chapter 13

>> Money, Banking, and the Federal Reserve System

A WAGGON-WAY THROUGH THE AIR

The birth of economics as a discipline is usually dated to 1776, when Adam Smith published *The Wealth of Nations*. His book is most famous for its early appreciation of the "invisible hand" of markets, which harnesses private interest to the public good. But there's a lot more in *The Wealth of Nations*. Among other things, it contains a passionate defense of what were, in Smith's time, newfangled inventions: banks and paper money.

Today we take it for granted that we can trade pieces of elaborately printed paper—green paper, in the United States—for almost any good or service. We also take for granted that in many cases we don't even need the pieces of paper: we can write a check or swipe a card, both of which amount to promises that a bank will provide green paper or its equivalent at a later time.

In Adam Smith's time, however, most of the world's business was still conducted with gold or silver coins. Paper money and bank accounts—though well established in his native Scotland—were still regarded with suspicion in much of the world. That's why Smith felt it necessary to explain the virtues of a modern monetary system that would allow a nation to conduct its business while freeing up that gold and silver for other uses. Using paper money instead of gold and silver coins, he said, was like finding a way to build a road without diverting any land from other uses—building "a sort of waggon-way through the air."

Erik Dreyer/Stone/Getty

According to an old proverb, "With money in your pocket, you are wise, and you are handsome, and you sing well, too."

In this chapter, we'll look at how a modern monetary system works and at the institutions that sustain and regulate it. This topic is important in itself, and it's also essential background for the understanding of *monetary policy,* which we will examine in Chapter 14.

What you will learn in this chapter:

- The various roles **money** plays and the many forms it takes in the economy.
- How the actions of private banks and the Federal Reserve determine the **money supply.**
- How the Federal Reserve uses **open-market operations** to change the monetary base.

The Meaning of Money

In everyday conversation, people often use the word *money* to mean "wealth." If you ask, "How much money does Bill Gates have?" the answer will be something like, "Oh, $40 billion or so, but who's counting?" That is, the number will include the value of the stocks, bonds, real estate, and other assets he owns.

But the economist's definition of money doesn't include all forms of wealth. The dollar bills in your wallet are money; other forms of wealth—such as cars, houses, and stock certificates—aren't money. What, according to economists, distinguishes money from other forms of wealth?

What Is Money?

Money is any asset that can easily be used to purchase goods and services.

Money is defined in terms of what it does: **money** is any asset that can easily be used to purchase goods and services. In Chapter 9 we defined an asset as *liquid* if it can easily be converted into cash. Money consists either of cash itself, which is liquid by definition, or of other assets that are highly liquid.

You can see the distinction between money and other assets by asking yourself how you pay for groceries. The person at the cash register will accept dollar bills in return for milk and frozen pizza—but not stock certificates or a collection of vintage baseball cards. If you want to convert stock certificates into groceries, you have to sell them—trade them for money—and then use the money to buy groceries.

Currency in circulation is cash held by the public.

Checkable bank deposits are bank accounts on which people can write checks.

The **money supply** is the total value of financial assets in the economy that are considered money.

Of course, many stores allow you to write a check on your bank account in payment for goods (or to pay with a debit card that is linked to your bank account). Does that make your bank account money, even if you haven't converted it into cash? Yes. **Currency in circulation**—actual cash in the hands of the public—is considered money. So are **checkable bank deposits**—bank accounts on which people can write checks.

Are currency and checkable bank deposits the only assets that are considered money? It depends. As we'll see later, there are several widely used definitions of the **money supply,** the total value of financial assets in the economy that are considered money. The narrowest definition is the most liquid because it contains only currency in circulation, traveler's checks, and checkable bank deposits. Broader definitions include other assets that are "almost" checkable, such as savings account deposits that can be transferred into a checking account with a phone call. All definitions of the money supply, however, make a distinction between assets that can easily be used to purchase goods and services, and those that can't.

Money plays a crucial role in generating *gains from trade,* because it makes indirect exchange possible. Think of what happens when a cardiac surgeon buys a new refrigerator. The surgeon has valuable services to offer—namely, heart operations. The owner of the store has valuable goods to offer: refrigerators and other appliances. It would be extremely difficult for both parties if, instead of using money, they had to directly barter the goods and services they sell. In a barter system, a cardiac surgeon and an appliance store owner could trade only if the store owner happened to want a heart operation *and* the surgeon happened to want a new refrigerator. This is known as the problem of finding a "double coincidence of wants": in a barter system, two parties can trade only when each wants what the other has to offer. Money solves this problem: individuals can trade what they have to offer for money and trade money for what they want.

Because money makes it easier to gain from trade, it increases welfare, even though it does not directly produce anything. As Adam Smith put it, money "may very properly be compared to a highway, which, while it circulates and carries to market all the grass and corn of the country, produces itself not a single pile of either."

Let's take a closer look at the roles money plays in the economy.

PITFALLS

PLASTIC AND THE MONEY SUPPLY

In twenty-first-century America, many purchases are made with neither cash nor a check, but with cards. These cards come in two varieties. *Debit cards,* like bank ATM cards that can also be used at the supermarket, automatically transfer funds from the buyer's bank account. So debit cards allow you to access your bank account balance, which is part of the money supply.

But what about credit cards? *Credit cards* in effect allow you to borrow money to buy things at the store. Shouldn't these be counted as part of the money supply? The answer is no—the money supply is the value of *financial assets,* and credit cards are not assets. Credit cards access funds you can borrow—a liability, not an asset. Your credit card balance is what you currently owe. Your available credit is the maximum amount you can borrow. Since your credit card balance and your available credit are both liabilities, not assets, neither is part of the money supply.

Both debit and credit cards make it easier for individuals to make purchases. But unless they are accessing assets, the balances on the cards aren't part of the money supply.

Roles of Money

Money plays three main roles in any modern economy: it is a *medium of exchange,* a *store of value,* and a *unit of account*.

Medium of Exchange

Our cardiac surgeon–refrigerator example illustrates the role of money as a **medium of exchange**—an asset that individuals use to trade for goods and services rather than for consumption. People can't eat dollar bills; rather, they use dollar bills to trade for edible goods and their accompanying services.

A medium of exchange is an asset that individuals acquire for the purpose of trading rather than for their own consumption.

In normal times, the official money of a given country—the dollar in the United States, the peso in Mexico, and so on—is also the medium of exchange in virtually all transactions in that country. During troubled economic times, however, other goods or assets often play that role. For example, during economic turmoil other countries' moneys frequently become the medium of exchange. U.S. dollars have played this role in Latin American countries, and euros have done so in Eastern Europe. In a famous example, cigarettes functioned as the medium of exchange in World War II prisoner-of-war camps. Even nonsmokers traded goods and services for cigarettes, because the cigarettes could in turn be easily traded for other items. During the extreme German inflation of 1923, goods such as eggs and lumps of coal became, briefly, mediums of exchange.

Store of Value

In order to act as a medium of exchange, money must also be a **store of value**—a means of holding purchasing power over time. To see why this is necessary, imagine trying to operate an economy in which ice-cream cones were the medium of exchange. Such an economy would quickly suffer from, well, monetary meltdown: your medium of exchange would often turn into a sticky puddle before you could use it to buy something else. (As we'll see in Chapter 16, one of the problems caused by high inflation is that, in effect, it causes the value of money to "melt.") Of course, money is by no means the only store of value. Any asset that holds its purchasing power over time is a store of value. So the store-of-value role is necessary but not distinctive.

A **store of value** is a means of holding purchasing power over time.

Unit of Account

Finally, money normally serves as a **unit of account**—a measure individuals use to set prices and make economic calculations. A new CD costs about five times as much as a Big Mac, but Amazon.com lists the price of a CD as $14, not five Big Macs.

A **unit of account** is a measure used to set prices and make economic calculations.

Types of Money

In some form or another, money has been in use for thousands of years. For most of that period, people used **commodity money:** the medium of exchange was a good, normally gold or silver, that had other uses. These other uses gave commodity money value independent of its role as a medium of exchange. For example, cigarettes, which served as money in POW camps, were also valuable because many prisoners smoked. Gold was valuable because it was used for jewelry and ornamentation, aside from the fact that it was minted into coins.

Commodity money is a good used as a medium of exchange that has other uses.

By the time Adam Smith wrote *The Wealth of Nations,* most of the money in Scotland consisted of paper notes rather than gold or silver coins. Unlike modern dollar bills, however, those notes were issued by private banks, which promised to exchange their notes for gold or silver coins on demand. That is, the paper currency of 1776 Scotland was a **commodity-backed money,** a medium of exchange with no intrinsic value whose ultimate value was guaranteed by a promise that it could always be converted into valuable goods.

