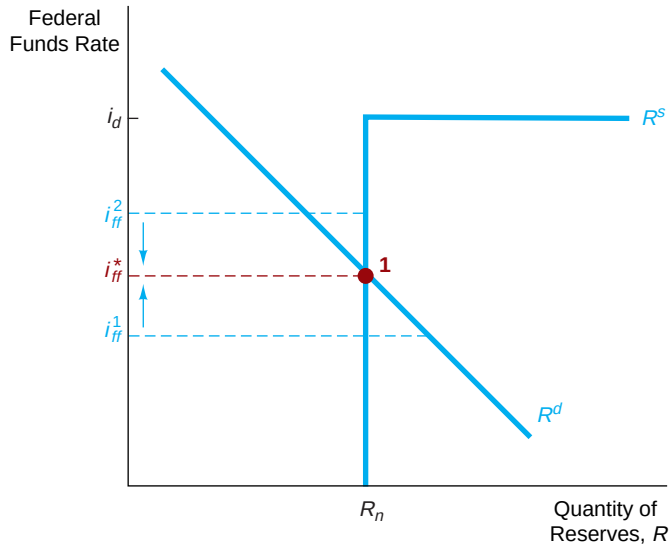
The analysis of the market for reserves proceeds in a similar fashion to the analysis of the bond market we conducted in Chapter 5. We derive a demand and supply curve for reserves. Then the market equilibrium in which the quantity of reserves demanded equals the quantity of reserves supplied determines the federal funds rate, the interest rate charged on the loans of these reserves.

Demand Curve. To derive the demand curve for reserves, we need to ask what happens to the quantity of reserves demanded, holding everything else constant, as the federal funds rate changes. Recall from Chapter 16 that the amount of reserves can be split up into two components: (1) required reserves, which equal the required reserve ratio times the amount of deposits on which reserves are required, and (2) excess reserves, the additional reserves banks choose to hold. Therefore, the quantity of reserves demanded equals required reserves plus the quantity of excess reserves demanded. Excess reserves are insurance against deposit outflows, and the cost of holding these excess reserves is their opportunity cost, the interest rate that could have been earned on lending these reserves out, which is equivalent to the federal funds rate. Thus as the federal funds rate decreases, the opportunity cost of holding excess reserves falls and, holding everything else constant, including the quantity of required reserves, the quantity of reserves demanded rises. Consequently, the demand curve for reserves, R^d, slopes downward in Figure 1.

Supply Curve. The supply of reserves, R^s, can be broken up into two components: the amount of reserves that are supplied by the Fed's open market operations, called nonborrowed reserves (R_n), and the amount of reserves borrowed from the Fed, called discount loans (DL). The primary cost of borrowing discount loans from the Fed is

FIGURE 1 Equilibrium in the Market for Reserves

Equilibrium occurs at the intersection of the supply curve R^s and the demand curve R^d at point 1 and an interest rate of i^*_{ff}.



the interest rate the Fed charges on these loans, the discount rate (i_d). Because borrowing federal funds is a substitute for taking out discount loans from the Fed, if the federal funds rate i_{ff} is below the discount rate i_d, then banks will not borrow from the Fed and discount loans will be zero because borrowing in the federal funds market is cheaper. Thus, as long as i_{ff} remains below i_d, the supply of reserves will just equal the amount of nonborrowed reserves supplied by the Fed, R_n, and so the supply curve will be vertical as shown in Figure 1. However, as the federal funds rate begins to rise above the discount rate, banks would want to keep borrowing more and more at i_d and then lending out the proceeds in the federal funds market at the higher rate, i_{ff}. The result is that the supply curve becomes flat (infinitely elastic) at i_d, as shown in Figure 1.

Market Equilibrium. Market equilibrium occurs where the quantity of reserves demanded equals the quantity supplied, $R^s = R^d$. Equilibrium therefore occurs at the intersection of the demand curve R^d and the supply curve R^s at point 1, with an equilibrium federal funds rate of i^*_{ff}. When the federal funds rate is above the equilibrium rate at i^2_{ff}, there are more reserves supplied than demanded (excess supply) and so the federal funds rate falls to i^*_{ff} as shown by the downward arrow. On the other hand, when the federal funds rate is below the equilibrium rate at i^1_{ff}, there are more reserves demanded than supplied (excess demand) and so the federal funds rate rises as shown by the upward arrow. (Note that Figure 1 is drawn so that i_d is above i^*_{ff} because the Federal Reserve now keeps the discount rate substantially above the target for the federal funds rate.)

www.federalreserve.gov/fomc/fundsrate.htm
This site lists historical federal funds rates and also discusses Federal Reserve targets.

How Changes in the Tools of Monetary Policy Affect the Federal Funds Rate

Now that we understand how the federal funds rate is determined, we can examine how changes in the three tools of monetary policy—open market operations, discount lending, and reserve requirements—affect the market for reserves and the equilibrium federal funds rate.

Open Market Operations. We have already seen that an open market purchase leads to a greater quantity of reserves supplied; this is true at any given federal funds rate because of the higher amount of nonborrowed reserves, which rises from R^1_n to R^2_n. An open market purchase therefore shifts the supply curve to the right from R^s_1 to R^s_2 and moves the equilibrium from point 1 to point 2, lowering the federal funds rate from i^1_{ff} to i^2_{ff} (see Figure 2).[1] The same reasoning implies that an open market sale decreases the quantity of reserves supplied, shifts the supply curve to the left and causes the federal funds rate to rise.

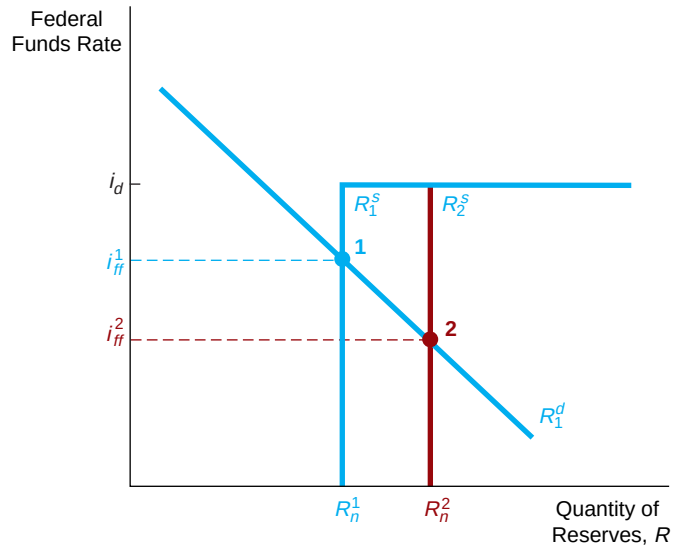
The result is that ***an open market purchase causes the federal funds rate to fall, whereas an open market sale causes the federal funds rate to rise***.

