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THE MONETARY SYSTEM

When you walk into a restaurant to buy a meal, you get something of value—a full stomach. To pay for this service, you might hand the restaurateur several worn-out pieces of greenish paper decorated with strange symbols, government buildings, and the portraits of famous dead Americans. Or you might hand him a single piece of paper with the name of a bank and your signature. Whether you pay by cash or check, the restaurateur is happy to work hard to satisfy your gastronomical desires in exchange for these pieces of paper, which, in and of themselves, are worthless.

To anyone who has lived in a modern economy, this social custom is not at all odd. Even though paper money has no intrinsic value, the restaurateur is confident that, in the future, some third person will accept it in exchange for something that the restaurateur does value. And that third person is confident that some fourth person will accept the money, with the knowledge that yet a fifth person will accept the money . . . and so on. To the restaurateur and to other people in our society, your cash or check represents a claim to goods and services in the future.

The social custom of using money for transactions is extraordinarily useful in a large, complex society. Imagine, for a moment, that there was no item in the economy widely accepted in exchange for goods and services. People would have to rely on *barter*—the exchange of one good or service for another—to obtain the things they need. To get your restaurant meal, for instance, you would have to offer the restaurateur something of immediate value. You could offer to wash some dishes, clean his car, or give him your family's secret recipe for meat

**IN THIS CHAPTER
YOU WILL**

*Consider what money is
and what functions
money has in the
economy*

*Learn what the Federal
Reserve System is*

*Examine how the banking
system helps determine
the supply of money*

*See what tools the Federal
Reserve uses to alter the
supply of money*

loaf. An economy that relies on barter will have trouble allocating its scarce resources efficiently. In such an economy, trade is said to require the *double coincidence of wants*—the unlikely occurrence that two people each have a good or service that the other wants.

The existence of money makes trade easier. The restaurateur does not care whether you can produce a valuable good or service for him. He is happy to accept your money, knowing that other people will do the same for him. Such a convention allows trade to be roundabout. The restaurateur accepts your money and uses it to pay his chef; the chef uses her paycheck to send her child to day care; the day care center uses this tuition to pay a teacher; and the teacher hires you to mow his lawn. As money flows from person to person in the economy, it facilitates production and trade, thereby allowing each person to specialize in what he or she does best and raising everyone's standard of living.

In this chapter we begin to examine the role of money in the economy. We discuss what money is, the various forms that money takes; how the banking system helps create money, and how the government controls the quantity of money in circulation. Because money is so important in the economy, we devote much effort in the rest of this book to learning how changes in the quantity of money affect various economic variables, including inflation, interest rates, production, and employment. Consistent with our long-run focus in the last three chapters, we will examine the long-run effects of changes in the quantity of money in the next chapter. The short-run effects of monetary changes are a more complex topic, which we will take up later in the book. This chapter provides the background for all of this further analysis.

THE MEANING OF MONEY

What is money? This might seem like an odd question. When you read that billionaire Bill Gates has a lot of money, you know what that means: He is so rich that he can buy almost anything he wants. In this sense, the term *money* is used to mean *wealth*.

Economists, however, use the word in a more specific sense: **Money** is the set of assets in the economy that people regularly use to buy goods and services from other people. The cash in your wallet is money because you can use it to buy a meal at a restaurant or a shirt at a clothing store. By contrast, if you happened to own most of Microsoft Corporation, as Bill Gates does, you would be wealthy, but this asset is not considered a form of money. You could not buy a meal or a shirt with this wealth without first obtaining some cash. According to the economist's definition, money includes only those few types of wealth that are regularly accepted by sellers in exchange for goods and services.

money

the set of assets in an economy that people regularly use to buy goods and services from other people

THE FUNCTIONS OF MONEY

Money has three functions in the economy: It is a *medium of exchange*, a *unit of account*, and a *store of value*. These three functions together distinguish money from other assets.

A **medium of exchange** is an item that buyers give to sellers when they purchase goods and services. When you buy a shirt at a clothing store, the store gives you the shirt, and you give the store your money. This transfer of money from buyer to seller allows the transaction to take place. When you walk into a store, you are confident that the store will accept your money for the items it is selling because money is the commonly accepted medium of exchange.

medium of exchange
an item that buyers give to sellers when they want to purchase goods and services

A **unit of account** is the yardstick people use to post prices and record debts. When you go shopping, you might observe that a shirt costs \$20 and a hamburger costs \$2. Even though it would be accurate to say that the price of a shirt is 10 hamburgers and the price of a hamburger is 1/10 of a shirt, prices are never quoted in this way. Similarly, if you take out a loan from a bank, the size of your future loan repayments will be measured in dollars, not in a quantity of goods and services. When we want to measure and record economic value, we use money as the unit of account.