A **commodity-backed money** is a medium of exchange with no intrinsic value whose ultimate value is guaranteed by a promise that it can be converted into valuable goods.

The big advantage of commodity-backed money over gold and silver coins is that it ties up fewer valuable resources. A country in which gold and silver coins have been replaced by paper money can normally rely on the fact that on any given day holders of only a fraction of its paper notes will demand to have them converted into gold or silver coins. So the note-issuing bank needs to keep only a portion of the total value of its notes in circulation in the form of gold and silver in its vaults. It can lend out the

remaining gold and silver to those who wish to use it. This allows society to use that gold and silver for other purposes, all with no loss in the ability to achieve gains from trade.

That's what Adam Smith meant by a "waggon-way through the air." Remember his analogy between money and an imaginary highway that did not absorb valuable land beneath it. An actual highway provides a useful service but at a cost: land that could be used to grow crops is instead paved over. If the highway could be built through the air, it wouldn't destroy useful land. As Smith understood, when Scottish banks replaced gold and silver money with paper, they accomplished a similar feat: they reduced the amount of real resources used by society to provide the functions of money.

At this point you may ask, why make any use at all of gold and silver as a medium of exchange in the monetary system? In fact, today's monetary system goes even further than the Scottish system Smith admired. A U.S. dollar bill isn't commodity money, and it isn't even commodity-backed. Its value arises entirely from the fact that it is generally accepted as a means of payment, a role that is ultimately decreed by the U.S. government. Money whose value derives entirely from its official status as a means of exchange is known as **fiat money** because it exists by government *fiat*, a historical term for a policy declared by a ruler.

Fiat money is a medium of exchange whose value derives entirely from its official status as a means of payment.

Measuring the Money Supply

A **monetary aggregate** is an overall measure of the money supply.

Near-moneys are financial assets that can't be directly used as a medium of exchange but can readily be converted into cash or checkable bank deposits.

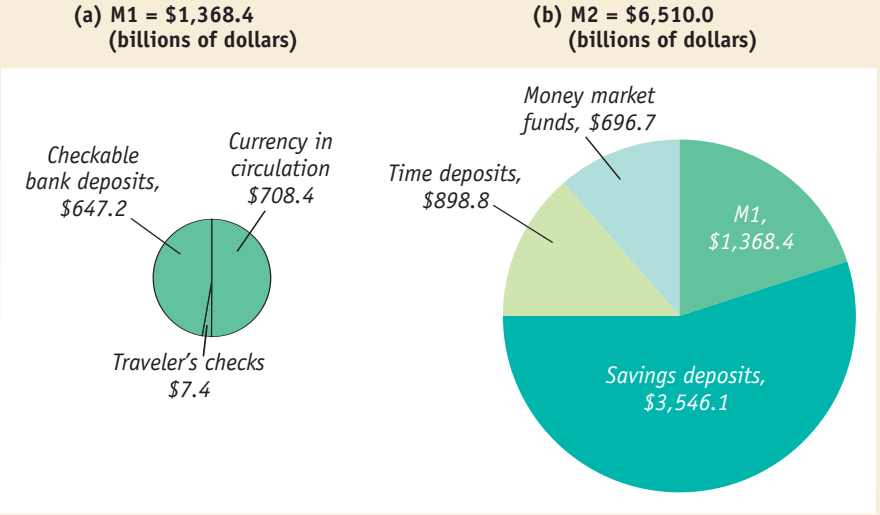
The Federal Reserve (an institution we'll talk about shortly) calculates three **monetary aggregates,** overall measures of the money supply, which differ in how strictly money is defined. The three aggregates are known, rather cryptically, as M1, M2, and M3. M1, the narrowest definition, contains only currency in circulation (also known as cash), traveler's checks, and checkable bank deposits. M2 adds several other kinds of assets, often referred to as **near-moneys**—financial assets that aren't directly usable as a medium of exchange but can readily be converted into cash or checkable bank deposits. Examples are deposits that aren't checkable but can be withdrawn at any time without penalty. Most monetary analyses focus on either M1 or M2. There is, however, a third aggregate, M3, which adds yet another group of somewhat more "distant" near-moneys—assets that are somewhat harder to convert into cash or checkable bank deposits, such as deposits that come with some penalty for early withdrawal. M1 is therefore the most liquid measure of money because currency and checkable deposits are directly usable as a medium of exchange.

Figure 13-1 shows the makeup of M1 and M2 in June 2005, in billions of dollars. M1, valued at $1,368.4 billion, consisted roughly of half currency in circulation and

Figure 13-1

Monetary Aggregates, June 2005 (billions of dollars)

The Federal Reserve uses three definitions of the money supply: M1, M2, and M3 (not shown). As panel (a) shows, M1 is equally split between currency in circulation and checkable bank deposits. M2, as panel (b) shows, has a much broader definition: it includes M1, plus a range of other deposits and deposit-like assets, making it about three times as large.



FOR INQUIRING MINDS

WHAT'S WITH ALL THE CURRENCY?

Alert readers may be a bit startled at one of the numbers in the money supply: more than $700 billion of currency in circulation. That's almost $2,500 in cash for every man, woman, and child in the United States. How many people do you know who carry $2,500 in their wallets? Where is all that cash?

Part of the answer is that it isn't in individuals' wallets: it's in cash registers. Businesses as well as individuals need to hold cash.

Economists also believe that cash plays an important role in transactions that people want to keep hidden. Small businesses and the self-employed sometimes prefer to be paid in cash so they can hide the income from the Internal Revenue Service. Also, drug dealers and other criminals obviously don't want bank records of their dealings. In fact, some analysts have tried to use cash holdings to infer the amount of illegal activity in the economy.

The most important reason for those huge currency holdings, however, is foreign use of dollars. The Federal Reserve estimates that 60% of U.S. currency is actually held outside the country.

half checkable bank deposits, with a tiny slice of traveler's checks. In turn, M1 made up slightly less than 25% of M2, valued at $6,510.0 billion. The rest of M2 consisted of two types of bank deposits, known as savings deposits and time deposits, which are considered noncheckable, plus money market funds, which are mutual funds that invest only in liquid assets and bear a close resemblance to bank deposits.

economics in action

The History of the Dollar

U.S. dollar bills are pure fiat money: they have no intrinsic value, and they are not backed by anything that does. But money in America wasn't always like that. In the early days of European settlement, the colonies that would become the United States used commodity money, consisting in part of gold and silver coins. But such coins were scarce on this side of the Atlantic, so the colonists relied on a variety of other forms of commodity money. For example, settlers in Virginia used tobacco as money and settlers in the Northeast used "wampum," a type of clamshell.

Later in American history, commodity-backed paper money came into widespread use. But this wasn't paper money as we now know it, issued by the government and bearing the signature of the secretary of the treasury. Before the Civil War, the U.S. government didn't issue paper money at all. Dollar bills were issued by private banks, which promised holders that these bills could be redeemed for silver coins on demand. These promises weren't always credible, because sometimes banks failed. People were reluctant to accept currency from banks suspected of being in financial trouble. In other words, some dollars were less valuable than others.

Electric Studio/Library and Archives Canada

Counting money 1870s style: Iroquois chiefs from the Six Nations Reserve read wampum belts.

A curious legacy of that time was notes issued by the Citizens' Bank of Louisiana, based in New Orleans, that became among the most widely used bank notes in the southern states. These notes were printed in English on one side and French on the other. (At the time, many people in New Orleans, originally a colony of France, spoke French.) Thus, the $10 bill read *Ten* on one side and *Dix,* the French word for "ten," on the other. These $10 bills became known as "dixies," probably the source of the nickname of the U.S. South.

The U.S. government began issuing official paper money, called "greenbacks," during the Civil War. At first greenbacks had no fixed value in terms of commodities. After 1873 the U.S. government guaranteed the value of a dollar in terms of gold, effectively turning dollars into commodity-backed money.