Discount Lending. The effect of a discount rate change depends on whether the demand curve intersects the supply curve in its vertical section versus its flat section. Panel a of Figure 3 shows what happens if the intersection occurs at the vertical section of the supply curve so there is no discount lending. In this case, when the discount rate

[1] We come to the same conclusion using the money supply framework in Chapter 16, along with the liquidity preference framework in Chapter 5. An open market purchase raises reserves and the money supply, and then the liquidity preference framework shows that interest rates fall.

FIGURE 2 Response to an Open Market Operation

An open market purchase increases nonborrowed reserves and hence the reserves supplied, and shifts the supply curve from R_1^s to R_2^s. The equilibrium moves from point 1 to point 2, lowering the federal funds rate from i_{ff}^1 to i_{ff}^2.



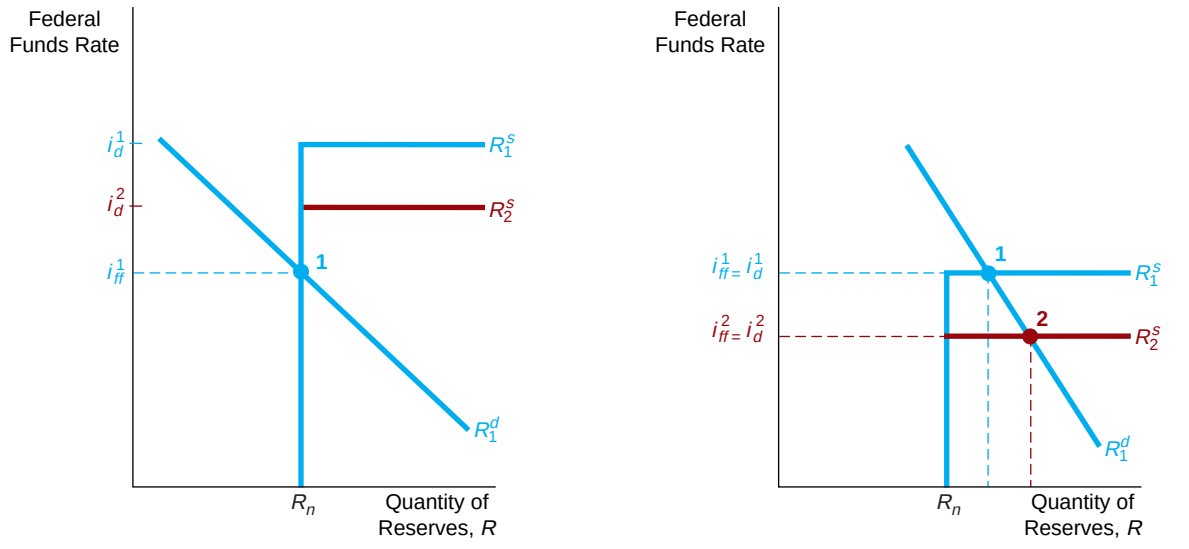


FIGURE 3 Response to a Change in the Discount Rate

In panel a when the discount rate is lowered by the Fed from i_d^1 to i_d^2, the vertical section of the supply curve just shortens, as in R_2^s, so that the equilibrium federal funds rate remains unchanged at i_{ff}^1. In panel b when the discount rate is lowered by the Fed from i_d^1 to i_d^2, the horizontal section of the supply curve R_2^s falls, and the equilibrium federal funds rate falls from i_{ff}^1 to i_{ff}^2.

www.frbdiscountwindow.org/
Information on the operation of the discount window and data on current and historical interest rates.

is lowered by the Fed from i_d^1 to i_d^2, the vertical section of the supply curve where there is no discount lending just shortens, as in R_2^s, while the intersection of the supply and demand curve remains at the same point. Thus, in this case there is no change in the equilibrium federal funds rate, which remains at i_{ff}^1. Because this is the typical situation—since the Fed now usually keeps the discount rate above its target for the federal funds rate—the conclusion is that ***most changes in the discount rate have no effect on the federal funds rate***.

However, if the demand curve intersects the supply curve on its flat section, so there is some discount lending, as in panel b of Figure 3, changes in the discount rate do affect the federal funds rate. In this case, initially discount lending is positive and the equilibrium federal funds rate equals the discount rate, $i_{ff}^1 = i_d^1$. When the discount rate is lowered by the Fed from i_d^1 to i_d^2, the horizontal section of the supply curve R_2^s falls, moving the equilibrium from point 1 to point 2, and the equilibrium federal funds rate falls from i_{ff}^1 to i_{ff}^2 $(= i_d^2)$ in panel b.

www.federalreserve.gov/monetarypolicy/reservereq.htm
Historical data and discussion about reserve requirements.

Reserve Requirements. When the required reserve ratio increases, required reserves increase and hence the quantity of reserves demanded increases for any given interest rate. Thus a rise in the required reserve ratio shifts the demand curve to the right from R_1^d to R_2^d in Figure 4, moves the equilibrium from point 1 to point 2, and in turn raises the federal funds rate from i_{ff}^1 to i_{ff}^2.

