

CHAPTER **14**

Chapter Outline and Learning Objectives

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Money, Banks, and the Federal Reserve System



Can Greece Function without Banks?

How often do you use a bank? If you are like most people, you withdraw cash from an ATM a couple of times per week and occasionally deposit checks. You may have visited a bank to apply for a student loan or a car loan. If you own your own business, you will have had many more interactions with banks. For example, you may have taken out a long-term loan to finance expanding your business.

Individuals and businesses in most countries would consider it difficult to function without banks. But that's the situation people in Greece faced in 2015. In 2001, Greece and most other European countries abandoned their individual currencies in favor of the euro. (Greece's currency had been the drachma.) Following the 2007–2009 financial crisis, the Greek government had trouble paying interest on the bonds it had issued. Many people feared that Greece might leave the euro and resume using the drachma. If that happened, the drachma might be worth less than the euro, which gave people in Greece an incentive to hold as many euros as they could. In 2015, Greece appeared to be in danger of defaulting on its debts. People responded by withdrawing large amounts of euros from Greek banks. To keep the banks from losing all their funds, the Greek government decided to close the banks for three weeks and limit withdrawals from ATM machines to 60 euros (about \$66) per day.

Closing the banks dealt a heavy blow to the Greek economy. With the banks closed, many businesses insisted on being paid in cash. Consumers had trouble finding cash, though, because many ATMs had been emptied of currency. Some stores began accepting promises to pay later from customers who had no cash. Nikos Manisoitis & Son is a Greek firm that imports spices, pasta, and other products. The owner complained: "We feel like hostages. We can't move our money from the banks, and we fear that we are about to lose everything." Some importers loaded suitcases with euros and flew to other countries to pay their suppliers.

As we saw in [Chapter 10](#), a country needs a well-functioning financial system if its economy is to prosper and grow. Greece's situation in the summer of 2015 shows what can happen when a country's banking system breaks down. In this chapter, we will study the role banks play in the financial system. We will also discuss the link between changes in the money supply and the inflation rate, as well as provide an overview of the operations of the Federal Reserve, which is the central bank of the United States.

Sources: Suzanne Daley, "Greeks Spend in Droves, Afraid of Losing Savings to a Bailout," *New York Times*, July 8, 2015; Liz Alderman, "Greek Economy under Siege, with Fears That the Worst Is Coming," *New York Times*, July 9, 2015; and "When Banks Die," *Economist*, July 5, 2015.

Economics in Your Life

What if Money Became Increasingly Valuable?

Most people are used to the fact that as prices rise each year, the purchasing power of money falls. You will be able to buy fewer goods and services with \$1,000 one year from now, and you will be able to buy even fewer goods and services the year after that. In fact, with an inflation rate of just 3 percent, in 25 years, \$1,000 will buy only what \$475 can buy today. Suppose that you could live in an economy where the purchasing power of money rose each year? What would be the advantages and disadvantages of living in such an economy? As you read this chapter, try to answer these questions. You can check your answers against those we provide [on page 503](#) at the end of this chapter.

In this chapter, we will explore the role of money in the economy. We will see how the banking system creates money and what policy tools the Federal Reserve uses to manage the quantity of money in the United States. We will also examine the crisis in the banking system during and after the 2007–2009 recession. At the end of this chapter, we will explore the link between changes in the quantity of money and changes in the price level. What you learn in this chapter will serve as an important foundation for understanding monetary policy and fiscal policy, which we study in [Chapters 15 through 17](#).

14.1 What Is Money, and Why Do We Need It?

LEARNING OBJECTIVE: Define money and discuss the four functions of money.

Could an economy function without money? There are historical examples of economies in which people traded goods for other goods rather than use money. For example, on the American frontier during colonial times, very little money was available, so a farmer might have traded a plow for a cow. Most economies, though, use money. The economic definition of **money** is any asset that people are generally willing to accept in exchange for goods and services or for payment of debts. Recall that an **asset** is anything of value owned by a person or a firm (see [Chapter 6](#)). There are many possible kinds of money: In West Africa, at one time, cowrie shells served as money. During World War II, prisoners of war used cigarettes as money.

Money Assets that people are generally willing to accept in exchange for goods and services or for payment of debts.

Asset Anything of value owned by a person or a firm.

Barter and the Invention of Money

To understand the importance of money, let's consider further the situation in economies that do not use money. Economies where goods and services are traded directly for other goods and services are called barter economies. Barter economies have a major shortcoming. To illustrate this shortcoming, consider a farmer on the American frontier in colonial days. Suppose the farmer needed a cow and proposed trading a spare plow to a neighbor for one of the neighbor's cows. If the neighbor did not want the plow, the trade would not happen. For a barter trade to take place between two people, each person must want what the other one has. Economists refer to this requirement as a *double coincidence of wants*. The farmer who wants the cow might eventually be able to obtain one if he first trades with some other neighbor for something the neighbor with the cow wants. However, it may take several trades before the farmer is ultimately able to trade for what the neighbor with the cow wants. Locating several trading partners and making several intermediate trades can take considerable time and energy.

To avoid the problems with barter, societies have an incentive to identify a product that most people will accept in exchange for what they have to trade. For example, in colonial times, animal skins were very useful in making clothing. The first governor of Tennessee actually received a salary of 1,000 deerskins per year, and the state's secretary of the Treasury received 450 otter skins per year. A good used as money that also has value independent of its use as money is called a **commodity money**. Historically, once a good became widely accepted as money, even people who did not have an immediate use for it would be willing to accept it. A colonial farmer—or the governor of Tennessee—might not want a deerskin, but as long as he knew he could use the deer-skin to buy other goods and services, he would be willing to accept it in exchange for what he had to sell.

Trading goods and services is much easier when money becomes available. People only need to sell what they have for money and then use the money to buy what they want. If the colonial family could find someone to buy their plow, they could use the money to buy the cow they wanted. The family with the cow would accept the money because they knew they could use it to buy what they wanted. When money is available, families are more likely to specialize and less likely to produce everything or nearly everything they need themselves.

Commodity money A good used as money that also has value independent of its use as money.

Most people in modern economies are highly specialized. They do only one thing—work as a nurse, an accountant, or an engineer—and use the money they earn to buy everything else they need. As we discussed in Chapter 2, people become much more productive by specializing because they can pursue their *comparative advantage*. The high income levels in modern economies are based on the specialization that money makes possible. We can now answer the question, “Why do we need money?” By making exchange easier, money allows people to specialize and become more productive.

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The Functions of Money

Anything used as money—whether a deerskin, a cowrie seashell, cigarettes, or a dollar bill—must serve four key functions in the economy:

1. It must act as a medium of exchange.
2. It must serve as a unit of account.
3. It must serve as a store of value.
4. It must offer a standard of deferred payment.