In 1933, when President Franklin D. Roosevelt broke the link between dollars and gold, his own federal budget director declared ominously, "This will be the end of Western civilization." It wasn't. The link between the dollar and gold was restored a few years later, then dropped again—seemingly for good—in August 1971. Despite the warnings of doom, the U.S. dollar is still the world's most widely used currency. ■

>>QUICK REVIEW

- *Money* is any asset that can easily be used to purchase goods and services. *Currency in circulation* and *checkable bank deposits* are both considered part of the *money supply.*
- Money plays three roles: as a *medium of exchange,* a *store of value,* and a *unit of account.*
- Historically, money took the form first of *commodity money,* then of *commodity-backed money*. Today the dollar is pure *fiat money*.
- The money supply is measured by several *monetary aggregates:* M1, M2, and M3. M1 is the most liquid; M2 consists of M1 plus various kinds of *near-moneys*.

>>CHECK YOUR UNDERSTANDING 13-1

1. Suppose you hold a gift certificate, good for certain products at participating stores. Is this gift certificate money? Why or why not?
2. Although most bank accounts pay some interest, depositors can get a higher interest rate by buying a certificate of deposit, or CD. The difference between a CD and a checking account is that the depositor pays a penalty for withdrawing the money before the CD comes due—a period of months or even years. Small CDs are counted in M2, but not in M1. Explain why they are not part of M1.

Solutions appear at back of book.

The Monetary Role of Banks

About half of M1, the narrowest definition of the money supply, consists of currency—$1 bills, $5 bills, and so on. It's obvious where currency comes from: it's printed by the U.S. Treasury. But the other half consists of bank deposits, and deposits account for the great bulk of M2 and M3, the broader definitions of the money supply. Bank deposits, then, are a major component of the money supply. And this fact brings us to our next topic: the monetary role of banks.

What Banks Do

As we learned in Chapter 9, a bank is a *financial intermediary* that uses liquid assets in the form of bank deposits to finance the illiquid investments of borrowers. Banks can create liquidity because it isn't necessary for a bank to keep all of the funds deposited with it in the form of highly liquid assets. Except in the case of a *bank run*—which we'll get to shortly—all of a bank's depositors won't want to withdraw funds at the same time. So a bank can provide its depositors with liquid assets yet still invest much of the depositors' funds in illiquid assets, such as mortgages and business loans.

Banks don't, however, lend out all the funds placed in their hands by depositors because they do have to satisfy any depositor who wants to withdraw funds. In order to meet these demands, banks keep substantial quantities of liquid assets on hand. In the modern U.S. banking system, these assets take the form either of currency in the banks' vaults or deposits held in the bank's own account at the Federal Reserve. The latter can be, as we'll see shortly, converted into currency more or less instantly. The currency and Federal Reserve deposits held by banks are called **bank reserves.**

Bank reserves are the currency banks hold in their vaults plus their deposits at the Federal Reserve.

To understand the basic role of banks in determining the money supply, let's consider a hypothetical example. Figure 13-2 shows the financial position of First Street

Figure 13-2

Assets and Liabilities of First Street Bank

A T-account summarizes a bank's financial position. The bank's assets, $900,000 in outstanding loans to borrowers and reserves of $100,000, are entered on the left side. Its liabilities, $1,000,000 in bank deposits held for depositors, are entered on the right side.

Assets		Liabilities	
Loans	$900,000	Deposits	$1,000,000
Reserves	$100,000		

Bank, which is the repository of $1 million in bank deposits. The bank's financial position is described by the *T-account,* a type of financial spreadsheet, as shown in the figure. On the left side are First Street's *assets*—claims on individuals and businesses, consisting of the value of its outstanding loans and its reserves. On the right side are the bank's *liabilities*—other claims held by individuals and firms against the bank, consisting of the value of bank deposits.

In this example, First Street Bank holds reserves equal to 10% of its bank deposits. The fraction of bank deposits that a bank holds as reserves is its **reserve ratio.** In the modern American system the Federal Reserve—which, among other things, regulates banks—sets a minimum required reserve ratio that banks are required to maintain. To understand why banks are regulated, we need to look at a problem banks can face: bank runs.

The **reserve ratio** is the fraction of bank deposits that a bank holds as reserves.

The Problem of Bank Runs

Banks can lend out most of the funds deposited in their care because all depositors normally won't want to withdraw all their funds at the same time. But what would happen to a bank if, for some reason, all or at least a large fraction of its depositors *did* try to withdraw all their funds over a short period of time, such as a couple of days?

The answer is that the bank wouldn't have enough cash and reserves at the Federal Reserve to meet its depositors' demands for immediate cash withdrawals. The bank would have a hard time coming up with the cash, even if it had invested depositors' funds wisely, because bank loans are relatively *illiquid*. Bank loans can't easily be converted into cash on short notice. To see why, imagine that First Street Bank has lent $100,000 to Drive-A-Peach Used Cars, a local dealership. To raise cash, First Street can sell its loan to Drive-A-Peach to someone else—another bank or an individual investor. But if First Street tries to sell the loan quickly, potential buyers will be wary: they will suspect that First Street wants to sell the loan because there is something wrong and the loan might not be repaid. As a result, First Street Bank can sell the loan quickly only by offering it for sale at a deep discount, say a discount of 50%, or $50,000.

The upshot is that if First Street's depositors all suddenly decide to withdraw their funds, any effort to raise the necessary cash forces the bank to sell off its assets very cheaply. Inevitably, it will not be able to pay off its depositors in full.

What might start this whole process? That is, what might lead First Street's depositors to rush to pull their money out? A plausible answer is a spreading rumor that the bank is in financial trouble. Even if they aren't sure the rumor is true, depositors are likely to play it safe and get their money out while they still can. And it gets worse: a depositor who simply thinks that *other* depositors are going to panic and try to get

their money out will realize that this could "break the bank." So he or she joins the rush. In other words, fear about a bank's financial condition can be a self-fulfilling prophecy: depositors who believe that other depositors will rush for the exit will rush for the exit themselves.

A **bank run** is a phenomenon in which many of a bank's depositors try to withdraw their funds due to fears of a bank failure.

A **bank run** is a phenomenon in which many of a bank's depositors try to withdraw their funds due to fears of a bank failure. Moreover, bank runs aren't bad only for the bank in question and its depositors. Historically, they have often proved contagious, with a run on one bank leading to a loss of faith in other banks, causing additional bank runs. The Economics in Action that follows this section describes just such a contagion, the wave of bank runs that swept the United States in the early 1930s. In response to that experience and similar experiences in other countries, the United States and most other modern governments have established a system of bank regulations that protect depositors and prevent bank runs.

Bank Regulation

Should you worry about losing money in the United States because of a bank run? No. After the banking crises of the 1930s, the United States and most other countries put into place a system designed to protect depositors and the economy as a whole against bank runs. This system has three main features: *deposit insurance, capital requirements,* and *reserve requirements*.

Deposit insurance guarantees that a bank's depositors will be paid even if the bank can't come up with the funds, up to a maximum amount per account.

Deposit Insurance Almost all banks in the United States advertise themselves as a "member of the FDIC"—the Federal Deposit Insurance Corporation. As we learned in Chapter 9, it provides **deposit insurance,** a guarantee by the federal government that depositors will be paid even if the bank can't come up with the funds, up to a maximum amount per account. The FDIC currently guarantees the first $100,000 of each account.

It's important to realize that deposit insurance doesn't just protect depositors if a bank actually fails. The insurance also eliminates the main reason for bank runs: since depositors know their funds are safe even if a bank fails, they have no incentive to rush to pull them out because of a rumor that the bank is in trouble.

FOR INQUIRING MINDS

IS BANKING A CON?

Banks make it possible for any individual depositor to withdraw funds whenever he or she wants. Yet the cash in a bank's vaults, and its deposits at the Federal Reserve, wouldn't be enough to satisfy all or even most depositors if they all tried to withdraw funds at the same time. Does this mean that there is something fundamentally dishonest about the banking business?

Many people have thought so; every once in a while a prominent critic of the banking industry demands regulations that would stop banks from making illiquid loans. But an analogy may help explain what banks do and why it's productive.

Think about car-rental agencies. Because of these agencies, someone who travels, say, from Atlanta to Cincinnati can normally count on having a car when he or she needs one. Yet there are many more potential travelers to Cincinnati than there are cars available to rent; the rent-a-car business depends on the fact that only a fraction of those potential visitors show up in any given week. There's no trickery involved. Travelers believe they can almost always get a car when needed, even though the number of cars actually available is limited—and they are right. Banks do the same thing. Depositors believe they can almost always get cash when they need it, even though the bank has only limited reserves.