The result is that ***when the Fed raises reserve requirements, the federal funds rate rises***.[2]

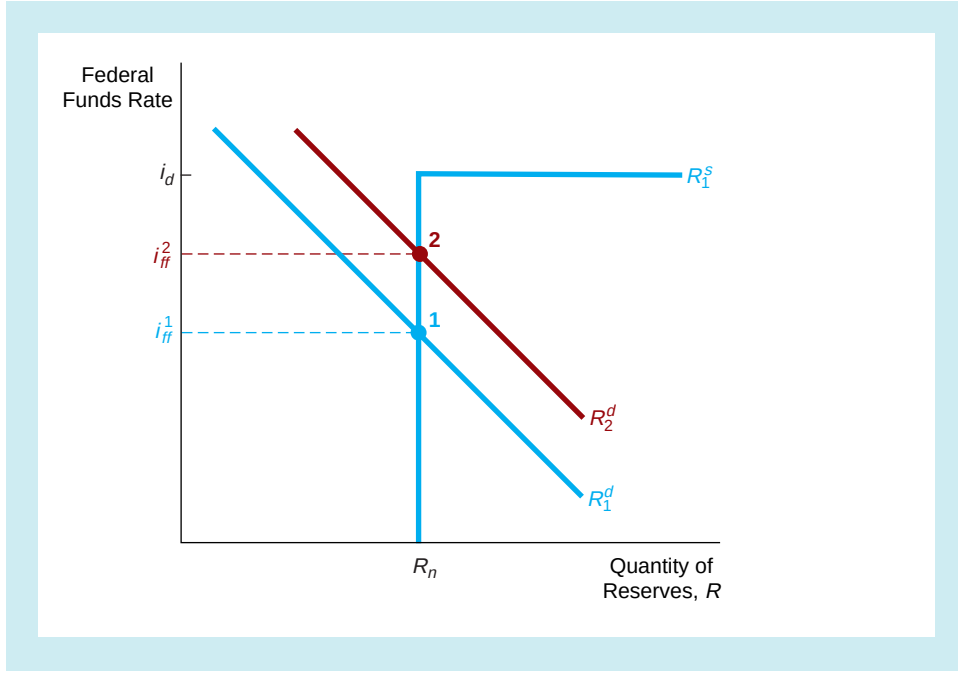


FIGURE 4 Response to a Change in Required Reserves
When the Fed raises reserve requirements, required reserves increase, which increases the demand for reserves. The demand curve shifts from R_1^d to R_2^d, the equilibrium moves from point 1 to point 2, and the federal fund rate rises from i_{ff}^1 to i_{ff}^2.

[2]Because an increase in the required reserve ratio means that the same amount of reserves is able to support a smaller amount of deposits, a rise in the required reserve ratio leads to a decline in the money supply. Using the liquidity preference framework, the fall in the money supply results in a rise in interest rates, yielding the same conclusion in the text that raising reserve requirements leads to higher interest rates.

Similarly, a decline in the required reserve ratio lowers the quantity of reserves demanded, shifts the demand curve to the left, and causes the federal funds rate to fall. ***When the Fed decreases reserve requirements, it leads to a fall in the federal funds rate.***

Now that we understand how the three tools of monetary policy—open market operations, discount lending, and reserve requirements—can be used by the Fed to manipulate the money supply and interest rates, we will look at each of them in turn to see how the Fed wields them in practice and how relatively useful each tool is.

Open Market Operations

Open market operations are the most important monetary policy tool, because they are the primary determinants of changes in interest rates and the monetary base, the main source of fluctuations in the money supply. Open market purchases expand reserves and the monetary base, thereby raising the money supply and lowering short-term interest rates. Open market sales shrink reserves and the monetary base, lowering the money supply and raising short-term interest rates. Now that we understand from Chapter 15 the factors that influence the reserves and monetary base, we can examine how the Federal Reserve conducts open market operations with the object of controlling short-term interest rates and the money supply.

There are two types of open market operations: **Dynamic open market operations** are intended to change the level of reserves and the monetary base, and **defensive open market operations** are intended to offset movements in other factors that affect reserves and the monetary base, such as changes in Treasury deposits with the Fed or float. The Fed conducts open market operations in U.S. Treasury and government agency securities, especially U.S. Treasury bills.[3] The Fed conducts most of its open market operations in Treasury securities because the market for these securities is the most liquid and has the largest trading volume. It has the capacity to absorb the Fed's substantial volume of transactions without experiencing excessive price fluctuations that would disrupt the market.

www.federalreserve.gov/fomc
A discussion about the federal open market committee, list of current members, meeting dates, and other current information.

As we saw in Chapter 14, the decision-making authority for open market operations is the Federal Open Market Committee (FOMC), which sets a target for the federal funds rate. The actual execution of these operations, however, is conducted by the trading desk at the Federal Reserve Bank of New York. The best way to see how these transactions are executed is to look at a typical day at the trading desk, located in a newly built trading room on the ninth floor of the Federal Reserve Bank of New York.

A Day at the Trading Desk

The manager of domestic open market operations supervises the analysts and traders who execute the purchases and sales of securities in order to hit the federal funds rate target. To get a grip on what might happen in the federal funds market that day, her workday and that of her staff begins with a review of developments in the federal funds market the previous day and with an update on the actual amount of reserves

[3] To avoid conflicts of interest, the Fed does not conduct open market operations in privately issued securities. (For example, think of the conflict if the Federal Reserve purchased bonds issued by a company owned by the chairman's brother-in-law.)

in the banking system the day before. Later in the morning, her staff issues updated reports that contain detailed forecasts of what will be happening to some of the short-term factors affecting the supply and demand of reserves (discussed in Chapter 15). For example, if float is predicted to decrease because good weather throughout the country is speeding up check delivery, the manager of domestic open market operations knows that she will have to conduct a defensive open market operation (in this case, a *purchase* of securities) to offset the expected decline in reserves and the monetary base from the decreased float. However, if Treasury deposits with the Fed are predicted to fall, a defensive open market *sale* would be needed to offset the expected increase in reserves. The report also predicts the change in the public's holding of currency. If currency holdings are expected to rise, then, as we have seen in Chapters 15 and 16, reserves fall, and an open market purchase is needed to raise reserves back up again.

This information will help the manager of domestic open market operations and her staff decide how large a change in reserves is needed to obtain the federal funds rate target. If the amount of reserves in the banking system is too large, many banks will have excess reserves to lend that other banks may have little desire to hold, and the federal funds rate will fall. If the level of reserves is too low, banks seeking to borrow reserves from the few banks that have excess reserves to lend may push the funds rate higher than the desired level. Also during the morning, the staff will monitor the behavior of the federal funds rate and contact some of the major participants in the funds market, which may provide independent information about whether a change in reserves is needed to achieve the desired level of the federal funds rate. Early in the morning, members of the manager's staff contact several representatives of the so-called **primary dealers**, government securities dealers (who operate out of private firms or commercial banks) that the open market desk trades with. Her staff finds out how the dealers view market conditions to get a feel for what may happen to the prices of the securities they trade in over the course of the day. They also call the Treasury to get updated information on the expected level of Treasury balances at the Fed in order to refine their estimates of the supply of reserves.