Medium of Exchange Money serves as a medium of exchange when sellers are willing to accept it in exchange for goods or services. When the local supermarket accepts your \$5 bill in exchange for bread and milk, the \$5 bill is serving as a medium of exchange. With a medium of exchange, people can sell goods and services for money and use the money to buy what they want. An economy is more efficient when people accept a single good as a medium of exchange.

Unit of Account In a barter system, each good has many prices. A cow may be worth 2 plows, 20 bushels of wheat, or 6 axes. Once a single good is used as money, each good has a single price rather than many prices. This function of money gives buyers and sellers a *unit of account*, a way of measuring value in the economy in terms of money. Because the U.S. economy uses dollars as money, each good has a price in terms of dollars.

Store of Value Money allows people to easily store value: If you do not use all your dollars to buy goods and services today, you can hold the rest to use in the future. Money is not the only store of value, however. Any asset—shares of Facebook stock, Treasury bonds, real estate, or Renoir paintings, for example—represents a store of value. Financial assets, such as stocks and bonds, offer an important benefit relative to holding money because they pay a higher rate of interest or may increase in value in the future. Other assets also have advantages relative to money because they provide services. A house, for example, offers you a place to sleep.

Why, then, do people hold any money? The answer has to do with *liquidity*, or the ease with which people can convert an asset into the medium of exchange. Because money is the medium of exchange, it is the most liquid asset. If you want to buy something and you need to sell an asset to do so, you are likely to incur a cost. For example, if you want to buy a car and need to sell bonds or stocks to do so, you will need to pay a commission to your broker. To avoid such costs, people are willing to hold some of their wealth in the form of money, even though other assets offer a greater return as stores of value.

Standard of Deferred Payment Money is useful because it can serve as a standard of deferred payment in borrowing and lending. It can facilitate exchange at a *given point in time* by providing a medium of exchange and unit of account. Money can facilitate exchange *over time* by providing a store of value and a standard of deferred payment. For example, a computer manufacturer may buy hard drives from another firm in exchange for the promise of making payment in 60 days.

How important is it that money be a reliable store of value and standard of deferred payment? People care about how much food, clothing, and other goods and services their dollars will buy. The value of money depends on its *purchasing power*, which refers to its ability to buy goods and services. Inflation causes a decline in purchasing power

because with rising prices, a given amount of money can purchase fewer goods and services. When inflation reaches very high levels, money is no longer a reliable store of value or standard of deferred payment.

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What Can Serve as Money?

Having a medium of exchange helps to make transactions easier, which allows the economy to work more efficiently. The next question to consider is: What can serve as money? That is, which assets can be used as the medium of exchange? We saw earlier that an asset must, at a minimum, be generally accepted as payment to serve as money. In practical terms, however, it must be even more.

These five criteria make an asset suitable for use as a medium of exchange:

1. The asset must be *acceptable* to (that is, usable by) most people.
2. It should be of *standardized quality* so that any two units are identical.
3. It should be *durable* so that value is not lost by its quickly wearing out.
4. It should be *valuable* relative to its weight so that amounts large enough to be useful in trade can be easily transported.
5. It should be *divisible* so that it can be used in purchases of both low-priced and high-priced goods.

Dollar bills meet all these criteria. What determines the acceptability of dollar bills as a medium of exchange? Basically, it is through self-fulfilling expectations: You value something as money only if you believe that others will accept it from you as payment. A society's willingness to use paper dollars as money is what makes them an acceptable medium of exchange.

Commodity Money ✓ Commodity money has value independent of its use as money. Gold, for example, was a common form of money in the nineteenth and early twentieth centuries because it was a medium of exchange, a unit of account, a store of value, and a standard of deferred payment. But commodity money has a significant problem: Its value depends on its purity. Therefore, someone who wanted to cheat could mix a low-value metal, like iron, with a precious metal, like gold or silver. Another problem with using gold as money was that the money supply was difficult to control because it depended partly on unpredictable discoveries of new gold fields.

Problems with gold as currency

Fiat Money It can be inefficient for an economy to rely on only gold or other precious metals for its money supply. What if you had to transport bars of gold to settle your transactions? Not only would doing so be difficult and costly, but you would run the risk of being robbed. To get around this problem, private institutions or governments began to store gold and issue paper certificates that could be redeemed for gold. In modern economies, paper currency is generally issued by a *central bank*, which is an agency of the government that regulates the money supply. The **Federal Reserve** is the central bank of the United States. Today, no government in the world issues paper currency that can be redeemed for gold. Paper currency has no value unless it is used as money, and it is therefore not a commodity money. Instead, paper currency is a **flat money**, which has no value except as money. If paper currency has no value except as money, why do consumers and firms use it?

If you look at the top of a U.S. dollar bill, you will see the words "Federal Reserve Note" because it is issued by the Federal Reserve. Because U.S. dollars are fiat money, the Federal Reserve is not required to give you gold or silver for your dollar bills. Federal Reserve currency is *legal tender* in the United States, which means the federal government requires that it be accepted in payment of debts and requires that cash or checks denominated in dollars be used in payment of taxes. Despite being legal tender, dollar bills would not be a good medium of exchange and could not serve as money if people didn't usually accept them. The key to this acceptance is that *households and firms have confidence that if they accept paper dollars in exchange for goods and services, the dollars will not lose much value during the time they hold them*. Without this confidence, dollar bills would not serve as a medium of exchange.

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Federal Reserve The central bank of the United States.

Fiat money Money, such as paper currency, that is authorized by a central bank or governmental body and that does not have to be exchanged by the central bank for gold or some other commodity money.

Making the Connection

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Apple Didn't Want My Cash!

If Federal Reserve Notes are legal tender, doesn't that mean that everyone in the United States, including every business, has to accept paper money? The answer to this question is "no," as a woman in California found out when she went to an Apple store in Palo Alto and tried to buy an iPad using \$600 in currency. The store refused to sell her the iPad for cash. At that time, the iPad had just been released, and Apple did not want to sell large numbers to people who were buying them to resell on eBay, Craigslist, or elsewhere. So, a customer wanting to buy an iPad had to pay with either a credit card or a debit card, which would make it easier for Apple to keep track of anyone attempting to buy more than the limit of two per customer.

Because Federal Reserve Notes are legal tender, creditors must accept them in payment of debts, and the government will accept them in payment of taxes. However, as this incident demonstrates, firms do not have to accept cash as payment for goods and services. As the U.S. Treasury Department explains on its Web site:

There is ... no Federal statute mandating that a private business, a person or an organization must accept currency or coins as payment for goods and/or services. ... For example, a bus line may prohibit payment of fares in pennies or dollar bills. In addition, movie theaters, convenience stores and gas stations may refuse to accept large denomination currency (usually notes above \$20) as a matter of policy.

The woman who tried to buy an iPad was disabled and on a limited income, so the incident led to negative publicity for Apple. As a result, Apple decided to lift its ban on paying for iPads with cash, provided that the customer was willing to set up an Apple account at the time of purchase. In addition, Apple presented a free iPad to the customer who was originally turned down when she tried to pay with cash.