Capital Requirements Deposit insurance, although it protects the banking system against bank runs, creates a well-known incentive problem. Because depositors are protected from loss, they have no incentive to monitor their bank's financial health. Meanwhile, the owners of banks have an incentive to engage in overly risky investment behavior, such as making risky loans at high interest. If all goes well, the owners profit; and if things go badly, the government covers the losses through federal deposit insurance

To reduce the incentive for excessive risk taking, regulators require that the owners of banks hold substantially more assets than the value of bank deposits. That way, the bank will still have assets larger than its deposits even if some of its loans go bad, and losses will accrue against the bank owners' assets, not the government. The excess of a bank's assets over its bank deposits and other liabilities is called the bank's capital. In practice, banks' capital is equal to 7% or more of their assets.

Reserve Requirements Another way to reduce the risk of bank runs is to require banks to maintain a higher reserve ratio than they otherwise would. **Reserve requirements** are rules set by the Federal Reserve that determine a bank's minimum reserve ratio. For example, in the United States, the minimum reserve ratio for checkable bank deposits is 10%.

Reserve requirements are rules set by the Federal Reserve that determine the minimum reserve ratio for a bank.

economics in action

It's a Wonderful Banking System

Next Christmas time, it's a sure thing that at least one TV station in your home town will show the 1946 film *It's a Wonderful Life,* featuring Jimmy Stewart as George Bailey, a small-town banker whose life is saved by an angel. The movie's climactic scene is a run on Bailey's bank, as fearful depositors rush to take their funds out.

When the movie was made, such scenes were still fresh in Americans' memories. There was a wave of bank runs in late 1930, a second wave in the spring of 1931, and a third wave in early 1933. By the end, more than a third of the nation's banks had failed. To bring the panic to an end, on March 6, 1933, the newly inaugurated president, Franklin Delano Roosevelt, declared a national "bank holiday," closing all banks for a week.

Diego Guidice/AP Photo

Argentina's economic crisis led to massive bank runs, angry public protests, and despair as many middle- and working-class families lost jobs and savings and were plunged into poverty.

Since then, regulation has protected the United States and other wealthy countries against bank runs. In fact, the scene in *It's a Wonderful Life* was already out of date when the movie was made. But the last decade has seen several waves of bank runs in developing countries, for example, bank runs played a role in an economic crisis that swept Southeast Asia in 1997–1998 and in the severe economic crisis in Argentina, which began in late 2001. ■

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>>QUICK REVIEW

- Banks hold *reserves* of currency plus deposits at the Federal Reserve. The *reserve ratio* is the ratio of reserves to bank deposits.
- *Bank runs* were a serious problem in the past, but in the contemporary United States, banks and their depositors are protected by *deposit insurance,* capital requirements, and *reserve requirements.*

>>CHECK YOUR UNDERSTANDING 13-2

1. Suppose you are a depositor at First Street Bank. You hear a rumor that the bank has suffered serious losses on its loans. Every depositor knows that the rumor isn't true, but each thinks that most other depositors believe the rumor. Why, in the absence of deposit insurance, could this lead to a bank run? Why does deposit insurance change the situation?

2. A con man has a great idea: he'll open a bank without investing any capital and lend all the deposits at high interest rates to real estate developers. If the real estate market booms, the loans will be repaid and he'll make high profits. If the real estate market goes bust, the loans won't be repaid and the bank will fail—but he will not lose any of his own wealth. How would modern bank regulation frustrate his scheme?

Solutions appear at back of book.

Determining the Money Supply

If banks didn't exist, the quantity of currency would be equal to the money supply. And since all U.S. currency in circulation—coins, $1 bills, $5 bills, and so on—is issued by the government, the money supply would be determined directly by whoever controls the minting and printing presses. But banks do exist, and they affect the money supply in two ways. First, they take some currency out of circulation: dollar bills that are sitting in bank vaults, as opposed to sitting in people's wallets, aren't considered part of the money supply. Second, and much more important, is that banks, by offering deposits, create money, allowing the money supply to be larger than the quantity of currency. Let's look at how banks create money and what determines the amount of money they create.

How Banks Create Money

To see how banks create money, it's useful to examine what happens when someone decides to deposit currency in a bank. So let's consider the example of Silas, a miser, who keeps shoeboxes full of currency under his bed. Suppose he realizes that it would actually be safer, as well as more convenient, to deposit that cash in the bank and withdraw funds or write checks when necessary. And suppose he takes his money, $1,000 in cash, and deposits it in First Street Bank. What effect will this have on the money supply?

Panel (a) of Figure 13-3 shows the initial effect of his deposit. First Street Bank credits Silas with $1,000 in his account, so bank deposits rise by $1,000. Meanwhile, Silas's cash goes into the vault, so First Street's reserves also rise by $1,000.

Figure 13-3 **Effect on the Money Supply of a Deposit at First Street Bank**

(a) Initial Effect Before Bank Makes New Loans

Assets		Liabilities	
Loans		Deposits	+$1,000
Reserves	+ $1,000		

(b) Effect After Bank Makes New Loans

Assets		Liabilities	
Loans	+ $900	No change	
Reserves	– $900		

When Silas deposits $1,000 (which had been stashed under his mattress) in a bank account, there is initially no effect on the money supply: currency in circulation falls by $1,000, but bank deposits rise by $1,000. The corresponding entries on the bank's T-account (panel a) show deposits initially rising by $1,000 and the bank's reserves initially rising by $1,000. In the second stage (panel b), the bank holds 10% of Silas's deposit ($100) as reserves and lends out the rest ($900) to Mary. As a result, its reserves fall by $900 and its loans increase by $900. Its liabilities, including Silas's $1,000 deposit, are unchanged. The money supply, the sum of bank deposits and currency in circulation, has now increased by $900—the $900 now held by Mary.

This initial transaction has no effect on the money supply. Currency in circulation falls by $1,000, but bank deposits—which are also part of the money supply—rise by the same amount.

But this is not the end of the story, because First Street Bank can now lend out part of Silas's deposit. Assume that it holds 10% of the deposit—$100—in reserves and lends the rest out to Silas's neighbor, Mary. The effect of this second stage is shown in panel (b). First Street's deposits remain unchanged, and so does the value of its assets. But the composition of its assets changes. Its reserves are $900 less than if it had not made the loan (they are $100 more than before Silas deposited his money). And in the place of that $900 it has acquired an IOU, its $900 loan to Mary.

By putting Silas's cash back in circulation by lending it to Mary, First Street Bank has, in fact, increased the money supply. That is, the sum of currency in circulation and bank deposits has risen by $900.

And even this may not be the end of the story. Suppose that Mary uses her cash to buy a television and a DVD player from Acme Merchandise. What does Anne Acme, the store's owner, do with the cash? If she holds on to it, the money supply doesn't increase any further. But suppose she deposits the $900 in a bank—say, Second Street Bank. Second Street Bank, in turn, will keep only part of that deposit in reserves, lending out the rest, creating still more money.

Assume that Second Street Bank, like First Street Bank, keeps 10% of any bank deposit in reserves and lends out the rest. Then it will keep $90 in reserves and lend out $810 of Anne's deposit, further increasing the money supply.

Table 13-1 shows the process of money creation we have described so far. At first the money supply consists only of Silas's $1,000. After he deposits the cash and the bank makes a loan, the money supply rises to $1,900. After the second deposit and the second loan, the money supply rises to $2,710. And the process will, of course, continue from there.

This process of money creation may sound familiar. In Chapter 10 we described the *multiplier process:* an initial increase in real GDP leads to a rise in consumer spending, which leads to a further rise in real GDP, which leads to a further rise in consumer spending, and so on. What we have here is another kind of multiplier—the *money multiplier*. Let's look at how the size of this multiplier is determined.

TABLE 13-1

How Banks Create Money

	Currency in circulation	Bank deposits	Money supply
First stage (Silas keeps his money under the bed)	$1,000	0	$1,000
Second stage (Silas deposits cash in First Street Bank, which lends out $900 to Mary)	900	1,000	1,900
Third stage (Ann Acme deposits loan of $900 in Second Street Bank, which lends out $810)	810	1,900	2,710

Reserves, Bank Deposits, and the Money Multiplier

In tracing out the effect of Silas's deposit in Table 13-1, we assumed that the funds a bank lends out always end up being deposited either in the same bank or in another bank—so loans come back to the banking system, even if not to the lending bank. In reality, part of the loans may be held by borrowers in the form of currency, and so some of the loaned amount "leaks" out of the banking system because individuals add to their holdings of currency. But let's set that complication aside for a moment and consider how the money supply would be determined in a "deposits-only" monetary system.