Afterward, members of the Monetary Affairs Division at the Board of Governors are contacted, and the New York Fed's forecasts of reserve supply and demand are compared with the Board's. On the basis of these projections and the observed behavior of the federal funds market, the desk will formulate and propose a course of action to be taken that day, which may involve plans to add reserves to or drain reserves from the banking system through open market operations. If an operation is contemplated, the type, size, and maturity will be discussed.

The whole process is currently completed by midmorning, at which time a daily conference call is arranged linking the desk with the Office of the Director of Monetary Affairs at the Board and with one of the four voting Reserve Bank presidents outside of New York. During the call, a member of the open market operations unit will outline the desk's proposed reserve management strategy for the day. After the plan is approved, the desk is instructed to execute immediately any temporary open market operations that were planned for that day. (Outright operations, to be described shortly, may be conducted at other times of the day.)

The desk is linked electronically with its domestic open market trading counterparties by a computer system called TRAPS (Trading Room Automated Processing System), and all open market operations are now performed over this system. A message will be electronically transmitted simultaneously to all the primary dealers over TRAPS indicating the type and maturity of the operation being arranged. The dealers

are given several minutes to respond via TRAPS with their propositions to buy or sell government securities. The propositions are then assembled and displayed on a computer screen for evaluation. The desk will select all propositions, beginning with the most attractively priced, up to the point where the desired amount is purchased or sold, and it will then notify each dealer via TRAPS which of its propositions have been chosen. The entire selection process is typically completed in a matter of minutes.

These temporary transactions are of two basic types. In a **repurchase agreement** (often called a **repo**), the Fed purchases securities with an agreement that the seller will repurchase them in a short period of time, anywhere from 1 to 15 days from the original date of purchase. Because the effects on reserves of a repo are reversed on the day the agreement matures, a repo is actually a temporary open market purchase and is an especially desirable way of conducting a defensive open market purchase that will be reversed shortly. When the Fed wants to conduct a temporary open market sale, it engages in a **matched sale–purchase transaction** (sometimes called a **reverse repo**) in which the Fed sells securities and the buyer agrees to sell them back to the Fed in the near future.

At times, the desk may see the need to address a persistent reserve shortage or surplus and wish to arrange an operation that will have a permanent impact on the supply of reserves. Outright transactions, which involve a purchase or sale of securities that is not self-reversing, are also conducted over TRAPS. These operations are traditionally executed at times of day when temporary operations are not being conducted.

Advantages of Open Market Operations

Open market operations have several advantages over the other tools of monetary policy.

1. Open market operations occur at the initiative of the Fed, which has complete control over their volume. This control is not found, for example, in discount operations, in which the Fed can encourage or discourage banks to take out discount loans by altering the discount rate but cannot directly control the volume of discount loans.

2. Open market operations are flexible and precise; they can be used to any extent. No matter how small a change in reserves or the monetary base is desired, open market operations can achieve it with a small purchase or sale of securities. Conversely, if the desired change in reserves or the base is very large, the open market operations tool is strong enough to do the job through a very large purchase or sale of securities.

3. Open market operations are easily reversed. If a mistake is made in conducting an open market operation, the Fed can immediately reverse it. If the Fed decides that the federal funds rate is too low because it has made too many open market purchases, it can immediately make a correction by conducting open market sales.

4. Open market operations can be implemented quickly; they involve no administrative delays. When the Fed decides that it wants to change the monetary base or reserves, it just places orders with securities dealers, and the trades are executed immediately.

Discount Policy

The Federal Reserve facility at which discount loans are made to banks is called the **discount window**. The easiest way to understand how the Fed affects the volume of discount loans is by looking at how the discount window operates.

Operation of the Discount Window

The Fed's discount loans to banks are of three types: primary credit, secondary credit, and seasonal credit.[4] *Primary credit* is the discount lending that plays the most important role in monetary policy. Healthy banks are allowed to borrow all they want from the primary credit facility, and it is therefore referred to as a *standing lending facility*. The interest rate on these loans is the discount rate, and as we mentioned before, it is set higher than the federal funds rate target, usually by 100 basis points (one percentage point), and thus in most circumstances the amount of discount lending under the primary credit facility is very small. Then why does the Fed have this facility?

The answer is that the facility is intended to be a backup source of liquidity for sound banks so that the federal funds rate never rises too far above the federal funds target. To see how the primary credit facility works, let's see what happens if there is a large increase in the demand for reserves, say because deposits have surged unexpectedly and have led to an increase in required reserves. This situation is analyzed in Figure 5. Suppose that initially, the demand and supply curve for reserves intersect at point 1 so that the federal funds rate is at its target level, i_{ff}^{T}. Now the increase in required reserves shifts the demand curve to R_2^d and the equilibrium moves to point 2. The result is that discount lending increases from zero to DL_2 and the federal funds rate rises to i_d and can rise no further. The primary credit facility has thus put a ceiling on the federal funds rate of i_d.

