we must understand money—what it is, what affects its supply and demand, and what influence it has on the economy. Thus, Section 4-1 begins our analysis of inflation by discussing the economist's concept of "money" and how, in most modern economies, the government controls the quantity of money in the hands of the public. Section 4-2 shows that the quantity of money determines the price level and that the rate of growth in the quantity of money determines the rate of inflation.

Inflation in turn has numerous effects of its own on the economy. Section 4-3 discusses the revenue that the government raises by printing money, sometimes called the *inflation tax*. Section 4-4 examines how inflation affects the nominal interest rate. Section 4-5 discusses how the nominal interest rate in turn affects the quantity of money people wish to hold and, thereby, the price level.

After completing our analysis of the causes and effects of inflation, in Section 4-6 we address what is perhaps the most important question about inflation: Is it a major social problem? Does inflation amount to "overturning the existing basis of society," as the chapter's opening quotation suggests?

Finally, in Section 4-7, we discuss the extreme case of hyperinflation. Hyperinflations are interesting to examine because they show clearly the causes, effects, and costs of inflation. Just as seismologists learn much by studying earthquakes, economists learn much by studying how hyperinflations begin and end.

4-1 What Is Money?

When we say that a person has a lot of money, we usually mean that he or she is wealthy. By contrast, economists use the term *money* in a more specialized way. To an economist, money does not refer to all wealth but only to one type of it: **money** is the stock of assets that can be readily used to make transactions. Roughly speaking, the dollars in the hands of the public make up the nation's stock of money.

The Functions of Money

Money has three purposes. It is a store of value, a unit of account, and a medium of exchange.

As a **store of value**, money is a way to transfer purchasing power from the present to the future. If I work today and earn $100, I can hold the money and spend it tomorrow, next week, or next month. Of course, money is an imperfect store of value: if prices are rising, the amount you can buy with any given quantity of money is falling. Even so, people hold money because they can trade the money for goods and services at some time in the future.

As a **unit of account**, money provides the terms in which prices are quoted and debts are recorded. Microeconomics teaches us that resources are allocated according to relative prices—the prices of goods relative to other goods—yet

stores post their prices in dollars and cents. A car dealer tells you that a car costs $20,000, not 400 shirts (even though it may amount to the same thing). Similarly, most debts require the debtor to deliver a specified number of dollars in the future, not a specified amount of some commodity. Money is the yardstick with which we measure economic transactions.

As a **medium of exchange**, money is what we use to buy goods and services. "This note is legal tender for all debts, public and private" is printed on the U.S. dollar. When we walk into stores, we are confident that the shopkeepers will accept our money in exchange for the items they are selling. The ease with which money is converted into other things—goods and services—is sometimes called money's *liquidity*.

To better understand the functions of money, try to imagine an economy without it: a barter economy. In such a world, trade requires the *double coincidence of wants*—the unlikely happenstance of two people each having a good that the other wants at the right time and place to make an exchange. A barter economy permits only simple transactions.

Money makes more indirect transactions possible. A professor uses her salary to buy books; the book publisher uses its revenue from the sale of books to buy paper; the paper company uses its revenue from the sale of paper to pay the lumberjack; the lumberjack uses his income to send his child to college; and the college uses its tuition receipts to pay the salary of the professor. In a complex, modern economy, trade is often indirect and requires the use of money.

The Types of Money

Money takes many forms. In the U.S. economy we make transactions with an item whose sole function is to act as money: dollar bills. These pieces of green paper with small portraits of famous Americans would have little value if they were not widely accepted as money. Money that has no intrinsic value is called **fiat money** because it is established as money by government decree, or fiat.

Although fiat money is the norm in most economies today, most societies in the past have used for money a commodity with some intrinsic value. Money of this sort is called **commodity money**. The most widespread example of commodity money is gold. When people use gold as money (or use paper money that is redeemable for gold), the economy is said to be on a **gold standard**. Gold is a form of commodity money because it can be used for various purposes—jewelry, dental fillings, and so on—as well as for transactions. The gold standard was common throughout the world during the late nineteenth century.

Drawing by Bernard Schoenbaum; © 1979 The New Yorker Magazine, Inc.