Sources: Michael Winter, "Apple Ends No-Cash Policy and California Woman Gets Free iPad," www.usatoday.com, May 20, 2010; and U.S. Treasury, "FAQs: Currency," www.treasury.gov/resource-center/faqs/Currency/Pages/edu_faq_currency_index2.aspx.

Your Turn: Test your understanding by doing related problem 1.9 on page 505 at the end of this chapter.



The law doesn't stop Apple from requiring customers to use a credit card rather than cash, but the company decided to lift its ban on paying for iPads with cash after bad publicity.

14.2

How Is Money Measured in the United States Today?

LEARNING OBJECTIVE: Discuss the definitions of the money supply used in the United States today.

People are interested in the money supply because, as we will see, changes in the money supply can affect other economic variables, including employment, gross domestic product (GDP), and inflation. If the only function of money was to serve as a medium of exchange, then a narrow definition of the money supply should include only currency, checking account deposits, and traveler's checks because households and firms can easily use these assets to buy goods and services. A broader definition of the money supply would include other assets that can be used as a medium of exchange even though they are not as liquid as currency or checking account deposits. For example, you can't directly buy goods or services with funds in a bank savings account, but it is easy to withdraw funds from your savings account and then use these funds to buy goods and services.

Congress gave the Federal Reserve the responsibility of regulating the money supply and the task of determining how to measure it. The Federal Reserve's measures of the money supply have changed several times over the decades. Currently, the Federal Reserve publishes data on two measures of the money supply: M1 and M2. These measures, sometimes called *monetary aggregates*, are important to understand, so we devote the following sections to discussing them.

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M1: A Narrow Definition of the Money Supply

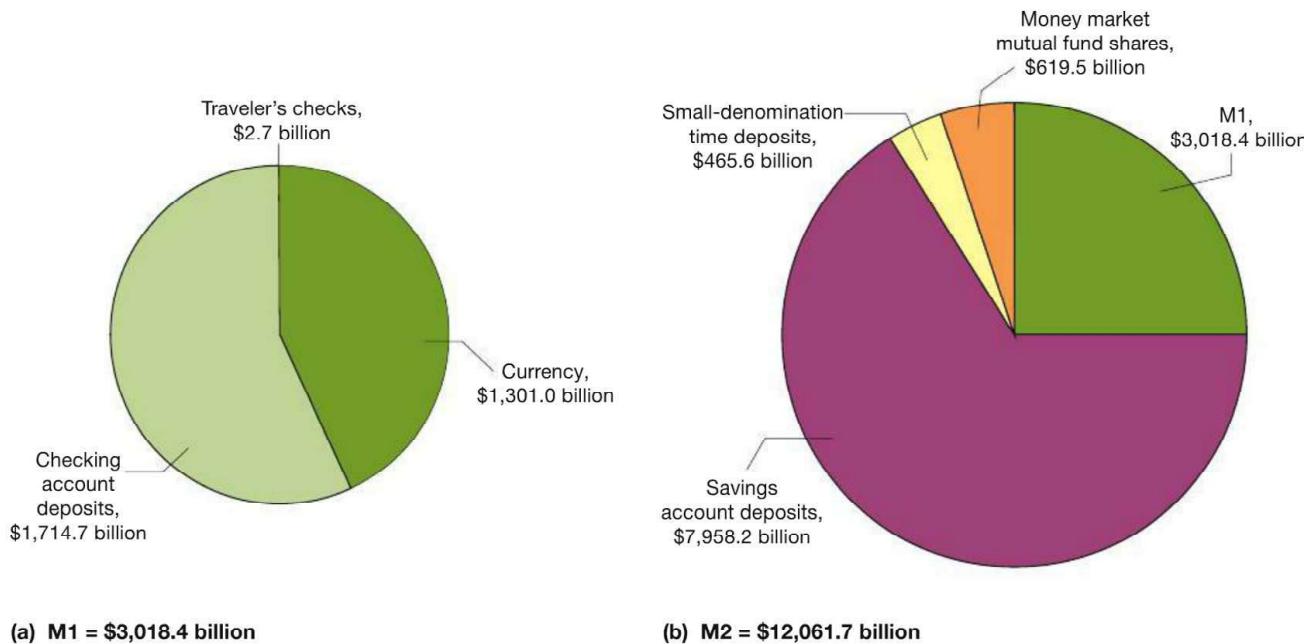
M1 The narrow definition of the money supply: the sum of currency in circulation, checking account deposits in banks, and holdings of traveler's checks.

Figure 14.1 illustrates the definitions of the money supply. The narrow definition of the money supply, **M1**, includes the following:

1. Currency, which is all the paper money and coins held by households and firms (not including currency held by banks)
2. The value of all checking account deposits in banks
3. The value of traveler's checks (Because this last category is so small—typically less than \$4 billion—relative to the other two categories, we will ignore it in our discussion of the money supply.)

Although currency has almost as large a value as checking account deposits, checking account deposits are used much more often than currency to make payments. More than 80 percent of all expenditures on goods and services are made with checks rather than with currency. In fact, the total amount of currency in circulation—\$1.3 trillion in July 2015—is a misleading number. This amount is more than \$4,000 per person—adult or child—in the United States. If this sounds like an unrealistically large amount of currency to be held per person, it is. Economists estimate that more than 60 percent of U.S. currency is actually outside the borders of the United States. More than three-quarters of U.S. paper currency is in denominations of \$100 or larger—too large to be used for routine buying and selling within the United States.

Who holds these dollars outside the United States? Foreign banks and foreign governments hold some U.S. currency, but most is held by households and firms in countries where there is not much confidence in the local currency or where the underground economy is large. When inflation rates are very high, many households and firms do not want to hold their domestic currency because it is losing its value too rapidly. The value of the U.S. dollar will be much more stable than their domestic currency. If enough people are willing to accept dollars as well as—or instead of—domestic currency, dollars become a second currency for the country. When inflation soared in the African country of Zimbabwe to the point where it took 15 billion Zimbabwean dollars



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Figure 14.1 Measuring the Money Supply

The Federal Reserve uses two different measures of the money supply: M1 and M2. Panel (a) shows the assets in M1. Panel (b) shows M2, which includes the assets in M1, as well as money market mutual fund shares, small-denomination time deposits, and savings account deposits.

Source: Board of Governors of the Federal Reserve System, "Federal Reserve Statistical Release, H.6," July 30, 2015.

to buy a can of Coca-Cola, the government went so far as to adopt the U.S. dollar as the country's official currency.

MyEconLab Concept Check

M2: A Broad Definition of Money

Before 1980, U.S. law prohibited banks from paying interest on checking account deposits. Households and firms held checking account deposits primarily to buy goods and services. M1 was, therefore, very close to the function of money as a medium of exchange. Almost all currency, checking account deposits, and traveler's checks were held with the intention of buying and selling, not with the intention of storing value. In 1980, the law was changed to allow banks to pay interest on certain types of checking accounts. This change reduced the difference between checking accounts and savings accounts, although people are still not allowed to write checks against their savings account balances.