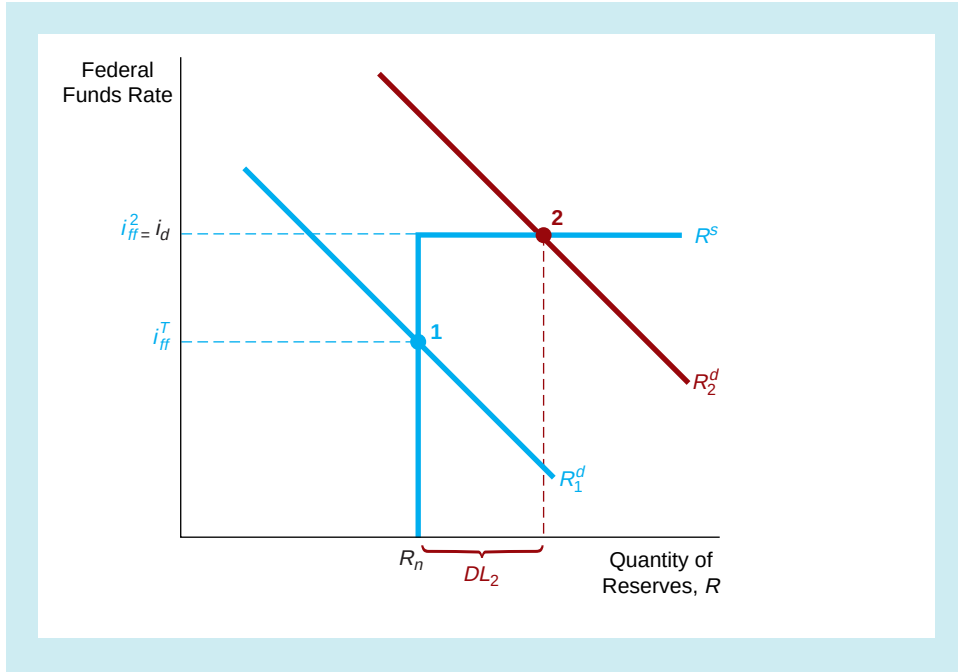


FIGURE 5 How the Primary Credit Facility Puts a Ceiling on the Federal Funds Rate

The rightward shift of the demand curve to reserves from R_1^d to R_2^d moves the equilibrium from point 1 to point 2 where $i_{ff}^{2} = i_d$ and discount lending rises from zero to DL_2.

[4] The procedures for administering the discount window were changed in January 2003. The primary credit facility replaced an adjustment credit facility whose discount rate was typically set below market interest rates, so banks were restricted in their access to this credit. In contrast, now healthy banks can borrow all they want from the primary credit facility. The secondary credit facility replaced the extended credit facility which focused somewhat more on longer-term credit extensions. The seasonal credit facility remains basically unchanged.

Secondary credit is given to banks that are in financial trouble and are experiencing severe liquidity problems. The interest rate on secondary credit is set at 50 basis points (0.5 percentage points) above the discount rate. This interest rate on these loans is set at a higher, penalty rate to reflect the less-sound condition of these borrowers. *Seasonal credit* is given to meet the needs of a limited number of small banks in vacation and agricultural areas that have a seasonal pattern of deposits. The interest rate charged on seasonal credit is tied to the average of the federal funds rate and certificate of deposit rates. The Federal Reserve has questioned the need for the seasonal credit facility because of improvements in credit markets and is thus contemplating eliminating it in the future.

Lender of Last Resort

In addition to its use as a tool to influence reserves, the monetary base, and the money supply, discounting is important in preventing financial panics. When the Federal Reserve System was created, its most important role was intended to be as the **lender of last resort**; to prevent bank failures from spinning out of control, it was to provide reserves to banks when no one else would, thereby preventing bank and financial panics. Discounting is a particularly effective way to provide reserves to the banking system during a banking crisis because reserves are immediately channeled to the banks that need them most.

Using the discount tool to avoid financial panics by performing the role of lender of last resort is an extremely important requirement of successful monetary policymaking. As we demonstrated with our money supply analysis in Chapter 16, the bank panics in the 1930–1933 period were the cause of the sharpest decline in the money supply in U.S. history, which many economists see as the driving force behind the collapse of the economy during the Great Depression. Financial panics can also severely damage the economy because they interfere with the ability of financial intermediaries and markets to move funds to people with productive investment opportunities (see Chapter 8).

Unfortunately, the discount tool has not always been used by the Fed to prevent financial panics, as the massive failures during the Great Depression attest. The Fed learned from its mistakes of that period and has performed admirably in its role of lender of last resort in the post–World War II period. The Fed has used its discount lending weapon several times to avoid bank panics by extending loans to troubled banking institutions, thereby preventing further bank failures. The largest of these occurred in 1984, when the Fed lent Continental Illinois, at that time one of the ten largest banks in the United States, more than $5 billion.

At first glance, it might seem that the presence of the FDIC, which insures depositors up to a limit of $100,000 per account from losses due to a bank's failure, would make the lender-of-last-resort function of the Fed superfluous. (The FDIC is described in detail in Chapter 11.) There are two reasons why this is not the case. First, it is important to recognize that the FDIC's insurance fund amounts to around 1% of the amount of these deposits outstanding. If a large number of bank failures occurred, the FDIC would not be able to cover all the depositors' losses. Indeed, the large number of bank failures in the 1980s and early 1990s, described in Chapter 11, led to large losses and a shrinkage in the FDIC's insurance fund, which reduced the FDIC's ability to cover depositors' losses. This fact has not weakened the confidence of small depositors in the banking system because the Fed has been ready to stand behind the banks to provide whatever reserves are needed to prevent bank panics. Second, the nearly $1 trillion of large-denomination deposits in the banking system are not

guaranteed by the FDIC, because they exceed the $100,000 limit. A loss of confidence in the banking system could still lead to runs on banks from the large-denomination depositors, and bank panics could still occur despite the existence of the FDIC. The importance of the Federal Reserve's role as lender of last resort is, if anything, more important today because of the high number of bank failures experienced in the 1980s and early 1990s.

Not only can the Fed be a lender of last resort to banks, but it can also play the same role for the financial system as a whole. The existence of the Fed's discount window can help prevent financial panics that are not triggered by bank failures, as was the case during the Black Monday stock market crash of 1987 and the terrorist destruction of the World Trade Center in September 2001 (see Box 1).

Although the Fed's role as the lender of last resort has the benefit of preventing bank and financial panics, it does have a cost. If a bank expects that the Fed will provide it with discount loans when it gets into trouble, as occurred with Continental Illinois, it will be willing to take on more risk knowing that the Fed will come to the rescue. The Fed's lender-of-last-resort role has thus created a moral hazard problem similar to the one created by deposit insurance (discussed in Chapter 11): Banks take on more risk, thus exposing the deposit insurance agency, and hence taxpayers, to greater losses. The moral hazard problem is most severe for large banks, which may believe that the Fed and the FDIC view them as "too big to fail"; that is, they will always receive Fed loans when they are in trouble because their failure would be likely to precipitate a bank panic.