Assume, then, that banks are subject to a rule that sets a minimum required reserve ratio. Assume also that banks lend out any **excess reserves,** reserves over and above its required reserves. Assume, finally, that any money an individual borrows from a bank gets deposited into a bank account. Now suppose that for some reason a

Excess reserves are bank reserves over and above its required reserves.

bank suddenly finds itself with $1,000 in excess reserves. What happens? The answer is that the bank will lend out that $1,000, which will end up as a bank deposit somewhere in the banking system, launching a process very similar to the process shown in Table 13-1.

Let's start by assuming that the required reserve ratio is 10%. In that case, the process will proceed as follows. First, the bank with excess reserves lends out $1,000, which ends up as a bank deposit somewhere. The bank that receives that deposit keeps 10%, or $100, as reserves, and lends out the other 90%, or $900, which again ends up as a bank deposit somewhere. The bank receiving this $900 deposit again keeps 10%, which is $90, as reserves, and lends out the other $810. The bank receiving this $810 keeps $81 in reserves, and lends out the remaining $729, and so on. So the increase in bank deposits is

$$\$1{,}000 + \$900 + \$810 + \$729 + \ldots$$

Let's use the symbol rr for the reserve ratio. More generally, the increase in bank deposits that is generated when a bank lends out $1,000 in excess reserves is

(13-1) Increase in bank deposits from $1,000 in excess reserves =
$\$1000 + \$1000 \times (1 - rr) + \$1000 \times (1 - rr)^2 + \$1000 \times (1 - rr)^3 + \ldots$

As we saw in Equation 10-2 in Chapter 10, this can be simplified to:

(13-2) Increase in bank deposits from $1,000 in excess reserves = $\$1{,}000/rr$

So if the reserve ratio is 10%, or 0.1, a $1,000 increase in reserves will increase the total value of bank deposits by $1,000/0.1 = $10,000. In fact, in a deposits-only monetary system the total value of bank deposits would be equal to the value of bank reserves divided by the reserve ratio. Or to put it a different way, if the reserve ratio is 10%, each dollar of reserves supports $\$1/rr = \$1/0.1 = \$10$ of bank deposits.

The Money Multiplier in Reality

In reality, the determination of the money supply is more complicated than our simple model suggests, because it depends not only on the ratio of reserves to bank deposits but also on the fraction of the money supply that individuals choose to hold in the form of currency. In fact, we already saw this in our example of Silas depositing the cash under his bed: when he chose to hold bank deposits instead of currency, he set in motion an increase in the money supply.

To define the money multiplier in practice, it's important to recognize that the monetary authorities control the *sum* of bank reserves and currency in circulation, but not the division of that sum between reserves and currency in circulation. Consider Silas and his deposit one more time: by taking the money from under his bed and depositing it in a bank, he reduced the quantity of currency in circulation but increased bank reserves by an equal amount. The **monetary base,** which is the quantity the monetary authorities control, is the sum of currency in circulation and reserves held by banks.

The **monetary base** is the sum of currency in circulation and bank reserves.

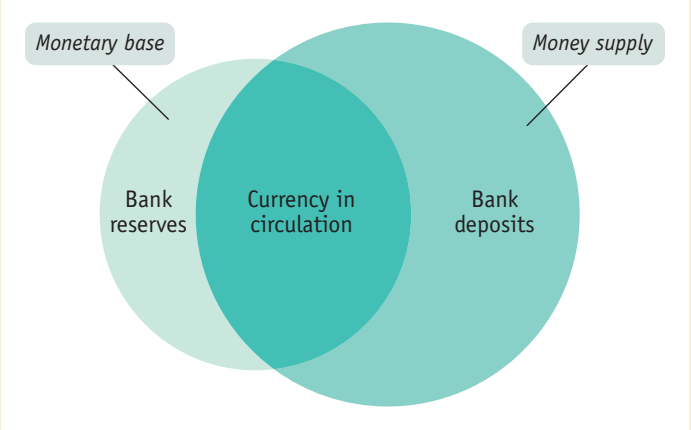
The monetary base isn't the same thing as the money supply, for two reasons. First, bank reserves, which are part of the monetary base, aren't considered part of the money supply. A $1 bill in someone's wallet is considered money because it's available for an individual to spend, but a $1 bill in a bank vault or a $1 deposit at the Federal Reserve isn't considered money because it's not available for spending. Second, bank deposits aren't part of the monetary base, but they are part of the money supply.

Figure 13-4 shows the two concepts schematically. The circle on the left represents the monetary base, which consists of bank reserves plus currency in circulation. The

Figure 13-4

The Monetary Base and the Money Supply

The monetary base is equal to bank reserves plus currency in circulation. It is different from the money supply, bank deposits plus currency in circulation. Each dollar of bank reserves backs several dollars of bank deposits, making the money supply larger than the monetary base.



circle on the right shows the money supply, which consists of currency in circulation plus bank deposits. As the figure indicates, currency in circulation is part of both the monetary base and the money supply. But bank reserves aren't part of the money supply, and bank deposits aren't part of the monetary base. In practice, most of the monetary base actually consists of currency in circulation, which also makes up about half of the money supply.

Now we can formally define the **money multiplier:** it's the ratio of the money supply to the monetary base. The actual money multiplier in the United States, using M1 as our measure of money, is about 1.9. That's a lot smaller than $1/rr$. The reason the money multiplier is so small is that a dollar of currency in circulation, unlike a dollar in reserves, doesn't support multiple dollars of the money supply.

The **money multiplier** is the ratio of the money supply to the monetary base.

economics in action

Multiplying Money Down

In our hypothetical example illustrating how banks create money, we described Silas the miser deciding to take the currency from under his bed and deposit it in a bank. This led to an increase in the money supply, as banks engaged in successive waves of lending. It follows that if something happened to make Silas revert to old habits, taking his money out of the bank and putting it back under his bed, the result would be a decline in the money supply. And that's exactly what happened as a result of the bank runs of the 1930s.

Table 13-2 shows what happened between 1929 and 1933, as bank failures shook the public's confidence. The first column shows the public's holdings of currency. These increased sharply, as many Americans decided that money under the bed might be safer than money in the bank after all. The second column shows the value of checkable bank deposits; these fell sharply, through the multiplier process we have just analyzed, when individuals pulled their cash out of banks. (Loans also fell because banks that survived the waves of bank runs increased their reserve ratios, just in case another wave began.) The third column shows the value of M1, the first of the monetary aggregates we described earlier. It fell sharply, because the decrease of bank deposits was much larger than the increase of currency in circulation.

TABLE 13-2

The Effects of Bank Runs, 1929–1933

	Currency	Bank deposits	M1
	(billions of dollars)		
1929	$3.90	$22.74	$26.64
1933	5.09	14.82	19.91
Percent change	+31%	−35%	−25%

Source: U.S Census Bureau (1975), *Historical Statistics of the United States.*

>>QUICK REVIEW

- Banks create money: when currency is deposited in a bank, the bank can lend *excess reserves* out, which leads to new deposits in the banking system and a multiplier effect on the money supply.
- In a *deposits-only* system, the money supply would be equal to bank reserves divided by the reserve ratio.
- In practice, much of the *monetary base* takes the form of currency, so that the *money multiplier* is smaller.

In a famous 1963 book, *A Monetary History of the United States,* Anna Schwartz and Milton Friedman drew attention to this drop in the U.S. money supply, arguing that it was the main cause of the Great Depression. They also argued that the Federal Reserve could and should have prevented it. (We should note that many economists disagree with both conclusions.) And that brings us to the nature and role of the Fed. ■

>>CHECK YOUR UNDERSTANDING 13-3

1. Assume that total reserves are equal to $200 and total bank deposits are equal to $1,000. Also assume that the public does not hold any currency. Now suppose that for some reason the required reserve ratio falls from 20% to 10%. Trace out how this leads to an expansion in bank deposits.
2. Use the example of Silas putting currency into First Street Bank, assuming that the required reserve ratio is 10%. But assume that each time someone receives a bank loan, he or she keeps half the loan in cash. Trace out the expansion in the money supply.

Solutions appear at back of book.

The Federal Reserve System

Who's in charge of ensuring that banks maintain enough reserves? Who decides how large the monetary base will be? The answer, in the United States, is an institution known as the Federal Reserve.

The Fed: America's Central Bank

A **central bank** is an institution that oversees and regulates the banking system and controls the monetary base.