After 1980, economists began to pay closer attention to a broader definition of the money supply, **M2**. As panel (b) of [Figure 14.1](#) shows, M2 includes everything that is in M1, plus savings account deposits, small-denomination time deposits—such as certificates of deposit (CDs)—balances in money market deposit accounts in banks, and non-institutional money market fund shares. Small-denomination time deposits are similar to savings accounts, but the deposits are for a fixed period of time—usually from six months to several years—and withdrawals before that time are subject to a penalty. Mutual fund companies sell shares to investors and use the funds raised to buy financial assets such as stocks and bonds. Some of these mutual funds, such as Vanguard's Treasury Money Market Fund or Fidelity's Cash Reserves Fund, are called *money market mutual funds* because they invest in very short-term bonds, such as U.S. Treasury bills. The balances individual investors hold in these funds are included in M2. Each week, the Federal Reserve publishes statistics on M1 and M2. In the discussion that follows, we will use the M1 definition of the money supply because it corresponds most closely to money as a medium of exchange.

There are two key points to keep in mind about the money supply:

1. The narrowest definition of the money supply consists of *both* currency and checking account deposits.
2. Because balances in checking account deposits are included in the money supply, banks play an important role in the way the money supply increases and decreases.

We will discuss this second point further in the next section. **MyEconLab Concept Check**

M2 A broader definition of the money supply: It includes M1 plus savings account deposits, small-denomination time deposits, balances in money market deposit accounts in banks, and noninstitutional money market fund shares.

Don't Let This Happen to You

Don't Confuse Money with Income or Wealth

According to *Forbes*, in 2015, Bill Gates's wealth of \$79 billion made him the richest person in the world. He also has a very large income, but how much money does he have? Your *wealth* is equal to the value of your assets minus the value of any debts you have. Your *income* is equal to your earnings during the year. Bill Gates's earnings as chairman of Microsoft and from his investments are very large. But his *money* is just equal to what he has in currency and checking accounts. Only a small proportion of Gates's \$79 billion in wealth is likely to be in currency or checking accounts. Most of his wealth is invested in stocks and bonds and other financial assets that are not included in the definition of money.

In everyday conversation, we often describe someone who is wealthy or who has a high income as "having a lot of money." But when economists use the word *money*, they

are usually referring to currency plus checking account deposits. It is important to keep straight the differences between wealth, income, and money.

Just as money and income are not the same for a person, they are not the same for the whole economy. National income in the United States was equal to \$15.1 trillion in 2014. The money supply in 2014 was \$2.8 trillion (using the M1 measure). There is no reason why national income in a country should be equal to the country's money supply, nor will an increase in a country's money supply necessarily increase the country's national income.

Source: "The World's Billionaires," *Forbes*, March 2, 2015.

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Your Turn: Test your understanding by doing related problems [2.5](#) and [2.6](#) on page [505](#) at the end of this chapter.

Solved Problem 14.2

MyEconLab Interactive Animation

The Definitions of M1 and M2

Suppose you decide to withdraw \$2,000 from your checking account and put the money into a bank certification of

deposit (CD). Briefly explain how this action will affect M1 and M2.

Solving the Problem

Step 1: **Review the chapter material.** This problem is about the definitions of the money supply, so you may want to review the section “How Is Money Measured in the United States Today?” which begins on page 479.

Step 2: **Use the definitions of M1 and M2 to answer the problem.** Funds in checking accounts are included in both M1 and M2. Funds in CDs are included only in M2. It is tempting to answer this problem by saying that shifting \$2,000 from a checking account to a CD reduces M1 by \$2,000 and increases M2 by \$2,000, but the \$2,000 in your checking account was already counted in M2. So, the correct answer is that your action reduces M1 by \$2,000 but leaves M2 unchanged.

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Your Turn: For more practice, do related problems 2.7 and 2.8 on page 505 at the end of this chapter.

What about Credit Cards and Debit Cards?

Many people buy goods and services with credit cards, yet credit cards are not included in either definition of the money supply. The reason is that when you buy something with a credit card, you are in effect taking out a loan from the bank that issued the credit card. The transaction is complete only when you pay your credit card bill at the end of the month—often with a check or an electronic transfer from your checking account. In contrast, with a debit card, the funds to make the purchase are taken directly from your checking account. In either case, the cards themselves do not represent money.

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Making the Connection

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Are Bitcoins Money?

Typically, when we think of “money,” we think of currency issued by a government. But we have just seen that currency represents only a small part of the money supply of the United

States, whether measured as M1 or M2. The non-currency components of M1 or M2, although not issued by the government, are familiar financial assets such as checking or savings accounts. Some households and firms have shifted away from M1 or M2 to finance their buying and selling of goods and services and are instead using e-money, or digital funds. The best-known form of e-money is PayPal, which until 2015 was owned by eBay, the online auction site. An individual or a firm can set up a PayPal account by transferring funds from a checking account or credit card. As long as a seller is willing to accept funds from a buyer’s PayPal (or other e-money) account, e-money functions like conventional government-issued money.

Recently, journalists, economists, and policymakers have been debating the merits of bitcoin, a new form of e-money. Unlike PayPal and other similar services for transferring money electronically, bitcoin is not owned by a firm but is instead the product of a decentralized system of linked computers. Bitcoin was founded in 2009 by “Satoshi Nakamoto,” which is likely an assumed name taken by bitcoin’s founder or founders. Bitcoins are produced by people performing the complicated calculations necessary to ensure that online purchases made with bitcoins are legitimate—that is, that someone doesn’t try to spend the same bitcoin multiple times. People who successfully complete these calculations are awarded a fixed amount of bitcoins—typically 14. This process of bitcoin “mining” will continue until a maximum of 21 million bitcoins has been produced—a total expected to be reached in 2030.



Bitcoins are created by computer calculations, not by central banks.

Because people can buy and sell bitcoins in exchange for dollars and other currencies on Web sites, some people refer to it as a “cryptocurrency.” You can buy bitcoins and store them in a “digital wallet” on a smartphone. You can then buy something in a store that accepts bitcoins by scanning a bar code with your phone. A number of Web sites, such as BitPay, which is based in Atlanta, allow merchants to process purchases made with bitcoins in a manner similar to the way they process credit card payments.

Why would buyers and sellers prefer to use bitcoins rather than cash or a credit card? The popularity of bitcoins with some buyers may be due to its being a new and fashionable way to make purchases, and because of the convenience of using a smartphone to make a purchase. In addition, some people are afraid that because central banks in most countries greatly increased the money supply during and after the recession of 2007–2009, the result will eventually be high rates of inflation. These people hope that because the total amount of bitcoins is limited, inflation will not undermine their value. Finally, when you buy something with a credit card, the credit card company has a permanent record of your transaction. Bitcoin transactions are more private because no such record of your transaction exists.