"And how would you like your funny money?"

CASE STUDY

Money in a POW Camp

An unusual form of commodity money developed in some Nazi prisoner of war (POW) camps during World War II. The Red Cross supplied the prisoners with various goods—food, clothing, cigarettes, and so on. Yet these rations were allocated without close attention to personal preferences, so the allocations were often inefficient. One prisoner may have preferred chocolate, while another may have preferred cheese, and a third may have wanted a new shirt. The differing tastes and endowments of the prisoners led them to trade with one another.

Barter proved to be an inconvenient way to allocate these resources, however, because it required the double coincidence of wants. In other words, a barter system was not the easiest way to ensure that each prisoner received the goods he valued most. Even the limited economy of the POW camp needed some form of money to facilitate transactions.

Eventually, cigarettes became the established "currency" in which prices were quoted and with which trades were made. A shirt, for example, cost about 80 cigarettes. Services were also quoted in cigarettes: some prisoners offered to do other prisoners' laundry for 2 cigarettes per garment. Even nonsmokers were happy to accept cigarettes in exchange, knowing they could trade the cigarettes in the future for some good they did enjoy. Within the POW camp the cigarette became the store of value, the unit of account, and the medium of exchange.[1]

How Fiat Money Evolves

It is not surprising that some form of commodity money arises to facilitate exchange: people are willing to accept a commodity currency such as gold because it has intrinsic value. The development of fiat money, however, is more perplexing. What would make people begin to value something that is intrinsically useless?

To understand how the evolution from commodity money to fiat money takes place, imagine an economy in which people carry around bags of gold. When a purchase is made, the buyer measures out the appropriate amount of gold. If the seller is convinced that the weight and purity of the gold are right, the buyer and seller make the exchange.

The government might first get involved in the monetary system to help people reduce transaction costs. Using raw gold as money is costly because it takes time to verify the purity of the gold and to measure the correct quantity. To reduce these costs, the government can mint gold coins of known purity and weight. The coins are easier to use than gold bullion because their values are widely recognized.

The next step is for the government to accept gold from the public in exchange for gold certificates—pieces of paper that can be redeemed for a certain

[1] R. A. Radford, "The Economic Organisation of a P.O.W. Camp," *Economica* (November 1945): 189–201. The use of cigarettes as money is not limited to this example. In the Soviet Union in the late 1980s, packs of Marlboros were preferred to the ruble in the large underground economy.

to a partially independent institution called a central bank. In the United States this institution is called the **Federal Reserve**—often called *the Fed*. If you look at a U.S. dollar bill, you will see that it is called a *Federal Reserve Note*. Decisions over monetary policy are made by the Federal Open Market Committee. This committee is made up of members of the Federal Reserve Board, who are appointed by the president and confirmed by Congress, together with the presidents of the regional Federal Reserve Banks. The Federal Open Market Committee meets about every six weeks to discuss and set monetary policy.

The primary way in which the Fed controls the supply of money is through **open-market operations**—the purchase and sale of government bonds. When the Fed wants to increase the money supply, it uses some of the dollars it has to buy government bonds from the public. Because these dollars leave the Fed and enter into the hands of the public, the purchase increases the quantity of money in circulation. Conversely, when the Fed wants to decrease the money supply, it sells some government bonds from its own portfolio. This open-market sale of bonds takes some dollars out of the hands of the public and, thus, decreases the quantity of money in circulation.

In Chapter 18 we discuss in detail how the Fed controls the supply of money. For our current discussion, these details are not crucial. It is sufficient to assume that the Fed (or any other central bank) directly controls the supply of money.

How the Quantity of Money Is Measured

One goal of this chapter is to determine how the money supply affects the economy; we turn to that problem in the next section. As background for that analysis, let's first discuss how economists measure the quantity of money.

Because money is the stock of assets used for transactions, the quantity of money is the quantity of those assets. In simple economies, this quantity is easy to measure. In the POW camp, the quantity of money was the quantity of cigarettes in the camp. But how can we measure the quantity of money in more complex economies such as ours? The answer is not obvious, because no single asset is used for all transactions. People can use various assets, such as cash or checks, to make transactions, although some assets are more convenient than others. This ambiguity leads to numerous measures of the quantity of money.