unit of account
the yardstick people use to post prices and record debts

A **store of value** is an item that people can use to transfer purchasing power from the present to the future. When a seller accepts money today in exchange for a good or service, that seller can hold the money and become a buyer of another good or service at another time. Of course, money is not the only store of value in the economy. A person can also transfer purchasing power from the present to the future by holding stocks, bonds, real estate, art, or even baseball cards. The term *wealth* is used to refer to the total of all stores of value, including both money and nonmonetary assets.

store of value
an item that people can use to transfer purchasing power from the present to the future

Economists use the term **liquidity** to describe the ease with which an asset can be converted into the economy's medium of exchange. Because money is the economy's medium of exchange, it is the most liquid asset available. Other assets vary widely in their liquidity. Most stocks and bonds can be sold easily with small cost, so they are relatively liquid assets. By contrast, selling a house, a Rembrandt painting, or a 1948 Joe Dimaggio baseball card requires more time and effort, so these assets are less liquid.

liquidity
the ease with which an asset can be converted into the economy's medium of exchange

When people decide in what form to hold their wealth, they have to balance the liquidity of each possible asset against the asset's usefulness as a store of value. Money is the most liquid asset, but it is far from perfect as a store of value. When prices rise, the value of money falls. In other words, when goods and services become more expensive, each dollar in your wallet can buy less. This link between the price level and the value of money will turn out to be important for understanding how money affects the economy.

THE KINDS OF MONEY

When money takes the form of a commodity with intrinsic value, it is called **commodity money**. The term *intrinsic value* means that the item would have value even if it were not used as money. One example of commodity money is gold. Gold has intrinsic value because it is used in industry and in the making of jewelry. Although today we no longer use gold as money, historically gold has been a common form of money because it is relatively easy to carry, measure, and verify for impurities. When an economy uses gold as money (or uses paper money that is convertible into gold on demand), it is said to be operating under a *gold standard*.

commodity money
money that takes the form of a commodity with intrinsic value

Another example of commodity money is cigarettes. In prisoner-of-war camps during World War II, prisoners traded goods and services with one

IN THE NEWS

Money on the
Island of Yap

THE ROLE OF SOCIAL CUSTOM IN THE monetary system is most apparent in foreign cultures with customs very different from our own. The following article describes the money on the island of Yap. As you read the article, ask yourself whether Yap is using a type of commodity money, a type of fiat money, or something in between.

Fixed Assets, or Why a Loan in
Yap Is Hard to Roll Over

BY ART PINE

YAP, MICRONESIA—On this tiny South Pacific island, life is easy and the currency is hard.

Elsewhere, the world's troubled monetary system creaks along; floating exchange rates wreak havoc on currency markets, and devaluations are commonplace. But on Yap the currency is as solid as a rock. In fact, it is rock. Limestone to be precise.

For nearly 2,000 years the Yapese have used large stone wheels to pay for major purchases, such as land, canoes and permissions to marry. Yap is a U.S. trust territory, and the dollar is used in grocery stores and gas stations. But re-

liance on stone money, like the island's ancient caste system and the traditional dress of loincloths and grass skirts, continues.

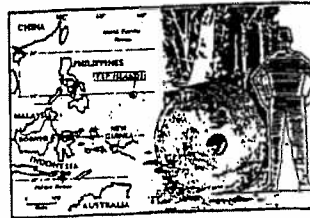
Buying property with stones is "much easier than buying it with U.S. dollars," says John Chodad, who recently purchased a building lot with a 30-inch stone wheel. "We don't know the value of the U.S. dollar. . . ."

Stone wheels don't make good pocket money, so for small transactions, Yapese use other forms of currency, such as beer. Beer is proffered as payment for all sorts of odd jobs, including construction. The 10,000 people on Yap consume 40,000 to 50,000 cases a year, mostly of Budweiser. . . .

The people of Yap have been using stone money ever since a Yapese warrior named Anagumang first brought the "huge stones from limestone caverns on neighboring Palau, some 1,500 to 2,000 years ago. Inspired by the moon, he fashioned the stone into large circles. The rest is history.

Yapese lean the stone wheels against their houses or prop up rows of them in village "banks." Most of the stones are 2 1/2 to 5 feet in diameter, but some are as much as 12 feet across. Each has a hole in the center so it can be slipped onto the trunk of a fallen betel nut tree and carried. It takes 20 men to lift some stones.

By custom, the stones are worthless when broken. You never hear people on Yap musing about wanting a piece of the rock. Rather than ask a broken stone—or back—Yapese tend to leave the larger stones where they are and make a mental accounting that the ownership has been transferred—much as



MONEY ON THE ISLAND OF YAP: NOT EXACTLY POCKET CHANGE

gold bars used in international transactions change hands without leaving the vaults of the New York Federal Reserve Bank. . . .