Some retailers prefer bitcoins to credit card purchases because the retailers pay only about 1 percent of the sale in processing costs, as opposed to about 3 percent for a credit card purchase. In addition, a bitcoin sale is final, just as if the purchase were made with cash, unlike credit card sales, where the buyer can dispute the purchase even months after it was made.

Despite these possible benefits to using bitcoin, by 2015, it had not yet been widely adopted. The introduction of Apple Pay and Google Wallet provided consumers with a way to use their smartphones linked to a credit card to make payments, which undercut one of bitcoin’s advantages. Some firms also questioned whether the software underlying bitcoin was capable of dealing with a large number of transactions, which would be a barrier to the cryptocurrency being widely used. The most popular online bitcoin exchange, Japan-based Mt. Gox, collapsed, further reducing confidence in the cryptocurrency. At the time of the firm’s collapse, the CEO said that software problems had allowed hackers to withdraw more than \$500 million worth of bitcoins investors had stored on the exchange. The Japanese police later arrested the CEO.

Some policymakers are concerned that investors on exchanges might manipulate the prices of bitcoins and other virtual currencies. The value of bitcoins in exchange for dollars rose from \$5 per bitcoin in June 2012 to \$266 per bitcoin in April 2013, before falling to \$94 per bitcoin in July 2013 and then rising to \$287 in July 2015. Whether these swings in value represented underlying movements in demand and supply for bitcoins or manipulation of their values was not clear.

Should the Federal Reserve include bitcoins and other virtual or cryptocurrencies in its measures of the money supply? So far, the volume of transactions in these currencies has been small, which makes the question of little practical importance. At this point, the Federal Reserve treats virtual currencies as being the equivalent of credit or debit cards, rather than currency or checking account balances, and does not include them in M1 or M2.

Sources: Paul Vigna, “Bitcoiners Decamp to Bretton Woods, Assess the Future of Bitcoin,” *Wall Street Journal*, July 30, 2015; Takashi Mochizuki, “Japanese Police Arrest Mark Karpeles of Collapsed Bitcoin Exchange Mt. Gox,” *Wall Street Journal*, August 1, 2015; Lingling Wei, “Fed Studying Risks at Online Payment Providers,” *Wall Street Journal*, June 3, 2013; and “How Does Bitcoin Work?” *Economist*, April 11, 2013.

Your Turn: Test your understanding by doing related problem 2.11 on page 506 at the end of this chapter.

MyEconLab Study Plan

14.3

How Do Banks Create Money?

LEARNING OBJECTIVE: Explain how banks create money.

We have seen that the most important component of the money supply is checking accounts in banks. To understand the role money plays in the economy, we need to look more closely at how banks operate. Banks are profit-making private businesses,

just like department stores and supermarkets. Some banks are quite small, with just a few branches, and do business in a limited area. Others are among the largest corporations in the United States, with thousands of branches spread across many states. Banks play an important role in the economy by accepting deposits and making loans. By taking these actions, banks fulfill a key function in the *money supply process* by which central banks control the money supply.

Bank Balance Sheets

To understand how banks create money, we need to briefly examine a typical bank balance sheet. On a balance sheet, a firm's assets are listed on the left, and its liabilities and stockholders' equity are listed on the right (see [Chapter 6](#)). Assets are the value of anything owned by the firm, liabilities are the value of anything the firm owes, and stockholders' equity is the difference between the total value of assets and the total value of liabilities. Stockholders' equity represents the value of the firm if it were closed, all its assets were sold, and all its liabilities were paid off. A corporation's stockholders' equity is also called its *net worth*. A bank's stockholders' equity or net worth is also called its *capital*.

[Figure 14.2](#) shows a typical balance sheet for a large bank. The key assets on a bank's balance sheet are its *reserves*, loans, and holdings of securities, such as U.S. Treasury bills. **Reserves** are deposits that a bank has retained rather than loaned out or invested. Banks keep reserves either physically within the bank, as *vault cash*, or on deposit with the Federal Reserve. Banks are required by law to keep as reserves 10 percent of their *checking account deposits* above a threshold level, which in 2015 was \$103.6 million. These reserves are called **required reserves**. The minimum fraction of deposits that banks are required to keep as reserves is called the **required reserve ratio**. We can abbreviate the required reserve ratio as *RR*. Any reserves that banks hold above the legal requirement are called **excess reserves**. The balance sheet in [Figure 14.2](#) shows that loans are a typical bank's largest asset.

Banks make *consumer loans* to households and *commercial loans* to firms. A loan is an asset to a bank because it represents a promise by the person taking out the loan to make certain specified payments to the bank. A bank's reserves and its holdings of securities are also assets because they are things of value the bank owns.

Reserves Deposits that a bank keeps as cash in its vault or on deposit with the Federal Reserve.

Required reserves Reserves that a bank is legally required to hold, based on its checking account deposits.

Required reserve ratio The minimum fraction of deposits banks are required by law to keep as reserves.

Excess reserves Reserves that banks hold over the legal requirement.

Figure 14.2

The Balance Sheet of a Typical Large Bank

The entries on a bank's balance sheet of greatest economic importance are its reserves, loans, and deposits. Notice that the difference between the value of this bank's total assets and its total liabilities is equal to its stockholders' equity. As a consequence, the left side of the balance sheet always equals the right side.

Note: Some entries have been combined to simplify the balance sheet.

Assets (in billions)		Liabilities and Stockholders' Equity (in billions)	
Reserves	\$135	Deposits	\$1,000
Loans	900	Short-term borrowing	400
Securities	700	Long-term debt	360
Buildings and equipment	15	Other liabilities	275
Other assets	550	Total liabilities	\$2,035
		Stockholders' equity	265
Total assets	\$2,300	Total liabilities and stockholders' equity	\$2,300

Making the Connection

[MyEconLab Video](#)

Would You Borrow from an Online Peer-to-Peer Lender?

The basic business of banks is taking in deposits from savers and using those funds to make loans to households and firms. Banks often require *collateral* before making a loan, which means that if the borrower stops making payments on the loan, the bank can seize the asset the borrower pledged as collateral. For example, if you take out a loan to buy a car and stop

making payments on the loan, the bank can repossess your car and sell it to get its money back.

In addition to collateral, banks rely on a borrower's *credit score* in deciding whether to make a loan. The best-known credit score is compiled by the FICO company, which rates borrowers on a scale of 350 to 850, with higher scores meaning the borrower is less likely to default. Credit scores are determined by a variety of factors, including whether the borrower has been on time with payments on other loans and on credit cards; how long the borrower has lived at his current residence; how long the borrower has held her current job; and how much other debt the borrower has. Borrowers with high scores are called *prime borrowers*, and borrowers with low scores are called *subprime borrowers*. A bank will typically charge a prime borrower a lower interest rate than it will charge a subprime borrower. The higher interest rate on a *subprime loan* compensates the bank for the greater risk that the borrower will default. Lenders differ in the minimum score they use to consider someone a prime borrower, but it is typically around 650.