Similarly, Federal Reserve actions to prevent financial panic, as occurred after the October 1987 stock market crash and the September 11, 2001 terrorist attacks, may encourage financial institutions other than banks to take on greater risk. They, too, expect the Fed to ensure that they could get loans if a financial panic seemed imminent. When the Fed considers using the discount weapon to prevent panics, it therefore needs to consider the trade-off between the moral hazard cost of its role as lender of last resort and the benefit of preventing financial panics. This trade-off explains why the Fed must be careful not to perform its role as lender of last resort too frequently.

Advantages and Disadvantages of Discount Policy

The most important advantage of discount policy is that the Fed can use it to perform its role of lender of last resort. Experiences with Continental Illinois, the Black Monday crash, and September 11, 2001 indicate that this role has become more important in the past couple of decades. In the past, discount policy was used as a tool of monetary policy, with the discount rate changed in order to affect interest rates and the monetary market. However, because the decisions to take out discount loans are made by banks and are therefore not completely controlled by the Fed, while open market operations are completely controlled by the Fed, the use of discount policy to conduct monetary policy has little to recommend it. This is why the Fed moved in January 2003 to the current system in which the discount facility is not used to set the federal funds rate, but is only a backup facility to prevent the federal funds rate from rising too far above its target.

Reserve Requirements

As we saw in Chapter 16, changes in reserve requirements affect the money supply by causing the money supply multiplier to change. A rise in reserve requirements reduces

Box 1: Inside the Fed

Discounting to Prevent a Financial Panic

The Black Monday Stock Market Crash of 1987 and the Terrorist Destruction of the World Trade Center in September 2001. Although October 19, 1987, dubbed "Black Monday," will go down in the history books as the largest one-day percentage decline in stock prices to date (the Dow Jones Industrial Average declined by more than 20%), it was on Tuesday, October 20, 1987, that financial markets almost stopped functioning. Felix Rohatyn, one of the most prominent men on Wall Street, stated flatly: "Tuesday was the most dangerous day we had in 50 years."* Much of the credit for prevention of a market meltdown after Black Monday must be given to the Federal Reserve System and the chairman of the Board of Governors, Alan Greenspan.

The stress of keeping markets functioning during the sharp decline in stock prices on Monday, October 19, meant that many brokerage houses and specialists (dealer-brokers who maintain orderly trading on the stock exchanges) were severely in need of additional funds to finance their activities. However, understandably enough, New York banks, as well as foreign and regional U.S. banks, growing very nervous about the financial health of securities firms, began to cut back credit to the securities industry at the very time when it was most needed. Panic was in the air. One chairman of a large specialist firm commented that on Monday, "from 2 P.M. on, there was total despair. The entire investment community fled the market. We were left alone on the field." It was time for the Fed, like the cavalry, to come to the rescue.

Upon learning of the plight of the securities industry, Alan Greenspan and E. Gerald Corrigan, then president of the Federal Reserve Bank of New York and the Fed official most closely in touch with Wall Street, became fearful of a spreading collapse of securities firms. To prevent this from occurring, Greenspan announced before the market opened on Tuesday, October 20, the Federal Reserve System's "readiness to serve as a source of liquidity to support the economic and financial system." In addition to this extraordinary announcement, the Fed made it clear that it would provide discount loans to any bank that would make loans to the securities industry, although this did not prove to be necessary. As one New York banker said, the Fed's message was, "We're here. Whatever you need, we'll give you."

The outcome of the Fed's timely action was that a financial panic was averted. The markets kept functioning on Tuesday, and a market rally ensued that day, with the Dow Jones Industrial Average climbing over 100 points.

A similar lender-of-last-resort operation was carried out in the aftermath of the destruction of the World Trade Center in New York City on Tuesday, September 11, 2001—the worst terrorist incident in U.S. history. Because of the disruption to the most important financial center in the world, the liquidity needs of the financial system skyrocketed. To satisfy these needs and to keep the financial system from seizing up, within a few hours of the incident, the Fed made an announcement similar to that made after the crash of 1987: "The Federal Reserve System is open and operating. The discount window is available to meet liquidity needs."** The Fed thenproceeded to provide $45 billion to banks through the discount window, a 200-fold increase over the previous week. As a result of this action, along with the injection of as much as $80 billion of reserves into the banking system through open market operations, the financial system kept functioning. When the stock market reopened on Monday, September 17, trading was orderly, although the Dow Jones average did decline 7%.

The terrorists were able to bring down the twin towers of the World Trade Center, with nearly 3,000 dead. However, they were unable to bring down the U.S. financial system because of the timely actions of the Federal Reserve.

*"Terrible Tuesday: How the Stock Market Almost Disintegrated a Day After the Crash," *Wall Street Journal*, November 20, 1987, p. 1. This article provides a fascinating and more detailed view of the events described here and is the source of all the quotations cited.

**"Economic Front: How Policy Makers Regrouped to Defend the Financial System," *Wall Street Journal*, Tuesday, September 18, 2001, p. A1, provides more detail on this episode.

the amount of deposits that can be supported by a given level of the monetary base and will lead to a contraction of the money supply. A rise in reserve requirements also increases the demand for reserves and raises the federal funds rate. Conversely, a decline in reserve requirements leads to an expansion of the money supply and a fall in the federal funds rate. The Fed has had the authority to vary reserve requirements since the 1930s; this is a powerful way of affecting the money supply and interest rates. Indeed, changes in reserve requirements have such large effects on the money supply and interest rates that the Fed rarely resorts to using this tool to control them.

The Depository Institutions Deregulation and Monetary Control Act of 1980 provided a simpler scheme for setting reserve requirements. All depository institutions, including commercial banks, savings and loan associations, mutual savings banks, and credit unions, are subject to the same reserve requirements, as follows: Required reserves on all checkable deposits—including non-interest-bearing checking accounts, NOW accounts, super-NOW accounts, and ATS (automatic transfer savings) accounts—are equal to 3% of the bank's first $42.1 million of checkable deposits[5] and 10% of the checkable deposits over $42.1 million, and the percentage set initially at 10% can be varied between 8 and 14%, at the Fed's discretion. In extraordinary circumstances, the percentage can be raised as high as 18%.