There are some decided advantages to using massive stones for money. They are immune to black-market trading, for one thing, and they pose formidable obstacles to pickpockets. In addition, there aren't any sterile debates about how to stabilize the Yapese monetary system. With only 6,600 stone wheels remaining on the island, the money supply stays put.

Meanwhile, Yap's stone money may be about to take on international significance. Just yesterday, Washington received notice that Tosiho Nakayama, the president of Micronesia, plans to bring a stone disk when he visits the United States next month. It will be flown by Air Force jet.

Officials say Mr. Nakayama intends the stone as Micronesia's symbolic contribution toward reducing the U.S. budget deficit.

SOURCE: *The Wall Street Journal*, March 29, 1984, p. A1

another using cigarettes as the store of value, unit of account, and medium of exchange. Similarly, as the Soviet Union was breaking up in the late 1980s, cigarettes started replacing the ruble as the preferred currency in Moscow. In both cases, even nonsmokers were happy to accept cigarettes in an exchange, knowing that they could use the cigarettes to buy other goods and services.

Money without intrinsic value is called **fiat money**. A *fiat* is simply an order or decree, and fiat money is established as money by government decree. For example, compare the paper dollars in your wallet (printed by the U.S. government) and the paper dollars from a game of Monopoly (printed by the Parker Brothers game company). Why can you use the first to pay your bill at a restaurant but not the second? The answer is that the U.S. government has decreed its dollars to be valid money. Each paper dollar in your wallet reads: "This note is legal tender for all debts, public and private."

fiat money
money without intrinsic value that is used as money because of government decree

Although the government is central to establishing and regulating a system of fiat money (such as by prosecuting counterfeiters), other factors are also required for the success of such a monetary system. To a large extent, the acceptance of fiat money depends as much on expectations and social convention as on government decree. The Soviet government in the 1980s never abandoned the ruble as the official currency. Yet the people of Moscow preferred to accept cigarettes (or even American dollars) in exchange for goods and services, because they were more confident that these alternative monies would be accepted by others in the future.

MONEY IN THE U.S. ECONOMY

As we will see, the quantity of money circulating in the economy, called the *money stock*, has a powerful influence on many economic variables. But before we consider why that is true, we need to ask a preliminary question: What is the quantity of money? In particular, suppose you were given the task of measuring how much money there is in the U.S. economy. What would you include in your measure?

The most obvious asset to include is **currency**—the paper bills and coins in the hands of the public. Currency is clearly the most widely accepted medium of exchange in our economy. There is no doubt that it is part of the money stock.

currency
the paper bills and coins in the hands of the public

Yet currency is not the only asset that you can use to buy goods and services. Many stores also accept personal checks. Wealth held in your checking account is almost as convenient for buying things as wealth held in your wallet. To measure the money stock, therefore, you might want to include **demand deposits**—balances in bank accounts that depositors can access on demand simply by writing a check.

demand deposits
balances in bank accounts that depositors can access on demand by writing a check

Once you start to consider balances in checking accounts as part of the money stock, you are led to consider the large variety of other accounts that people hold at banks and other financial institutions. Bank depositors usually cannot write checks against the balances in their savings accounts, but they can easily transfer funds from savings into checking accounts. In addition, depositors in money market mutual funds can often write checks against their balances. Thus, these other accounts should plausibly be part of the U.S. money stock.

In a complex economy such as ours, it is not easy to draw a line between assets that can be called "money" and assets that cannot. The coins in your

Table 15-1TWO MEASURES OF THE MONEY
STOCK FOR THE U.S. ECONOMY

MEASURE	AMOUNT IN 1996	WHAT'S INCLUDED
M1	\$1,117 billion	Currency Traveler's checks Demand deposits Other checkable deposits
M2	\$3,737 billion	Everything in M1 Savings deposits Small time deposits Money market mutual funds A few minor categories

SOURCE: Federal Reserve.

pocket are clearly part of the money stock, and the Empire State Building clearly is not, but there are many assets in between these extremes for which the choice is less clear. Therefore, various measures of the money stock are available for the U.S. economy. Table 15-1 shows the two most important, designated M1 and M2. Each of these measures uses a slightly different criterion for distinguishing monetary and nonmonetary assets.

For our purposes in this book, we need not dwell on the differences between the various measures of money. The important point is that the money stock for the U.S. economy includes not just currency but also deposits in banks and other financial institutions that can be readily accessed and used to buy goods and services.

CASE STUDY WHERE IS ALL THE CURRENCY?

One puzzle about the money stock of the U.S. economy concerns the amount of currency. In 1996 there was about \$380 billion of currency outstanding. To put this number in perspective, we can divide it by 200 million, the number of adults (age sixteen and over) in the United States. This calculation implies that the average adult holds about \$1,900 of currency. Most people are surprised to learn that our economy has so much currency because they carry far less than this in their wallets.