During the housing bubble of the early 2000s, many banks and other lenders made mortgage loans to subprime borrowers buying houses. High default rates on these mortgages following the bursting of the housing bubble in 2006 contributed to the 2007–2009 financial crisis and led policymakers to tighten regulations on banks granting subprime loans. Some consumer advocates also criticize these loans because they believe that the high interest rates exploit borrowers. To avoid both the new regulations and the criticism, many banks have cut back on subprime loans, particularly subprime *personal loans*, which are made to individuals who do not provide collateral for the loan. In past years, after getting a job, many new college graduates would take out a personal loan from a bank to buy the furniture or small appliances needed to set up an apartment. You may have a low credit score if you were late with a couple of credit card payments, have only a short work history, and have just moved into a new apartment. A bank may then consider you a subprime borrower and be unwilling to lend you money.

You could borrow on your credit card by taking a cash advance, but the interest rate is likely to be high—typically more than 20 percent. When banks cut back on subprime personal loans, it left a hole in the financial system. In the past few years, some new businesses have developed to fill that hole. For example, Lending Club and FreedomPlus facilitate peer-to-peer lending on the Internet. These businesses gather information about a borrower, determine the interest rate on the loan, and then post the loan online. Individual investors can then choose to fund the loan. Some loans are funded by a single investor, while others are funded by several investors. The loans can be as short as a few weeks or as long as several years and can have interest rates from 7 percent to more than 20 percent, with the typical interest rate being around 14 percent. Peer-to-peer lending firms are part of the “sharing economy,” which also includes the car ride firm Uber and short-term apartment rental firm Airbnb. In the case of peer-to-peer lending, it’s money that is being shared.

By 2015, peer-to-peer lending sites were making \$10 billion worth of loans. While this amount has been growing rapidly, it still far less than the trillions of dollars in loans of all types made by banks. It remains to be seen whether the peer-to-peer lending sites will end up becoming a major source of credit to households and firms.

Sources: Ianthe Jeanne Dugan and Telis Demos, “New Lenders Spring Up to Cater to Subprime Sector,” *Wall Street Journal*, March 5, 2014; and “From the People, for the People,” *Economist*, May 9, 2015.

Your Turn: Test your understanding by doing related problems 3.7 and 3.8 on pages 506–507 at the end of this chapter.



Some people with low credit scores who can't get a bank loan turn to peer-to-peer lending to borrow the funds to meet needs such as buying furniture.

Deposits are a typical bank's largest liability. Deposits include checking accounts, savings accounts, and CDs. Deposits are liabilities to banks because they are owed to the households or firms that have deposited the funds. If you deposit \$100 in your checking account, the bank owes you the \$100, and you can ask for it back at any time. So, your checking account is an asset to you, and it is a liability to the bank. Banks also borrow short term from other banks and from the Federal Reserve and borrow long term by selling bonds to investors. These *borrowings* are also liabilities.

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Using T-Accounts to Show How a Bank Can Create Money

It is easier to show how banks create money by using a T-account than by using a balance sheet. A T-account is a stripped-down version of a balance sheet that shows only how a transaction *changes* a bank's balance sheet. Suppose you deposit \$1,000 in currency into an account at Bank of America. This transaction raises the total deposits at Bank of America by \$1,000 and also raises its reserves by \$1,000. We show this result on the following T-account:

Assets	Liabilities
Reserves +\$1,000	Deposits +\$1,000
Your deposit of \$1,000 into your checking account increases Bank of America's assets and liabilities by the same amount.	

Remember that because the total value of all the entries on the right side of a balance sheet must always be equal to the total value of all the entries on the left side of a balance sheet, any transaction that increases (or decreases) one side of the balance sheet must also increase (or decrease) the other side of the balance sheet. In this case, the T-account shows that we increased both sides of the balance sheet by \$1,000.

Initially, this transaction does not increase the money supply. The currency component of the money supply declines by \$1,000 because the \$1,000 you deposited is no longer in circulation and, therefore, is not counted in the money supply. But the decrease in currency is offset by a \$1,000 increase in the checking account deposit component of the money supply.

This initial change is not the end of the story, however. Banks are required to keep 10 percent of deposits as reserves. Because the Federal Reserve pays banks only a low rate of interest on their reserves, banks have an incentive to loan out or buy securities with the other 90 percent. Suppose, for simplicity, that initially Bank of America holds no excess reserves. In that case, Bank of America can keep \$100 of your deposit as required reserves and loan out the other \$900, which represents its excess reserves. Assume that Bank of America loans out the \$900 to someone to buy a very inexpensive used car. Bank of America could give the \$900 to the borrower in currency, but usually banks make loans by increasing the borrower's checking account. We can show this transaction with another T-account:

Assets	Liabilities
Reserves +\$1,000	Deposits +\$1,000
Loans +\$900	Deposits +\$900
1. By loaning out \$900 in excess reserves ...	
2. . . . Bank of America has increased the money supply by \$900.	

Notice that by *making this \$900 loan*, *Bank of America has increased the money supply by \$900*. The initial \$1,000 in currency you deposited into your checking account has been turned into \$1,900 in checking account deposits—a net increase in the money supply of \$900.

But the story does not end here. The person who took out the \$900 loan did so to buy a used car. To keep things simple, let's suppose he buys the car for exactly \$900 and pays by writing a check on his account at Bank of America. The seller of the used car will now deposit the check in her bank. That bank may also be a branch of Bank of America, but in most cities, there are many banks, so let's assume that the seller of the car has her account at a branch of PNC Bank. Once she deposits the check, PNC Bank will send it to Bank of America to *clear* the check and collect the \$900. We show the result in the following T-accounts:

Bank of America			
Assets		Liabilities	
Reserves	+\$100	Deposits	+\$1,000
Loans	/\$900		
1. When the \$900 check that was deposited in a PNC account arrives to be cleared, the increase in Bank of America's reserves (shown in the previous T-account) falls by \$900 to \$100 ...			2. . . . and the increase in Bank of America's deposits falls by \$900 to \$1,000.

PNC Bank			
Assets		Liabilities	
Reserves	+\$900	Deposits	+\$900
After the check drawn on the account at Bank of America clears, PNC's reserves and deposits both increase by \$900.			

After the car buyer's check clears, Bank of America has lost \$900 in deposits—the amount loaned to the car buyer—and \$900 in reserves—the amount it had to pay PNC when PNC sent Bank of America the car buyer's check. PNC has an increase in checking account deposits of \$900—the deposit of the car seller—and an increase in reserves of \$900—the amount it received from Bank of America.