The most obvious asset to include in the quantity of money is **currency**, the sum of outstanding paper money and coins. Most day-to-day transactions use currency as the medium of exchange.

A second type of asset used for transactions is **demand deposits**, the funds people hold in their checking accounts. If most sellers accept personal checks, assets in a checking account are almost as convenient as currency. In both cases, the assets are in a form ready to facilitate a transaction. Demand deposits are, therefore, added to currency when measuring the quantity of money.

Once we admit the logic of including demand deposits in the measured money stock, many other assets become candidates for inclusion. Funds in savings accounts, for example, can be easily transferred into checking accounts; these

CHAPTER 18 EIGHTEEN

Money Supply and Money Demand

> *There have been three great inventions since the beginning of time: fire, the wheel, and central banking.*
>
> — *Will Rogers*

The supply and demand for money are crucial to many issues in macroeconomics. In Chapter 4, we discussed how economists use the term "money," how the central bank controls the quantity of money, and how monetary policy affects prices and interest rates in the long run when prices are flexible. In Chapters 10 and 11, we saw that the money market is a key element of the *IS–LM* model, which describes the economy in the short run when prices are sticky.

This chapter examines money supply and money demand more closely. In Section 18-1 we see that the banking system plays a key role in determining the money supply, and we discuss various policy instruments that the central bank can use to alter the money supply. In Section 18-2 we consider the motives behind money demand, and we analyze the household's decision about how much money to hold. We also discuss how recent changes in the financial system have blurred the distinction between money and other assets and how this development complicates the conduct of monetary policy.

18-1 Money Supply

Chapter 4 introduced the concept of "money supply" in a highly simplified manner. In that chapter we defined the quantity of money as the number of dollars held by the public, and we assumed that the Federal Reserve controls the supply of money by increasing or decreasing the number of dollars in circulation through open-market operations. Although this explanation is a good first approximation, it is incomplete, because it omits the role of the banking system in determining the money supply. We now present a more complete explanation.

In this section we see that the money supply is determined not only by Fed policy but also by the behavior of households (which hold money) and banks (in which money is held). We begin by recalling that the money supply in-

cludes both currency in the hands of the public and deposits at banks that households can use on demand for transactions, such as checking accounts. That is, letting M denote the money supply, C currency, and D demand deposits, we can write

$$\text{Money Supply} = \text{Currency} + \text{Demand Deposits}$$
$$M = C + D.$$

To understand the money supply, we must understand the interaction between currency and demand deposits and how Fed policy influences these two components of the money supply.

100-Percent-Reserve Banking

We begin by imagining a world without banks. In such a world, all money takes the form of currency, and the quantity of money is simply the amount of currency that the public holds. For this discussion, suppose that there is $1,000 of currency in the economy.

Now introduce banks. At first, suppose that banks accept deposits but do not make loans. The only purpose of the banks is to provide a safe place for depositors to keep their money.

The deposits that banks have received but have not lent out are called **reserves**. Some reserves are held in the vaults of local banks throughout the country, but most are held at a central bank, such as the Federal Reserve. In our hypothetical economy, all deposits are held as reserves: banks simply accept deposits, place the money in reserve, and leave the money there until the depositor makes a withdrawal or writes a check against the balance. This system is called **100-percent-reserve banking**.

Suppose that households deposit the economy's entire $1,000 in Firstbank. Firstbank's **balance sheet**—its accounting statement of assets and liabilities—looks like this:

FIRSTBANK'S BALANCE SHEET

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

The bank's assets are the $1,000 it holds as reserves; the bank's liabilities are the $1,000 it owes to depositors. Unlike banks in our economy, this bank is not making loans, so it will not earn profit from its assets. The bank presumably charges depositors a small fee to cover its costs.