Who is holding all this currency? No one knows for sure, but there are two plausible explanations.

The first explanation is that much of the currency is being held abroad. In foreign countries without a stable monetary system, people often prefer U.S. dollars to domestic assets. It is, in fact, not unusual to see U.S. dollars being used overseas as the medium of exchange, unit of account, and store of value.

The second explanation is that much of the currency is being held by drug dealers, tax evaders, and other criminals. For most people in the U.S. economy, currency is not a particularly good way to hold wealth. Currency can be lost or stolen. Moreover, currency does not earn interest, whereas money in a

FYI
**Credit Cards,
 Debit Cards,
 and Money**



IT MIGHT SEEM NATURAL TO include credit cards as part of the economy's stock of money. After all, people use credit cards to make many of their purchases. Aren't credit cards, therefore, a medium of exchange?

Although at first this argument may seem persuasive, credit cards are excluded from all measures of the quantity of money. The

reason is that credit cards are not really a method of payment but a method of *deferring* payment. When you buy a meal with a credit card, the bank that issued the card pays the restaurant what it is due. At a later date, you will have to repay the bank (perhaps with interest). When the time comes to pay your credit card bill, you will probably do so by writing a check against your checking account. The balance in this checking account is part of the economy's stock of money.

Notice that credit cards are very different from debit cards, which automatically withdraw funds from a bank

account to pay for items bought. Rather than allowing the user to postpone payment for a purchase, a debit card allows the user immediate access to deposits in a bank account. In this sense, a debit card is more similar to a check than to a credit card.

The account balances that lie behind debit cards are included in measures of the quantity of money.

Even though credit cards are not considered a form of money, they are nonetheless important for analyzing the monetary system. People who have credit cards can pay many of their bills all at once at the end of the month, rather than sporadically as they make purchases. As a result, people who have credit cards probably hold less money on average than people who do not have credit cards. Thus, the introduction and increased popularity of credit cards may reduce the amount of money that people choose to hold.



IS THIS MONEY?

bank account does. Thus, most people hold only small amounts of currency. By contrast, criminals may prefer not to hold their wealth in banks. A bank deposit would give police a paper trail with which to trace their illegal activities. For criminals, currency may be the best store of value available.

■ **QUICK QUIZ** List and describe the three functions of money.

THE FEDERAL RESERVE

Whenever an economy relies on a system of fiat money, as the U.S. economy does, some agency must be responsible for regulating the system. In the United States, that agency is the Federal Reserve, often simply called the Fed. If you look at the top of a dollar bill, you will see that it is called a "Federal Reserve Note." The Fed is an example of a **central bank**—an institution designed to oversee the banking system and regulate the quantity of money in the economy. Other major central banks around the world include the Bank of England, the Bank of Japan, and Germany's Bundesbank.

Federal Reserve (Fed)
the central bank of the United States

central bank
an institution designed to oversee the banking system and regulate the quantity of money in the economy

THE FED'S ORGANIZATION

The Federal Reserve was created in 1914 after a series of bank failures in 1907 convinced Congress that the United States needed a central bank to ensure the health of the nation's banking system. Today, the Fed is run by its Board of Governors, which has seven members appointed by the president and confirmed by the Senate. The governors have 14-year terms. Just as federal judges are given lifetime appointments to insulate them from politics, Fed governors are given long terms to give them independence from short-term political pressures when they formulate monetary policy.

Among the seven members of the Board of Governors, the most important is the chairman. The chairman directs the Fed staff, presides over board meetings, and testifies regularly about Fed policy in front of Congressional committees. The president appoints the chairman to a four-year term. As this book was going to press, the chairman of the Fed was Alan Greenspan.

The Federal Reserve System is made up of the Federal Reserve Board in Washington, D.C., and 12 regional Federal Reserve Banks located in major cities around the country. (If you look at any dollar bill, you can find the name of the regional bank that issued that dollar.) The presidents of the regional banks are chosen by each bank's board of directors, whose members are typically drawn from the local banking and business community.

The Fed has two related jobs. The first job is to regulate banks and ensure the health of the banking system. This task is largely the responsibility of the regional Federal Reserve Banks. In particular, the Fed monitors each bank's financial condition and helps to facilitate bank transactions by clearing checks. It also acts as a banker's bank. That is, the Fed makes loans to banks when banks themselves want to borrow. When financially troubled banks find themselves short of cash, the Fed acts as a *lender of last resort*—a lender to those who cannot borrow anywhere else—in order to maintain stability in the overall banking system.