The Federal Reserve is a **central bank**—an institution that oversees and regulates the banking system, and controls the monetary base. Other central banks include the Bank of England, the Bank of Japan, and the European Central Bank, or ECB. The ECB acts as a common central bank for 12 European countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. The world's oldest central bank, by the way, is Sweden's Sveriges Rijksbank, which awards the Nobel Prize in economics.

The legal status of the Fed, which was created in 1913, is unusual: it is not exactly part of the U.S. government, but it is not really a private institution either. Strictly speaking, the Federal Reserve system consists of two parts: the Board of Governors and the 12 regional Federal Reserve Banks.

The Board of Governors, which oversees the system from its offices in Washington, D.C., is set up like a government agency: its seven members are appointed by the president and must be approved by the Senate. However, they are appointed for 14-year terms, to insulate them from political pressure. The chairman is appointed on a more frequent basis, every 4 years, but it's traditional for chairmen to be reappointed and serve much longer terms. William McChesney Martin was chairman of the Fed from 1951 until 1970. Alan Greenspan, appointed in 1987, was still serving as Fed chairman in 2005.

The 12 Federal Reserve Banks each serve a region of the country, providing various banking and supervisory services. For example, they audit the books of private-sector banks, to ensure that they are financially sound. Each regional bank is run by a board of directors chosen from the local banking and business community. The Federal Reserve Bank of New York has a special role: it carries out *open-market operations*, the main tool of monetary policy. Figure 13-5 shows the Federal Reserve districts and the city in which each regional Federal Reserve Bank is located.

Decisions about monetary policy are made by the Federal Open Market Committee, which consists of the Board of Governors plus five of the regional bank

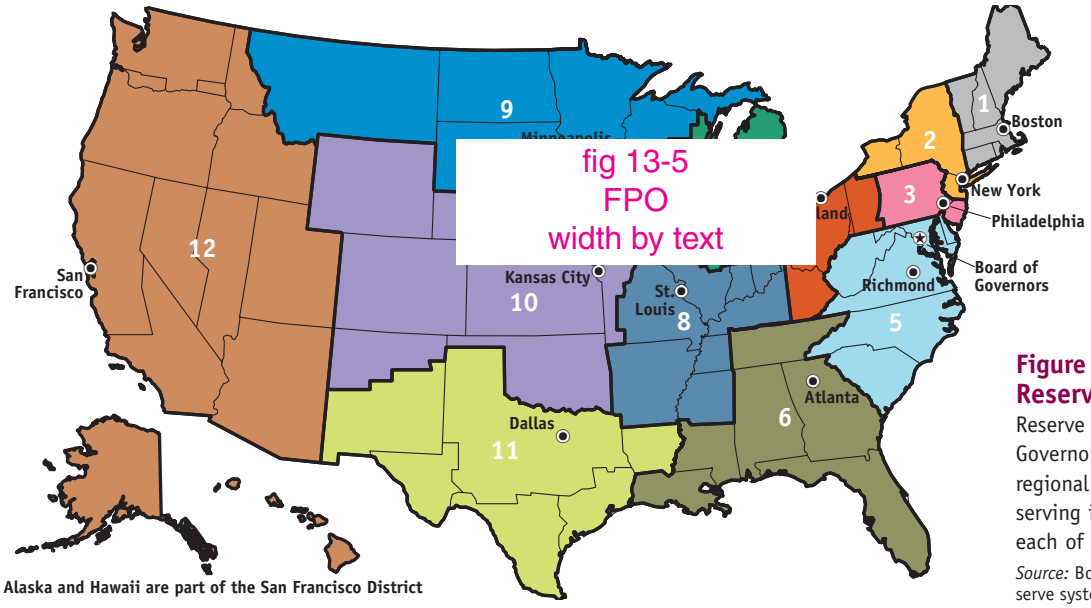


Figure 13-5 The Federal Reserve System The Federal Reserve system consists of the Board of Governors in Washington, D.C., plus regional Federal Reserve Banks, each serving its district; this map shows each of the 12 Federal Reserve districts.

Source: Board of Governors of the Federal Reserve system.

presidents. The president of the Federal Reserve Bank of New York is always on the committee, and the other four seats rotate among the other 11 regional banks. The chairman of the Board of Governors normally also serves as the chairman of the open-market committee.

The effect of this complex structure is to create an institution that is ultimately accountable to the voting public, because the Board of Governors is chosen by the president and confirmed by the Senate, all of whom are themselves elected officials. But the long terms served by board members, as well as the indirectness of the process by which they are appointed, largely insulate them from short-term political pressures.

What the Fed Does: Reserve Requirements and the Discount Rate

The Fed has three main policy tools at its disposal: *reserve requirements,* the *discount rate,* and, most importantly, *open-market operations*.

In our discussion of bank runs, we noted that the Fed sets a minimum reserve ratio requirement, currently equal to 10% of checkable bank deposits. Banks that fail to maintain at least the required reserve ratio on average over a two-week period face penalties.

What does a bank do if it looks as if it won't meet the Fed's reserve requirement? Normally, it borrows additional reserves from other banks. Banks lend money to each other in the **federal funds market,** a financial market that allows banks that fall short of the reserve requirement to borrow reserves—usually just overnight—from banks that hold excess reserves. The interest rate in this market is determined by supply and demand—but the supply and demand are both strongly affected by Federal Reserve actions. As we'll see in Chapter 14, the **federal funds rate,** the interest rate determined in the federal funds market, plays a key role in modern monetary policy.

Alternatively, banks can borrow reserves from the Fed itself. The **discount rate** is the rate of interest the Fed charges on loans to banks. Currently, the discount rate is set 1 percentage point above the federal funds rate in order to discourage banks from turning to the Fed.

If it chooses to do so, the Fed can change both reserve requirements and the discount rate. Either change would affect the money supply. If the Fed were to reduce

The **federal funds market** allows banks that fall short of the reserve requirement to borrow funds from banks with excess reserves.

The **federal funds rate** is the interest rate determined in the federal funds market.

The **discount rate** is the rate of interest the Fed charges on loans to banks.

reserve requirements, banks would be allowed to make more loans, leading to an increase in the money supply via the money multiplier. If the Fed were to increase reserve requirements, banks would be forced to cut back on loans, reducing the money supply via the money multiplier. If the Fed were to reduce the spread between the discount rate and the Federal funds rate, banks would increase their lending, because the cost of finding themselves short of reserves wouldn't be as high, and the money supply would increase. If the Fed were to increase the spread between the discount rate and the Federal funds rate, bank lending would fall, and so would the money supply.

In practice, today's Fed doesn't use changes in either reserve requirements or the discount rate to actively manage the money supply. The last significant change in reserve requirements was in 1992. The discount rate, as we've seen, is set 1 percentage point above the federal funds rate. Monetary policy is, instead, conducted using the third tool: open-market operations.

Open-Market Operations

Like the banks it oversees, the Federal Reserve has assets and liabilities. The Fed's assets consist mainly of short-term U.S. government bonds—bonds with a maturity of less than one year—known as U.S. Treasury bills. Remember, the Fed isn't exactly part of the U.S. government, so those U.S. Treasury bills are a liability of the government but an asset of the Fed. Its liabilities consist of currency in circulation and bank reserves (either in bank vaults or in deposits that private banks maintain at regional Federal Reserve Banks). In other words, the Fed's liabilities are the same as the monetary base—currency in circulation plus bank reserves. The assets and liabilities of the Fed are summarized by the T-account in Figure 13-6.

An **open-market operation** is a purchase or sale of government debt by the Fed.

In an **open-market operation** the Federal Reserve buys or sells some of the existing stock of U.S. Treasury bills, normally through a transaction with *commercial banks*—banks that mainly make business loans, as opposed to home loans. The Fed never buys U.S. Treasury bills directly from the federal government. There's a good reason for this: when central banks lend directly to the government, they are in effect printing money to finance the budget deficit. As we'll see later in the book, this can be a route to disastrous inflation.

The two panels of Figure 13-7 show the changes in the financial position of both the Fed and commercial banks that result from open-market operations. When the Fed buys U.S. Treasury bills, it pays for them by crediting the accounts of these banks with additional deposits, which increases the banks' reserves. This is illustrated in panel (a): the Fed buys $100 million of U.S. Treasury bills from commercial banks, which increases the monetary base by $100 million because it increases bank reserves by $100 million. When the Fed sells U.S. Treasury bills to commercial banks, it debits the banks' accounts, reducing their reserves. This is shown in panel (b),

Figure 13-6

The Federal Reserve's Assets and Liabilities

The Federal Reserve holds its assets mostly in short-term government bonds called Treasury bills. Its liabilities are the monetary base—currency in circulation plus bank reserves.