What is the money supply in this economy? Before the creation of Firstbank, the money supply was the $1,000 of currency. After the creation of Firstbank, the money supply is the $1,000 of demand deposits. A dollar deposited in a bank reduces currency by $1 and raises deposits by $1, so the money supply remains the same. *If banks hold 100 percent of deposits in reserve, the banking system does not affect the supply of money.*

Fractional-Reserve Banking

Now imagine that banks start to use some of their deposits to make loans—for example, to families who are buying houses or to firms that are investing in new plants and equipment. The advantage to banks is that they can charge interest on the loans. The banks must keep some reserves on hand so that reserves are available whenever depositors want to make withdrawals. But as long as the amount of new deposits approximately equals the amount of withdrawals, a bank need not keep all its deposits in reserve. Thus, bankers have an incentive to make loans. When they do so, we have **fractional-reserve banking**, a system under which banks keep only a fraction of their deposits in reserve.

Here is Firstbank's balance sheet after it makes a loan:

FIRSTBANK'S BALANCE SHEET

Assets		Liabilities	
Reserves	$200	Deposits	$1,000
Loans	$800		

This balance sheet assumes that the *reserve–deposit ratio*—the fraction of deposits kept in reserve—is 20 percent. Firstbank keeps $200 of the $1,000 in deposits in reserve and lends out the remaining $800.

Notice that Firstbank increases the supply of money by $800 when it makes this loan. Before the loan is made, the money supply is $1,000, equaling the deposits in Firstbank. After the loan is made, the money supply is $1,800: the depositor still has a demand deposit of $1,000, but now the borrower holds $800 in currency. *Thus, in a system of fractional-reserve banking, banks create money.*

The creation of money does not stop with Firstbank. If the borrower deposits the $800 in another bank (or if the borrower uses the $800 to pay someone who then deposits it), the process of money creation continues. Here is the balance sheet of Secondbank:

SECONDBANK'S BALANCE SHEET

Assets		Liabilities	
Reserves	$160	Deposits	$800
Loans	$640		

Secondbank receives the $800 in deposits, keeps 20 percent, or $160, in reserve, and then loans out $640. Thus, Secondbank creates $640 of money. If this $640 is eventually deposited in Thirdbank, this bank keeps 20 percent, or $128, in reserve and loans out $512, resulting in this balance sheet:

THIRDBANK'S BALANCE SHEET

Assets		Liabilities	
Reserves	$128	Deposits	$640
Loans	$512		

The process goes on and on. With each deposit and loan, more money is created.

Although this process of money creation can continue forever, it does not create an infinite amount of money. Letting rr denote the reserve–deposit ratio, the amount of money that the original \$1,000 creates is

$$\begin{aligned}
\text{Original Deposit} &= \$1{,}000 \\
\text{Firstbank Lending} &= (1 - rr) \times \$1{,}000 \\
\text{Secondbank Lending} &= (1 - rr)^2 \times \$1{,}000 \\
\text{Thirdbank Lending} &= (1 - rr)^3 \times \$1{,}000 \\
&\vdots \\
\text{Total Money Supply} &= [1 + (1 - rr) + (1 - rr)^2 \\
&\quad + (1 - rr)^3 + \cdots] \times \$1{,}000 \\
&= (1/rr) \times \$1{,}000
\end{aligned}$$

Each \$1 of reserves generates $\$(1/rr)$ of money. In our example, $rr = 0.2$, so the original \$1,000 generates \$5,000 of money.[1]

The banking system's ability to create money is the primary difference between banks and other financial institutions. As we first discussed in Chapter 3, financial markets have the important function of transferring the economy's resources from those households that wish to save some of their income for the future to those households and firms that wish to borrow to buy investment goods to be used in future production. The process of transferring funds from savers to borrowers is called **financial intermediation**. Many institutions in the economy act as financial intermediaries: the most prominent examples are the stock market, the bond market, and the banking system. Yet, of these financial institutions, only banks have the legal authority to create assets (such as checking accounts) that are part of the money supply. Therefore, banks are the only financial institutions that directly influence the money supply.

Note that although the system of fractional-reserve banking creates money, it does not create wealth. When a bank loans out some of its reserves, it gives borrowers the ability to make transactions and therefore increases the supply of money. The borrowers are also undertaking a debt obligation to the bank, however, so the loan does not make them wealthier. In other words, the creation of money by the banking system increases the economy's liquidity, not its wealth.