PNC has 100 percent reserves against this new \$900 deposit, but it needs only 10 percent reserves. The bank has an incentive to keep \$90 as reserves and to loan out the other \$810, which are excess reserves. If PNC does this, we can show the change in its balance sheet by using another T-account:

PNC Bank			
Assets		Liabilities	
Reserves	+\$900	Deposits	+\$900
Loans	+\$810	Deposits	+\$810
By making an \$810 loan, PNC has increased both its loans and its deposits by \$810.			

In loaning out the \$810 in excess reserves, PNC creates a new checking account deposit of \$810. The initial deposit of \$1,000 in currency into Bank of America has now resulted in the creation of $\$1,000 + \$900 + \$810 = \$2,710$ in checking account deposits. The money supply has increased by $\$2,710 - \$1,000 = \$1,710$.

The process is still not finished. The person who borrows the \$810 will spend it by writing a check against his account. Whoever receives the \$810 will deposit it in her bank, which could be a Bank of America branch or a PNC branch or a branch of some other bank. That new bank—if it's not PNC—will send the check to PNC and will receive \$810 in new reserves. That new bank will have an incentive to loan out 90 percent of these reserves—keeping 10 percent to meet the legal requirement—and the process will go on. At each stage, the additional loans being made and the additional deposits being created are shrinking by 10 percent, because each bank has to keep that amount as required reserves. We can use a table to show the total increase in checking account deposits started by your initial deposit of \$1,000. The dots in the table represent additional rounds in the money supply process:

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Bank	Increase in Checking Account Deposits
Bank of America	\$1,000
PNC	+ 900 ($= 0.9 \times \$1,000$)
Third Bank	+ 810 ($= 0.9 \times \$900$)
Fourth Bank	+ 729 ($= 0.9 \times \$810$)
.	+ .
.	+ .
.	+ .
Total change in checking account deposits	= \$10,000

The Simple Deposit Multiplier

Your initial deposit of \$1,000 increased the reserves of the banking system by \$1,000 and led to a total increase in checking account deposits of \$10,000. The ratio of the amount of deposits created by banks to the amount of new reserves is called the **simple deposit multiplier**. In this case, the simple deposit multiplier is equal to $\$10,000/\$1,000 = 10$. Why 10? How do we know that your initial \$1,000 deposit ultimately leads to a total increase in deposits of \$10,000?

There are two ways to answer this question. First, each bank in the money supply process is keeping reserves equal to 10 percent of its deposits. For the banking system as a whole, the total increase in reserves is \$1,000—the amount of your original currency deposit. Therefore, the system as a whole will end up with \$10,000 in deposits because \$1,000 is 10 percent of \$10,000.

A second way to answer the question is by deriving an expression for the simple deposit multiplier. The total increase in deposits equals:

$$\$1,000 + [0.9 \times \$1,000] + [(0.9 \times 0.9) \times \$1,000] + [(0.9 \times 0.9 \times 0.9) \times \$1,000] + \dots$$

or:

$$\$1,000 + [0.9 \times \$1,000] + [0.9^2 \times \$1,000] + [0.9^3 \times \$1,000] + \dots$$

or:

$$\$1,000 \times (1 + 0.9 + 0.9^2 + 0.9^3 + \dots)$$

The rules of algebra tell us that an expression like the one in the parentheses sums to:

$$\frac{1}{1 - 0.9}.$$

Simplifying further, we have:

$$\frac{1}{0.10} = 10.$$

So:

$$\text{Total increase in deposits} = \$1,000 \times 10 = \$10,000.$$

Don't Let This Happen to You

Don't Confuse Assets and Liabilities

Consider the following reasoning: "How can checking account deposits be a liability to a bank? After all, they are something of value that is in the bank. Therefore, checking account deposits should be counted as a bank asset rather than as a bank liability."

This statement is incorrect. The balance in a checking account represents something the bank *owes* to the owner

of the account. Therefore, it is a liability to the bank, although it is an asset to the owner of the account. Similarly, your car loan is a liability to you—because it is a debt you owe to the bank—but it is an asset to the bank.

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Your Turn: Test your understanding by doing related problem 3.11 on page 507 at the end of this chapter.

Note that 10 is equal to 1 divided by the required reserve ratio, RR , which in this case is 10 percent, or 0.10. So, we have another way of expressing the simple deposit multiplier:

$$\text{Simple deposit multiplier} = \frac{1}{RR}.$$

This formula makes it clear that the higher the required reserve ratio, the smaller the simple deposit multiplier. With a required reserve ratio of 10 percent, the simple deposit multiplier is 10. If the required reserve ratio were 20 percent, the simple deposit multiplier would fall to $1/0.20$, or 5.

We can use this formula to calculate the total increase in checking account deposits from an increase in bank reserves due to, for instance, currency being deposited in a bank:

$$\text{Change in checking account deposits} = \text{Change in bank reserves} \times \frac{1}{RR}.$$

For example, if \$100,000 in currency is deposited in a bank and the required reserve ratio is 10 percent, then:

$$\begin{aligned}\text{Change in checking account deposits} &= \$100,000 \times \frac{1}{0.10} \\ &= \$100,000 \times 10 = \$1,000,000.\end{aligned}$$

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Solved Problem 14.3

MyEconLab Interactive Animation

Showing How Banks Create Money

Suppose you deposit \$5,000 in currency into your checking account at a branch of PNC Bank, which we will assume has no excess reserves at the time you make your deposit. Also assume that the required reserve ratio is 0.10.

- Use a T-account to show the initial effect of this transaction on PNC's balance sheet.
- Suppose that PNC makes the maximum loan it can from the funds you deposited. Use a T-account to show the initial effect on PNC's balance sheet from granting the loan. Also include in this T-account the transaction from part (a).

- Now suppose that whoever took out the loan in part (b) writes a check for this amount and that the person receiving the check deposits it in Bank of America. Show the effect of these transactions on the balance sheets of PNC Bank and Bank of America *after the check has cleared*. On the T-account for PNC Bank, include the transactions from parts (a) and (b).
- What is the maximum increase in checking account deposits that can result from your \$5,000 deposit? What is the maximum increase in the money supply that can result from your deposit? Explain.

Solving the Problem

Step 1: Review the chapter material. This problem is about how banks create checking account deposits, so you may want to review the section “Using T-Accounts to Show How a Bank Can Create Money,” which begins on page 486.

Step 2: Answer part (a) by using a T-account to show the effect of the deposit. Keeping in mind that T-accounts show only the changes in a balance sheet that result from the relevant transaction and that assets are on the left side of the account and liabilities are on the right side, we have:

PNC Bank			
Assets		Liabilities	
Reserves	+\$5,000	Deposits	+\$5,000

Because the bank now has your \$5,000 in currency in its vault, its reserves (and, therefore, its assets) have risen by \$5,000. This transaction also increases your checking account balance by \$5,000. Because the bank owes you this money, the bank’s liabilities have also risen by \$5,000.