The Fed's second and more important job is to control the quantity of money that is made available in the economy, called the **money supply**. Decisions by policymakers concerning the money supply constitute **monetary policy**. At the Federal Reserve, monetary policy is made by the Federal Open Market Committee.

money supply
the quantity of money available in the economy

monetary policy
the setting of the money supply by policymakers in the central bank

THE FEDERAL OPEN MARKET COMMITTEE

The Federal Open Market Committee (FOMC) is made up of the 7 members of the Board of Governors and 5 of the 12 regional bank presidents. (All 12 regional presidents attend each FOMC meeting, but only 5 get to vote. The 5 with voting rights rotate among the 12 regional presidents over time. The president of the New York Fed always gets a vote, however, because New York is the traditional financial center of the U.S. economy and because all Fed purchases and sales of government bonds are conducted at the New York Fed's trading desk.) The FOMC meets about every six weeks in Washington, D.C., in order to discuss the condition of the economy and consider changes in monetary policy.

Through the decisions of the FOMC, the Fed has the power to increase or decrease the number of dollars in the economy. In simple metaphorical terms,

you can imagine the Fed printing up dollar bills and dropping them around the country by helicopter. Similarly, you can imagine the Fed using a giant vacuum cleaner to suck dollar bills out of people's wallets. Although in practice the Fed's methods for changing the money supply are more complex and subtle than this, the helicopter-vacuum metaphor is a good first approximation to the meaning of monetary policy.

We discuss later in this chapter how the Fed actually changes the money supply, but it is worth noting here that the Fed's primary tool is *open-market operations*—the purchase and sale of U.S. government bonds. (Recall that a U.S. government bond is a certificate of indebtedness of the federal government.) If the FOMC decides to increase the money supply, the Fed creates dollars and uses them to buy government bonds from the public in the nation's bond markets. After the purchase, these dollars are in the hands of the public. Thus, an open-market purchase of bonds by the Fed increases the money supply. Conversely, if the FOMC decides to decrease the money supply, the Fed sells government bonds from its portfolio to the public in the nation's bond markets. After the sale, the dollars it receives for the bonds are out of the hands of the public. Thus, an open-market sale of bonds by the Fed decreases the money supply.

The Fed is an important institution because changes in the money supply can profoundly affect the economy. One of the *Ten Principles of Economics* in Chapter 1 is that prices rise when the government prints too much money. Another of the *Ten Principles of Economics* is that society faces a short-run trade-off between inflation and unemployment. The power of the FOMC rests on these principles. For reasons we discuss more fully in the coming chapters, the FOMC's policy decisions have an important influence on the economy's rate of inflation in the long run and the economy's employment and production in the short run. Indeed, the chairman of the Federal Reserve has been called the second most powerful person in the United States.

QUICK QUIZ How does the Fed increase the supply of money in the economy?

BANKS AND THE MONEY SUPPLY

So far we have introduced the concept of "money" and discussed how the Federal Reserve controls the supply of money by buying and selling government bonds in open-market operations. Although this explanation of the money supply is correct, it is not complete. In particular, it omits the central role that banks play in the monetary system.

Recall that the amount of money you hold includes both currency (the bills in your wallet and coins in your pocket) and demand deposits (the balance in your checking account). Because demand deposits are held in banks, the behavior of banks can influence the quantity of demand deposits in the economy and, therefore, the money supply. This section examines how banks affect the money supply and how they complicate the Fed's job of controlling the money supply.

THE SIMPLE CASE OF 100-PERCENT-RESERVE BANKING

To see how banks influence the money supply, it is useful to imagine first a world without any banks at all. In this simple world, currency is the only form of money. To be concrete, let's suppose that the total quantity of currency is \$100. The supply of money is, therefore, \$100.

reserves

deposits that banks have received but have not loaned out

Now suppose that someone opens a bank, appropriately called First National Bank. First National Bank is only a depository institution. That is, the bank accepts deposits but does not make loans. The purpose of the bank is to give depositors a safe place to keep their money. Whenever a person deposits some money, the bank keeps the money in its vault until the depositor comes to withdraw it or writes a check against his or her balance. Deposits that banks have received but have not loaned out are called **reserves**. In this imaginary economy, all deposits are held as reserves, so this system is called *100-percent-reserve banking*.

We can express the financial position of First National Bank with a *T-account*, which is a simplified accounting statement that shows changes in a bank's assets and liabilities. Here is the T-account for First National Bank if the economy's entire \$100 of money is deposited in the bank:

FIRST NATIONAL BANK			
ASSETS		LIABILITIES	
Reserves	\$100.00	Deposits	\$100.00

On the left-hand side of the T-account are the bank's assets of \$100 (the reserves it holds in its vaults). On the right-hand side of the T-account are the bank's liabilities of \$100 (the amount it owes to its depositors). Notice that the assets and liabilities of First National Bank exactly balance.