Assets	Liabilities
Government debt (Treasury bills)	Monetary base (Currency in circulation + bank reserves)

Figure 13-7 Open-Market Operations by the Federal Reserve

(a) An Open-Market Purchase of $100 Million

	Assets		Liabilities	
Federal Reserve	Treasury bills	+ $100 million	Monetary base	+ $100 million

	Assets		Liabilities	
Commercial banks	Treasury bills	− $100 million		
	Reserves	+ $100 million		

(b) An Open-Market Sale of $100 Million

	Assets		Liabilities	
Federal Reserve	Treasury bills	− $100 million	Monetary base	− $100 million

	Assets		Liabilities	
Commercial banks	Treasury bills	+ $100 million		
	Reserves	− $100 million		

In panel (a), the Federal Reserve increases the monetary base by purchasing U.S. Treasury bills from private commercial banks in an open-market operation. Here a $100 million purchase of U.S. Treasury bills by the Federal Reserve is paid for by a $100 million addition to private bank reserves, generating a $100 million increase in the monetary base. This will ultimately lead to an increase in the money supply via the money multiplier as banks lend out some of these new reserves. In panel (b), the Federal Reserve reduces the monetary base by selling U.S. Treasury bills to private banks in an open-market operation. Here a $100 million sale of U.S. Treasury bills leads to a $100 million reduction in private bank reserves, resulting in a $100 million decrease in the monetary base. This will ultimately lead to a fall in the money supply via the money multiplier as banks reduce their loans in response to a fall in their reserves.

where the Fed sells $100 million of U.S. Treasury bills. Here, bank reserves and the monetary base decrease.

You might wonder where the Fed gets the funds to purchase U.S. Treasury bills from banks. The answer is that it simply creates them with a stroke of the pen (or, these days, a click of the mouse). Remember, the modern dollar is fiat money, which isn't backed by anything. so the Fed can create the monetary base at its own discretion.

The increase or decrease in reserves caused by an open-market operation doesn't directly affect the money supply. However, an open-market operation starts the money multiplier in motion. After the $100 million increase in reserves shown in panel (a), commercial banks would lend out the additional reserves, immediately increasing the money supply by $100 million. Some of those loans will be deposited back in the banking system, increasing reserves again and permitting a further round of loans, and so on. So an open-market purchase of U.S. Treasury bills sets the money multiplier in motion, leading to a rise in the money supply. An open-market sale has the reverse effect: bank reserves fall, requiring banks to reduce their loans, leading to a fall in the money supply.

The Federal Open Market Committee, as its name suggests, sets policy on open-market operations—that is, it gives instructions to buy or sell U.S. Treasury bills.

Economists often say, loosely, that the Fed controls the money supply. Literally, it only controls the monetary base. But by increasing or reducing the monetary base, the Fed can exert a powerful influence on both the money supply and interest rates. This influence is the basis of monetary policy, the subject of our next chapter.

economics in action

Building Europe's Fed

Until the last year of the twentieth century, the Federal Reserve was a giant among central banks. Because the U.S. economy was far larger than any other nation's, no other nation's central bank was remotely comparable in influence. But that all changed in January 1999, when 11 European nations adopted the euro as their common currency, placing their joint monetary policy in the hands of the new European Central Bank, generally referred to as the ECB.

Like the Fed, the ECB has a special status: it's not a private institution, but it's not exactly a government agency either. In fact, it can't be a government agency, because there is no Pan-European government! Luckily for puzzled Americans, there are strong analogies between European central banking and the Federal Reserve system.

First of all, the ECB, which is located in the German city of Frankfurt, isn't really the counterpart of the whole Federal Reserve system: it's the equivalent of the Board of Governors in Washington. The European counterparts of regional Federal Reserve Banks are Europe's national central banks: the Bank of France, the Bank of Italy, and so on. Until 1999, each of these national banks was the equivalent of the Fed. For example, the Bank of France controlled the French monetary base. Today these national banks, like regional Feds, provide various financial services to local banks and businesses, and actually carry out open-market operations. That doesn't mean that they are small institutions: together, the national central banks employ more than 50,000 people, while the ECB employs fewer than 1,300.

Each country gets to choose who runs its own central bank. The ECB is run by an executive board that is the counterpart of the Fed's Board of Governors; its members are chosen by unanimous consent of the governments of countries that use the euro. The counterpart of the Federal Open Market Committee is the ECB's Governing Board. Just as the Fed's Open Market Committee consists of the Board of Governors plus a rotating group of regional Fed presidents, the ECB's governing board consists of the executive board plus a rotating group of national central bank heads. But there's a special twist: the frequency with which any country's central bank gets a seat at the table is determined by a formula that reflects the size of the country's economy. In other words, Germany, which had a GDP of $2.7 trillion in 2004, gets a seat on the board a lot more often than Greece, which had a GDP of only $205 billion.

In the end, the details probably don't matter much. Like the Fed, the ECB is ultimately answerable to voters but is highly insulated from short-term political pressures. ■

>> QUICK REVIEW

- The Federal Reserve is America's *central bank*, overseeing banking and making monetary policy. It has a complex legal status, which puts it neither exactly in the government nor in the private sector.
- The Fed sets the required reserve ratio; banks borrow and lend reserves in the *federal funds market*. The interest rate determined in this market is the *federal funds rate*. Banks can also borrow from the Fed, at the *discount rate*.
- Although the Fed can change reserve requirements or the discount rate, in practice, monetary policy is conducted using *open-market operations*.

>> CHECK YOUR UNDERSTANDING 13-4

1. Assume that any money lent by a bank is deposited back in the banking system and that the reserve ratio is 10%, or 0.1. Trace out the effects of a $100 million open-market purchase by the Fed on the value of bank deposits.

Solutions appear at back of book.

• A LOOK AHEAD •

We have now seen how the monetary system is organized and, in particular, the role of the Federal Reserve in determining the size of the monetary base. But why is this important? Because the actions of the Fed change the money supply and this has a powerful effect on interest rates, and through interest rates the Fed has a powerful effect on real GDP and the aggregate price level.

In the next chapter we'll see how monetary policy affects the economy and how the Fed behaves in practice.

SUMMARY

1. **Money** is any asset that can easily be used to purchase goods and services. **Currency in circulation** and **checkable bank deposits** are both considered part of the **money supply.** Money plays three roles: it is a **medium of exchange** used for transactions, a **store of value** that holds purchasing power over time, and a **unit of account** in which prices are stated.
2. Over time, **commodity money,** which consisted of goods that had value aside from their role as money, such as gold and silver coins, were replaced by **commodity-based money,** such as paper currency backed by gold. Today the dollar is pure **fiat money,** whose value derives solely from its official role.
3. The United States has several definitions of the money supply. M1 is the narrowest **monetary aggregate,** containing only currency in circulation and checkable bank deposits. M2 and M3 include a wider range of assets, mainly other forms of bank deposits, that can easily be converted into checkable bank deposits, called **near-moneys.**
4. Banks allow depositors immediate access to their funds, but they also lend out most of the funds deposited in their care. To meet demands for cash, they maintain **bank reserves** either in currency or in deposits at the Federal Reserve. The **reserve ratio** is the ratio of reserves to bank deposits.
5. Historically, banks have sometimes been subject to **bank runs,** most notably in the early 1930s. To avert this danger, depositors are now protected by **deposit insurance,** bank owners face capital requirements that force them to put their own money at risk, and banks face **reserve requirements.**
6. When currency is deposited in a bank, it starts a multiplier process in which banks lend out **excess reserves,** leading to an increase in the money supply—so banks create money. If the entire money supply consisted of bank deposits, the money supply would be equal to the value of reserves divided by the reserve ratio. In reality, much of the **monetary base** consists of currency in circulation, and the **money multiplier** is the ratio of the money supply to the monetary base.
7. The monetary base is controlled by the Federal Reserve, the **central bank** of the United States. The Federal Reserve system combines some aspects of a government agency with some aspects of a private institution. The Fed sets reserve requirements; banks borrow and lend reserves in the **federal funds market** at the **federal funds rate.** Banks can also borrow from the Fed at the **discount rate.**
8. **Open-market operations** by the Fed are the principal tool of monetary policy: the Fed can increase or reduce the monetary base by buying government debt from banks or selling government debt to banks.