Advantages and Disadvantages of Reserve Requirement Changes

The main advantage of using reserve requirements to control the money supply and interest rates is that they affect all banks equally and have a powerful effect on the money supply. The fact that changing reserve requirements is a powerful tool, however, is probably more of a curse than a blessing, because small changes in the money supply and interest rates are hard to engineer by varying reserve requirements. With checkable deposits currently around the $600 billion level, a $\frac{1}{2}$-percentage-point increase in the reserve requirement on these deposits would reduce excess reserves by $30 billion. Because this decline in excess reserves would result in multiple deposit contraction, the decline in the money supply would be even greater. It is true that small changes in the money supply could be obtained by extremely small changes in reserve requirements (say, by 0.001 percentage point), but because it is so expensive to administer changes in reserve requirements, such a strategy is not practical. Using reserve requirements to fine-tune the money supply is like trying to use a jackhammer to cut a diamond.

Another disadvantage of using reserve requirements to control the money supply and interest rates is that raising the requirements can cause immediate liquidity problems for banks with low excess reserves. When the Fed has raised these requirements in the past, it has usually softened the blow by conducting open market purchases or by making the discount window more available, thus providing reserves to banks that needed them. Continually fluctuating reserve requirements would also create more uncertainty for banks and make their liquidity management more difficult.

The policy tool of changing reserve requirements does not have much to recommend it, and it is rarely used.

[5]The $42.1 million figure is as of the end of 2002. Each year, the figure is adjusted upward by 80% of the percentage increase in checkable deposits in the United States.

Application

Why Have Reserve Requirements Been Declining Worldwide?

In recent years, central banks in many countries in the world have been reducing or eliminating their reserve requirements. In the United States, the Federal Reserve eliminated reserve requirements on time deposits in December 1990 and lowered reserve requirements on checkable deposits from 12% to 10% in April 1992. As a result, the majority of U.S. depository institutions—but not the largest ones with the bulk of deposits—find that reserve requirements are not binding: In order to service their depositors, many depository institutions need to keep sufficient vault cash on hand (which counts toward meeting reserve requirements) that they more than meet reserve requirements voluntarily. Canada has gone a step further: Financial market legislation taking effect in June 1992 eliminated all reserve requirements over a two-year period. The central banks of Switzerland, New Zealand, and Australia have also eliminated reserve requirements entirely. What explains the downward trend for reserve requirements in most countries?

You may recall from Chapter 9 that reserve requirements act as a tax on banks. Because central banks typically do not pay interest on reserves, the bank earns nothing on them and loses the interest that could have been earned if the bank held loans instead. The cost imposed on banks from reserve requirements means that banks, in effect, have a higher cost of funds than intermediaries not subject to reserve requirements, making them less competitive. We have already seen in Chapter 10 that additional market forces have been making banks less competitive, weakening the health of banking systems throughout the world. Central banks have thus been reducing reserve requirements to make banks more competitive and stronger.[6] The Federal Reserve was explicit about this rationale for its April 1992 reduction when it announced it on February 18, 1992, stating in its press release that the reduction "will reduce funding costs for depositories and strengthen their balance sheets. Over time, it is expected that most of these cost savings will be passed on to depositors and borrowers."

Application

The Channel/Corridor System for Setting Interest Rates in Other Countries

The fall in reserve requirements has elicited the concern that if the demand for reserves falls to zero, then a central bank may not be able to exercise control over interest rates.[7] However, the so-called channel or corridor system for conducting monetary policy—which has been adopted by Canada,

[6]Many economists believe that the Fed should pay market interest rates on reserves, another suggestion for dealing with this problem.

[7]See Benjamin Friedman, "The Future of Monetary Policy: The Central Bank as an Army with Only a Signal Corps?" *International Finance* 2 (1999), pp. 321–338, and the rest of the symposium on this topic in the same journal.

Australia, and New Zealand, all of which have eliminated reserve requirements—shows that central banks can continue to effectively set overnight, interbank interest rates like the federal funds rate. How the channel/corridor system works is illustrated by Figure 6, which describes the market for reserves along the lines discussed at the beginning of this chapter.

In the channel/corridor system, the central bank sets up a standing lending facility, like the one currently in place in the United States and in most industrialized countries, in which the central bank stands ready to lend overnight any amount banks ask for at a fixed interest rate, i^l. This standing lending facility is commonly called a *lombard facility* and the interest rate charged on these loans is often called a *lombard rate*. (This name comes from Lombardy, a region in northern Italy that was an important center of banking in the middle ages.) As we saw at the beginning of the chapter, with a standing lending facility, the central bank does not limit the amount of borrowing by banks, but always stands ready to supply any amount the banks want at the lending rate i^l. Thus the quantity of reserves supplied is flat (infinitely elastic) at i^l as shown in Figure 6, because if the overnight interest rate, denoted by i_{ff}, begins to rise above i^l, banks would just keep borrowing discount loans indefinitely.

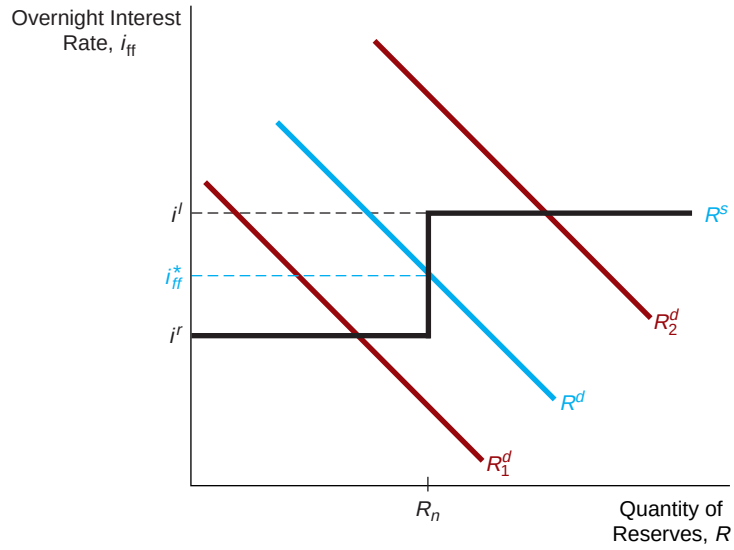
In the channel/corridor system the central bank sets up another standing facility that pays banks a fixed interest rate i^r on any reserves (deposits) they would like to keep at the central bank. The quantity of reserves supplied is also flat at i^r, because if the overnight rate begins to fall below this rate, banks would not lend in the overnight market. Instead they would keep increasing the amount of their deposits in the central bank (effectively lending to the central bank), and would thereby keep lowering the quantity of reserves the central bank is supplying. In between i^r and i^l, the quantity of reserves supplied equals nonborrowed reserves R_n, which are determined by open market operations. Nonborrowed reserves are set to zero if the demand for reserves is also expected to be zero. The supply curve for reserves R^s is thus the step function depicted in Figure 6.