Now consider the money supply in this imaginary economy. Before First National Bank opens, the money supply is the \$100 of currency that people are holding. After the bank opens and people deposit their currency, the money supply is the \$100 of demand deposits. (There is no longer any currency outstanding, for it is all in the bank vault.) Each deposit in the bank reduces currency and raises demand deposits by exactly the same amount, leaving the money supply unchanged. Thus, *if banks hold all deposits in reserve, banks do not influence the supply of money.*

MONEY CREATION WITH FRACTIONAL-RESERVE BANKING

fractional-reserve banking
a banking system in which banks hold only a fraction of deposits as reserves

Eventually, the bankers at First National Bank may start to reconsider their policy of 100-percent-reserve banking. Leaving all that money sitting idle in their vaults seems unnecessary. Why not use some of it to make loans? Families buying houses, firms building new factories, and students paying for college would all be happy to pay interest to borrow some of that money for a while. Of course, First National Bank has to keep some reserves so that currency is available if depositors want to make withdrawals. But if the flow of new deposits is roughly the same as the flow of withdrawals, First National needs to keep only a fraction of its deposits in reserve. Thus, First National adopts a system called **fractional-reserve banking**.



"I've heard a lot about money, and now I'd like to try some."

Let's suppose that First National decides to keep 10 percent of its deposits in reserve and to loan out the rest. We say that the **reserve ratio**—the fraction of total deposits that the bank holds as reserves—is 10 percent. Now let's look again at the bank's T-account:

reserve ratio
the fraction of deposits that banks hold as reserves

FIRST NATIONAL BANK

ASSETS		LIABILITIES	
Reserves	\$10.00	Deposits	\$100.00
Loans	90.00		

First National still has \$100 in liabilities because making the loans did not alter the bank's obligation to its depositors. But now the bank has two kinds of assets: It has \$10 of reserves in its vault, and it has loans of \$90. (These loans are liabilities of the people taking out the loans but they are assets of the bank making the loans, because the borrowers will later repay the bank.) In total, First National's assets still equal its liabilities.

Once again consider the supply of money in the economy. Before First National makes any loans, the money supply is the \$100 of deposits in the bank. Yet when First National makes these loans, the money supply increases. The depositors still have demand deposits totaling \$100, but now the borrowers hold \$90 in currency. The money supply (which equals currency plus demand deposits) equals \$190. Thus, *when banks hold only a fraction of deposits in reserve, banks create money.*

At first, this creation of money by fractional-reserve banking may seem too good to be true because it appears that the bank has created money out of thin air. To make this creation of money seem less miraculous, note that when First National Bank loans out some of its reserves and creates money, it does not create any wealth. Loans from First National give the borrowers some currency and thus the ability to buy goods and services. Yet the borrowers are also taking on debts, so the loans do not make them any richer. In other words, as a bank

creates the asset of money, it also creates a corresponding liability for its borrowers. At the end of this process of money creation, the economy is more liquid in the sense that there is more of the medium of exchange, but the economy is no wealthier than before.

THE MONEY MULTIPLIER

The creation of money does not stop with First National Bank. Suppose the borrower from First National uses the \$90 to buy something from someone who then deposits the currency in Second National Bank. Here is the T-account for Second National Bank:

SECOND NATIONAL BANK			
ASSETS		LIABILITIES	
Reserves	\$ 9.00	Deposits	\$90.00
Loans	\$1.00		

After the deposit, this bank has liabilities of \$90. If Second National also has a reserve ratio of 10 percent, it keeps assets of \$9 in reserve and makes \$81 in loans. In this way, Second National Bank creates an additional \$81 of money. If this \$81 is eventually deposited in Third National Bank, which also has a reserve ratio of 10 percent, this bank keeps \$8.10 in reserve and makes \$72.90 in loans. Here is the T-account for Third National Bank:

THIRD NATIONAL BANK			
ASSETS		LIABILITIES	
Reserves	\$ 8.10	Deposits	\$81.00
Loans	\$72.90		

The process goes on and on. Each time that money is deposited and a bank loan is made, more money is created.

How much money is eventually created in this economy? Let's add it up:

Original deposit	=	\$ 100.00
First National lending	=	\$ 90.00 [= .9 × \$100.00]
Second National lending	=	\$ 81.00 [= .9 × \$90.00]
Third National lending	=	\$ 72.90 [= .9 × \$81.00]
⋮		⋮
⋮		⋮
⋮		⋮
Total money supply		= \$1,000.00

It turns out that even though this process of money creation can continue forever, it does not create an infinite amount of money. If you laboriously add the infinite sequence of numbers in the foregoing example, you find the \$100 of reserves generates \$1,000 of money. The amount of money the banking system generates with each dollar of reserves is called the **money multiplier**. In this imaginary economy, where the \$100 of reserves generates \$1,000 of money, the money multiplier is 10.

money multiplier
the amount of money the banking
system generates with each dollar of
reserves

What determines the size of the money multiplier? It turns out that the answer is simple: *The money multiplier is the reciprocal of the reserve ratio.* If R is the reserve ratio for all banks in the economy, then each dollar of reserves generates $1/R$ dollars of money. In our example, $R = 1/10$, so the money multiplier is 10.