KEY TERMS

Money, p. 000
Currency in circulation, p. 000
Checkable bank deposits, p. 000
Money supply, p. 000
Medium of exchange, p. 000
Store of value, p. 000
Unit of account, p. 000
Commodity money, p. 000
Commodity-backed money, p. 000
Fiat money, p. 000
Monetary aggregate, p. 000
Near-moneys, p. 000
Bank reserves, p. 000
Reserve ratio, p. 000
Bank run, p. 000
Deposit insurance, p. 000
Reserve requirements, p. 000
Excess reserves, p. 000
Monetary base, p. 000
Money multiplier, p. 000
Central bank, p. 000
Federal funds market, p. 000
Federal funds rate, p. 000
Discount rate, p. 000
Open-market operation, p. 000

PROBLEMS

1. For each of the following transactions, what is the effect (increase or decrease) on M1? on M2?
   - **a.** You sell a few shares of stock and put the proceeds into your savings account.
   - **b.** You sell a few shares of stock and put the proceeds into your checking account.
   - **c.** You transfer money from your savings account to your checking account.
   - **d.** You discover $0.25 under the floor mat in your car and deposit it in your checking account.
   - **e.** You discover $0.25 under the floor mat in your car and deposit it in your savings account.
2. There are three types of money: commodity money, commodity-backed money, and fiat money. Which type of money is used in each of the following situations?
   - **a.** Mother-of-pearl seashells were used to pay for goods in ancient China.
   - **b.** Salt was used in many European countries as a medium of exchange.
   - **c.** For a brief time, Germany used paper money (the "Rye Mark") that could be redeemed for a certain amount of grain rye.
   - **d.** The town of Ithaca, New York, prints its own currency, the Ithaca HOURS, which can be used to purchase local goods and services.
3. The table below shows the components of M1 and M2 in billions of dollars for the month of December in the years 1995 to 2004 as published in the *2005 Economic Report of the President*. Complete the table by calculating M1, M2, currency in circulation as a percentage of M1, and currency in circulation as a percentage of M2. What trends or patterns about M1, M2, currency as a percentage of M1, and currency in circulation as a percentage of M2 do you see? What might account for these trends?
4. Indicate whether each of the following is part of M1 or M2:
   - **a.** A quarter under your couch cushion
   - **b.** A $2,000 line of credit on your VISA credit card account
   - **c.** A $210 balance in your checking account
   - **d.** $500 in your savings account
   - **e.** Ten shares of stock worth $650
   - **f.** $200 in traveler's checks
   - **g.** $95 on your campus meal card
5. Tracy Williams deposits $500 that was in her sock drawer into a checking account at the local bank.
   - **a.** How does the deposit initially change the T-account of the local bank? How does it change the money supply?
   - **b.** If the bank maintains a reserve ratio of 10%, how will it respond to the new deposit?
   - **c.** If every time the bank makes a loan, the loan results in a new deposit in a different bank equal to the amount of the loan, by how much could the money supply in the economy expand in total?
   - **d.** If every time the bank makes a loan, the loan results in a new deposit in a different bank equal to the amount of the loan and the bank maintains a reserve ratio of 5%, by how much could the money supply expand in response to an initial cash deposit of $500?
6. Ryan Cozzens withdraws $400 from his checking account at the local bank and keeps it in his wallet.
   - **a.** How will the withdrawal change the T-account of the local bank and the money supply?
   - **b.** If the bank maintains a reserve ratio of 10%, how will the bank respond to the withdrawal?
   - **c.** If every time the bank decreases its loans, deposits fall by the amount of the loan, by how much could the money supply in the economy contract in total?
   - **d.** If every time the bank decreases its loans, deposits fall by the amount of the loan and the bank maintains a reserve

	Currency in circulation	Traveler's checks	Checkable deposits	Money funds	Time deposits smaller than $100,000	Savings deposits	M1	M2	Currency in circulation as a percentage of M1	Currency in circulation as a percentage of M2
1995	$372.1	$9.1	$745.9	$448.8	$931.4	$1,134.0	?	?	?	?
1996	394.1	8.8	676.5	517.4	946.8	1,273.1	?	?	?	?
1997	424.6	8.5	639.5	592.2	967.9	1,399.1	?	?	?	?
1998	459.9	8.5	627.7	732.7	951.5	1,603.6	?	?	?	?
1999	517.7	8.6	597.7	832.5	954.0	1,738.2	?	?	?	?
2000	531.6	8.3	548.1	924.2	1,044.2	1,876.2	?	?	?	?
2001	582.0	8.0	589.3	987.2	972.8	2,308.9	?	?	?	?
2002	627.4	7.8	582.0	915.5	892.1	2,769.5	?	?	?	?
2003	663.9	7.7	621.8	801.1	809.4	3,158.5	?	?	?	?
2004	699.3	7.6	656.2	714.7	814.0	3,505.9	?	?	?	?

ratio of 20%, by how much could the money supply contract in response to a withdrawal of $400?

7. The government of Eastlandia uses measures of monetary aggregates similar to those used by the United States, and the central bank of Eastlandia imposes a required reserve ratio of 10%. Given the following information, answer the questions below.

   Bank deposits at the central bank = $200 million
   Currency held by public = $150 million
   Currency in bank vaults = $100 million
   Checkable deposits = $500 million
   Traveler's checks = $10 million

   a. What is M1?
   b. What is the monetary base?
   c. Are the commercial banks holding excess reserves?
   d. Can the commercial banks increase deposits? If yes, by how much can deposits increase?

8. In Westlandia, the public holds 50% of M1 in the form of currency, and the required reserve ratio is 20%. Estimate by how much the money supply will increase in response to a new cash deposit of $500 by completing the table below. (*Hint:* The first row shows that the bank must hold $100 in minimum reserves—20% of the $500 deposit—against this deposit, leaving $400 in excess reserves that can be loaned out. However, since the public wants to hold 50% of the loan in currency, only $200—50% of the loan will be deposited in round 2 from the loan granted in round 1.) How does your answer compare to an economy in which the total amount of the loan is deposited in the banking system and the public doesn't hold any of the loan in currency? What does this imply about the public's desire for currency and the money multiplier?

Round	Deposits	Required reserves	Excess reserves	Loans	Held as currency
1	$500.00	$100.00	$400.00	$400.00	$200.00
2	200.00	?	?	?	?
3	?	?	?	?	?
4	?	?	?	?	?
5	?	?	?	?	?
6	?	?	?	?	?
7	?	?	?	?	?
8	?	?	?	?	?
9	?	?	?	?	?
10	?	?	?	?	?
Total after 10 rounds	?	?	?	?	?

9. What will happen to the money supply under the following circumstances?

   a. The required reserve ratio is 25%, and a depositor withdraws $700 from his checkable deposit.
   b. The required reserve ratio is 5%, and a depositor withdraws $1,000 from his checkable deposit.
   c. The required reserve ratio is 20%, and a customer deposits $750 to her checkable deposit.
   d. The required reserve ratio is 10%, a customer deposits $600 to her checkable deposit.

10. Although the United States doesn't use changes in reserve requirements to manage the money supply, Albernia does. The commercial banks of Albernia have $100 million in reserves and $1,000 million in checkable deposits; the initial required reserve ratio is 10%. The commercial banks follow a policy of holding no excess reserves. The public holds a fixed amount of currency, so all loans create an equal amount of deposits in the banking system.

    a. How will the money supply change if the required reserve ratio falls to 5%?
    b. How will the money supply change if the minimum reserve ratio rises to 20%?

11. Using Figure 13-5, find the Federal Reserve district in which you live. Go to http://www.federalreserve.gov/bios/pres.htm and identify the president of that Federal Reserve Bank. Go to http://www.federalreserve.gov/fomc/ and determine if the president of the Fed is currently a voting member of the Federal Open Market Committee (FOMC).

12. Show the changes to the T-accounts for the Federal Reserve and for commercial banks when the Federal Reserve buys $50 million in U.S. Treasury bills. If the public holds a fixed amount of currency (all loans create an equal amount of deposits in the banking system) and the minimum reserve ratio is 10%, by how much will deposits in the commercial banks change? By how much will the money supply change? Show the final changes to the T-account for commercial banks when the money supply changes by this amount.

13. Show the changes to the T-accounts for the Federal Reserve and for commercial banks when the Federal Reserve sells $30 million in U.S. Treasury bills. If the public holds a fixed amount of currency (all loans create an equal amount of deposits in the banking system) and the minimum reserve ratio is 5%, by how much will deposits in the commercial banks change? By how much will the money supply change? Show the final changes to the T-account for the commercial banks when the money supply changes by this amount.

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