The demand curve for reserves R^d has the usual downward slope. As we can see in Figure 6, when the demand curve shifts to the left to R_1^d the overnight interest rate never falls below i^r, while if the demand curve shifts to the right to R_2^d, the overnight rate never rises above i^l. Thus the channel/corridor system enables the central bank to keep the overnight interest rate in between the narrow channel/corridor with an upper limit of i^l and lower limit of i^r. In Canada, Australia, and New Zealand the lending rate i^l is set 25 basis points (0.25 percentage points) above the announced target rate, while the interest rate paid on reserves kept at the central bank is set at 25 basis points below the target. More in-depth analysis shows that banks will set the demand for reserves so that the demand curve is expected to intersect the supply curve at the announced target overnight rate of i_{ff}^*, with the result that deviations from the announced target are fairly small.[8]

[8]See Michael Woodford, "Monetary Policy in the Information Economy," in *Symposium on Economic Policy for the Information Economy* (Federal Reserve Bank of Kansas City: 2001), pp. 297–370.

FIGURE 6 The Channel/Corridor System for Setting Interest Rates

In the channel/corridor system standing facilities result in a step function supply curve, R^s. Then if the demand curve shifts between R_1^d and R_2^d, the overnight interest rate i_{ff} always remains between i^r and i^l.



The important point of this analysis is that the channel/corridor approach enables the central bank to set the overnight policy rate, whatever the demand for reserves, including zero demand. Thus in the future, continuing declines in the demand for reserves may eventually lead central banks to follow in the footsteps of the central banks of Canada, Australia, and New Zealand, and to adopt the channel/corridor system for conducting monetary policy.

Summary

1. A supply and demand analysis of the market for reserves yields the following results. When the Fed makes an open market purchase or lowers reserve requirements, the federal funds rate declines. When the Fed makes an open market sale or raises reserve requirements, the federal funds rate rises. Changes in the discount rate may also affect the federal funds rate.
2. The amount of an open market operation conducted on any given day by the trading desk of the Federal Reserve Bank of New York is determined by the amount of the dynamic open market operation intended to change reserves and the monetary base and by the amount of the defensive open market operation used to offset other factors that affect reserves and the monetary base. Open market operations are the primary tool used by the Fed to control the money supply because they occur at the initiative of the Fed, are flexible, are easily reversed, and can be implemented quickly.
3. The volume of discount loans is affected by the discount rate. Besides its effect on the monetary base and the money supply, discounting allows the Fed to perform its role as the lender of last resort. However, because the decisions by banks to take out discount loans are not controlled by the Fed, the use of discount policy to conduct monetary policy has little to recommend it.
4. Changing reserve requirements is too blunt a tool to use for controlling the money supply, and hence it is rarely used.

Key Terms

defensive open market operations, p. 398
discount window, p. 400
dynamic open market operations, p. 398
federal funds rate, p. 393
lender of last resort, p. 402
matched sale–purchase transaction (reverse repo), p. 400
primary dealers, p. 399
repurchase agreement (repo), p. 400

Questions and Problems

Questions marked with an asterisk are answered at the end of the book in an appendix, "Answers to Selected Questions and Problems."

*1. If the manager of the open market desk hears that a snowstorm is about to strike New York City, making it difficult to present checks for payment there and so raising the float, what defensive open market operations will the manager undertake?

2. During Christmastime, when the public's holdings of currency increase, what defensive open market operations typically occur? Why?

*3. If the Treasury has just paid for a supercomputer and as a result its deposits with the Fed fall, what defensive open market operations will the manager of the open market desk undertake?

4. If float decreases below its normal level, why might the manager of domestic operations consider it more desirable to use repurchase agreements to affect the monetary base rather than an outright purchase of bonds?

*5. Most open market operations are currently repurchase agreements. What does this tell us about the likely volume of defensive open market operations relative to dynamic open market operations?

6. "The only way that the Fed can affect the level of discount loans is by adjusting the discount rate." Is this statement true, false, or uncertain? Explain your answer.

*7. Using the supply and demand analysis of the market for reserves, show what happens to the federal funds rate, holding everything else constant, if the economy is surprisingly strong, leading to a rise in the amount of checkable deposits.

8. If there is a switch from deposits into currency, what happens to the federal funds rate? Use the supply and demand analysis of the market for reserves to explain your answer.

*9. "Discounting is no longer needed because the presence of the FDIC eliminates the possibility of bank panics." Discuss.

10. The benefits of using Fed discount operations to prevent bank panics are straightforward. What are the costs?

*11. You often read in the newspaper that the Fed has just lowered the discount rate. Does this signal that the Fed is moving to a more expansionary monetary policy? Why or why not?

12. How can the procyclical movement of interest rates (rising during business cycle expansions and falling during business cycle contractions) lead to a procyclical movement in the money supply as a result of Fed discounting? Why might this movement of the money supply be undesirable?

*13. "If reserve requirements were eliminated, it would be harder to control interest rates." True, false, or uncertain?

14. "Considering that raising reserve requirements to 100% makes complete control of the money supply possible, Congress should authorize the Fed to raise reserve requirements to this level." Discuss.

*15. Compare the use of open market operations, discounting, and changes in reserve requirements to control the money supply on the following criteria: flexibility, reversibility, effectiveness, and speed of implementation.

Web Exercises

1. Go to www.federalreserve.gov/fomc/. This site reports activity by the open market committee. Scroll down to Calendar and click on the statement released after the last meeting. Summarize this statement in one paragraph. Be sure to note whether the committee has decided to increase or decrease the rate of growth of reserves. Now review the statements of the last two meetings. Has the stance of the committee changed?

2. Go to www.federalreserve.gov/releases/h15/update/. What is the current Federal Funds Rate (define this rate as well)? What is the current Federal Reserve Discount rate (define this rate as well)? Is the difference between these rates similar to what is usually observed, based on Figure 4? Have short-term rates increased or declined since the end of 2002?