This reciprocal formula for the money multiplier makes sense. If a bank holds \$1,000 in deposits, then a reserve ratio of $1/10$ (10 percent) means that the bank must hold \$100 in reserves. The money multiplier just turns this idea around: If the banking system holds a total of \$100 in reserves, it can have only \$1,000 in deposits. Similarly, if the reserve ratio were $1/5$ (20 percent), the banking system must have five times as much in deposits as in reserves, implying a money multiplier of 5. The higher the reserve ratio, the less of each deposit banks loan out, and the smaller the money multiplier. In the special case of 100-percent-reserve banking, the reserve ratio is 1, the money multiplier is 1, and banks do not create money.

THE FED'S TOOLS OF MONETARY CONTROL

As we have already discussed, the Federal Reserve is responsible for controlling the supply of money in the economy. Now that we understand how fractional-reserve banking works, we are in a better position to understand how the Fed carries out this job. Because banks create money in a system of fractional-reserve banking, the Fed's control of the money supply is indirect. When the Fed decides to change the money supply, it must consider how its actions will work through the banking system.

The Fed has three tools in its monetary toolbox: open-market operations, reserve requirements, and the discount rate. Let's discuss how the Fed uses each of these tools.

Open-Market Operations As we noted earlier, the Fed conducts open-market operations when it buys or sells government bonds from the public. To increase the money supply, the Fed instructs its bond traders at the New York Fed to buy bonds in the nation's bond markets. The dollars the Fed pays for the bonds increase the number of dollars in circulation. Some of these new dollars are held as currency, and some are deposited in banks. Each new dollar held as currency increases the money supply by exactly \$1. Each new dollar deposited in a bank increases the money supply to an even greater extent because it increases reserves and, thereby, the amount of money that the banking system can create.

open-market operations
the purchase and sale of U.S. government bonds by the Fed

To reduce the money supply, the Fed does just the opposite: It sells government bonds to the public in the nation's bond markets. The public pays for these bonds with its holdings of currency and bank deposits, directly reducing the amount of money in circulation. In addition, as people make withdrawals from banks, banks find themselves with a smaller quantity of reserves. In response, banks reduce the amount of lending, and the process of money creation reverses itself.

Open-market operations are easy to conduct. In fact, the Fed's purchases and sales of government bonds in the nation's bond markets are similar to the transactions that any individual might undertake for his own portfolio. (Of course, when an individual buys or sells a bond, money changes hands, but the amount of money in circulation remains the same.) In addition, the Fed can use

open-market operations to change the money supply by a small or large amount on any day without major changes in laws or bank regulations. Therefore, open-market operations are the tool of monetary policy that the Fed uses most often.

reserve requirements
regulations on the minimum amount
of reserves that banks must hold
against deposits

Reserve Requirements The Fed also influences the money supply with reserve requirements, which are regulations on the minimum amount of reserves that banks must hold against deposits. Reserve requirements influence how much money the banking system can create with each dollar of reserves. An increase in reserve requirements means that banks must hold more reserves and, therefore, can loan out less of each dollar that is deposited; as a result, it raises the reserve ratio, lowers the money multiplier, and decreases the money supply. Conversely, a decrease in reserve requirements lowers the reserve ratio, raises the money multiplier, and increases the money supply.

The Fed uses changes in reserve requirements only rarely because frequent changes would disrupt the business of banking. When the Fed increases reserve requirements, for instance, some banks find themselves short of reserves, even though they have seen no change in deposits. As a result, they have to curtail lending until they build their level of reserves to the new required level.

discount rate
the interest rate on the loans that the
Fed makes to banks

The Discount Rate The last tool in the Fed's toolbox is the discount rate, the interest rate on the loans that the Fed makes to banks. A bank borrows from the Fed when it has too few reserves to meet reserve requirements. This might occur because the bank made too many loans or because it has experienced recent withdrawals. When the Fed makes such a loan to a bank, the banking system has more reserves than it otherwise would, and these additional reserves allow the banking system to create more money.

The Fed can alter the money supply by changing the discount rate. A higher discount rate discourages banks from borrowing reserves from the Fed. Thus, an increase in the discount rate reduces the quantity of reserves in the banking system, which in turn reduces the money supply. Conversely, a lower discount rate encourages bank borrowing from the Fed, increases the quantity of reserves, and increases the money supply.

The Fed uses discount lending not only to control the money supply but also to help financial institutions when they are in trouble. For example, in 1984, rumors circulated that Continental Illinois National Bank had made a large number of bad loans, and these rumors induced many depositors to withdraw their deposits. As part of an effort to save the bank, the Fed acted as a lender of last resort and loaned Continental Illinois more than \$5 billion. Similarly, when the stock market crashed on October 19, 1987, many Wall Street brokerage firms found themselves temporarily in need of funds to finance the high volume of stock trading. The next morning, before the stock market opened, Fed Chairman Alan Greenspan announced the Fed's "readiness to serve as a source of liquidity to support the economic and financial system." Many economists believe that Greenspan's reaction to the stock crash was an important reason why it had so few repercussions.

PROBLEMS IN CONTROLLING THE MONEY SUPPLY

The Fed's three tools—open-market operations, reserve requirements, and the discount rate—have powerful effects on the money supply. Yet the Fed's control of the money supply is not precise. The Fed must wrestle with two problems,

each of which arises because much of the money supply is created by our system of fractional-reserve banking.

The first problem is that the Fed does not control the amount of money that households choose to hold as deposits in banks. The more money that households deposit, the more reserves banks have, and the more money the banking system can create. And the less money that households deposit, the less reserves banks have, and the less money the banking system can create. To see why this is a problem, suppose that one day people begin to lose confidence in the banking system and, therefore, decide to withdraw deposits and hold more currency. When this happens, the banking system loses reserves and creates less money. The money supply falls, even without any Fed action.

The second problem of monetary control is that the Fed does not control the amount that bankers choose to lend. Once money is deposited in a bank, it creates more money only when the bank loans it out. Yet banks can choose to hold reserves above what the Fed requires, called *excess reserves*. To see why excess reserves complicate control of the money supply, suppose that one day bankers become more cautious about economic conditions and decide to make fewer loans and hold greater reserves. In this case, the banking system creates less money than it otherwise would. Because of the bankers' decision, the money supply falls.

Hence, in a system of fractional-reserve banking, the amount of money in the economy depends in part on the behavior of depositors and bankers. Because the Fed cannot control or perfectly predict this behavior, it cannot perfectly control the money supply. Yet, if the Fed is vigilant, these problems need not be large. The Fed collects data on deposits and reserves from banks every week, so it is quickly aware of any changes in depositor or banker behavior. It can, therefore, respond to these changes and keep the money supply close to whatever level it chooses.

CASE STUDY BANK RUNS AND THE MONEY SUPPLY

Although you have probably never witnessed a bank run in real life, you may have seen one depicted in movies such as *Mary Poppins* or *It's a Wonderful Life*. A bank run occurs when depositors suspect that a bank may go bankrupt and, therefore, "run" to the bank to withdraw their deposits.

Bank runs are a problem for banks under fractional-reserve banking. Because a bank holds only a fraction of its deposits in reserve, it cannot satisfy withdrawal requests from all depositors. Even if the bank is in fact *solvent* (meaning that its assets exceed its liabilities), it will not have enough cash on hand to allow all depositors immediate access to all of their money. When a run occurs, the bank is forced to close its doors until some bank loans are repaid or until some lender of last resort (such as the Fed) provides it with the currency it needs to satisfy depositors.

Bank runs complicate the control of the money supply. An important example of this problem occurred during the Great Depression in the early 1930s. After a wave of bank runs and bank closings, households and bankers became more cautious. Households withdrew their deposits from banks, preferring to hold their money in the form of currency. This decision reversed the process of money creation, as bankers responded to falling reserves by reducing bank loans. At the same time, bankers increased their reserve ratios so that they would have enough cash on hand to meet their depositors' demands in

any future bank runs. The higher reserve ratio reduced the money multiplier, which also reduced the money supply. From 1929 to 1933, the money supply fell by 28 percent, even without the Federal Reserve taking any deliberate contractionary action. Many economists point to this massive fall in the money supply to explain the high unemployment and falling prices that prevailed during this period. (In future chapters we examine the mechanisms by which changes in the money supply affect unemployment and prices.)

Today, bank runs are not a major problem for the banking system or the Fed. The federal government now guarantees the safety of deposits at most banks, primarily through the Federal Deposit Insurance Corporation (FDIC). Depositors do not run on their banks because they are confident that, even if their bank goes bankrupt, the FDIC will make good on the deposits. As a result, most people see bank runs only in the movies.



A Not-So-Wonderful Bank Run

■ **QUICK QUIZ** Describe how banks create money.

CONCLUSION

Several years ago, a book made the best-seller list with the title *Secrets of the Temple: How the Federal Reserve Runs the Country*. Although no doubt an exaggeration, this title did highlight the important role of the monetary system in our daily lives. Whenever we buy or sell anything, we are relying on the extraordinarily useful social convention called "money." Now that we know what money is and what determines its supply, we can discuss how changes in the quantity of money affect the economy. We begin to address that topic in the next chapter.

Summary

- The term *money* refers to assets that people regularly use to buy goods and services.
- Money serves three functions. As a medium of exchange, it provides the item used to make transac-