Step 3: Answer part (b) by using a T-account to show the effect of the loan. The problem tells you to assume that PNC Bank currently has no excess reserves and that the required reserve ratio is 10 percent. This requirement means that if the bank’s checking account deposits go up by \$5,000, the bank must keep \$500 as reserves and can loan out the remaining \$4,500. Remembering that new loans usually take the form of setting up or increasing a checking account for the borrower, we have:

PNC Bank			
Assets		Liabilities	
Reserves	+\$5,000	Deposits	+\$5,000
Loans	+\$4,500	Deposits	+\$4,500

The first line of the T-account shows the transaction from part (a). The second line shows that PNC has loaned out \$4,500 by increasing the checking account of the borrower by \$4,500. The loan is an asset to PNC because it represents the borrower’s promise to make certain payments spelled out in the loan agreement.

Step 4: Answer part (c) by using T-accounts for PNC and Bank of America to show the effect of the check clearing. We now show the effect of the borrower having spent the \$4,500 he received as a loan from PNC. The person who received the \$4,500 check deposits it in her account at Bank of America. We need two T-accounts to show this activity:

PNC Bank			
Assets		Liabilities	
Reserves	+\$500	Deposits	+\$5,000
Loans	+\$4,500		

Bank of America			
Assets		Liabilities	
Reserves	+\$4,500	Deposits	+\$4,500

Look first at the T-account for PNC. Once Bank of America sends the check written by the borrower to PNC, PNC loses \$4,500 in reserves, and Bank of America gains \$4,500 in reserves. The \$4,500 is also deducted from the account of the borrower. PNC is now satisfied with the result. It received a \$5,000 deposit in currency from you. When that money was sitting in the bank vault, it wasn't earning any interest for PNC. Now \$4,500 of the \$5,000 has been loaned out and is earning interest. These interest payments allow PNC to cover its costs, which it has to do to remain in business.

Bank of America now has an increase in deposits of \$4,500, resulting from the check being deposited, and an increase in reserves of \$4,500. Bank of America is in the same situation as PNC was in part (a): It has excess reserves as a result of this transaction and a strong incentive to lend them out.

Step 5: Answer part (d) by using the simple deposit multiplier formula to calculate the maximum increase in checking account deposits and the maximum increase in the money supply. The simple deposit multiplier expression is (remember that RR is the required reserve ratio):

$$\text{Change in checking account deposits} = \text{Change in bank reserves} \times \frac{1}{RR}.$$

In this case, bank reserves rose by \$5,000 as a result of your initial deposit, and the required reserve ratio is 0.10, so:

$$\begin{aligned}\text{Change in checking account deposits} &= \$5,000 \times \frac{1}{0.10} \\ &= \$5,000 \times 10 = \$50,000.\end{aligned}$$

Because checking account deposits are part of the money supply, it is tempting to say that the money supply has also increased by \$50,000. Remember, though, that your \$5,000 in currency was counted as part of the money supply while you had it, but it is not counted when it is sitting in a bank vault. Therefore:

Increase in checking account deposits – Decline in currency in circulation = Change in the money supply.

Or,

$$\$50,000 - \$5,000 = \$45,000.$$

Your Turn: For more practice, do related problem 3.12 on page 507 at the end of the chapter.

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The Simple Deposit Multiplier versus the Real-World Deposit Multiplier

The story we have just told of the money supply process has been simplified in two ways. First, we assumed that banks do not keep any excess reserves. That is, we assumed that when you deposited \$1,000 in currency into your checking account at Bank of America, it loaned out \$900, keeping only the \$100 in required reserves. In fact, banks often keep some excess reserves to guard against the possibility that many depositors may simultaneously make withdrawals from their accounts. Since the financial crisis that began in 2007, banks have kept substantial excess reserves. The more excess reserves banks keep, the smaller the deposit multiplier. Imagine an extreme case in which Bank of America kept your entire \$1,000 as reserves, loaning out none of it. In this case, the process we described earlier—loans leading to the creation of new deposits, leading to the making of additional loans, and so on—will not take place. The \$1,000 increase in reserves will lead to just a \$1,000 increase in deposits, and the deposit multiplier will be $\$1,000/\$1,000 = 1$, not 10.

Second, we assumed that the whole amount of every check is deposited in a bank; no one takes any of it out as currency. In reality, households and firms keep roughly

constant the amount of currency they hold relative to the value of their checking account balances. So, we would expect to see people increasing the amount of currency they hold as the balances in their checking accounts rise. Once again, think of the extreme case. Suppose that when Bank of America makes the initial \$900 loan to the borrower who wants to buy a used car, the seller of the car cashes the check instead of depositing it. In that case, PNC does not receive any new reserves and does not make any new loans. Once again, the \$1,000 increase in your checking account at Bank of America is the only increase in deposits, and the deposit multiplier is 1.

The effect of these two simplifications is to reduce the real-world deposit multiplier to about 1.6 during normal times. So, a \$1 increase in the reserves of the banking system typically results in about a \$1.60 increase in deposits. Following the financial crisis of 2007–2009, the surge in bank holdings of excess reserves reduced the multiplier to less than 1.

Although the story of the deposit multiplier can be complicated, the key point to bear in mind is that the most important part of the money supply is the checking account balance component. When banks make loans, they increase checking account balances, and the money supply expands. Banks make new loans whenever they gain reserves. The whole process can also work in reverse: If banks lose reserves, they reduce their outstanding loans and deposits, and the money supply contracts.

We can summarize these important conclusions:

1. When banks gain reserves, they make new loans, and the money supply expands.
2. When banks lose reserves, they reduce their loans, and the money supply contracts.

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14.4

The Federal Reserve System

LEARNING OBJECTIVE: Compare the three policy tools the Federal Reserve uses to manage the money supply.

Fractional reserve banking system

A banking system in which banks keep less than 100 percent of deposits as reserves.

Bank run A situation in which many depositors simultaneously decide to withdraw money from a bank.

Bank panic A situation in which many banks experience runs at the same time.

Many people are surprised to learn that banks do not keep locked away in their vaults all the funds that are deposited in checking accounts. The United States, like nearly all other countries, has a **fractional reserve banking system**, which means that banks keep less than 100 percent of deposits as reserves. When people deposit money in a bank, the bank loans most of the money to someone else. What happens if depositors want their money back? Depositors withdrawing money would seem to be a problem because banks have loaned out most of the money and can't easily get it back.

In practice, withdrawals are usually not a problem for banks. On a typical day, about as much money is deposited as is withdrawn. If a small amount more is withdrawn than deposited, banks can cover the difference from their excess reserves or by borrowing from other banks. Sometimes depositors lose confidence in a bank when they question the value of the bank's underlying assets, particularly its loans. Often, the reason for a loss of confidence is bad news about the loans the bank has made, whether the news is accurate or not. When many depositors simultaneously decide to withdraw their money from a bank, there is a **bank run**. If many banks experience runs at the same time, the result is a **bank panic**. It is possible for one bank to handle a run by borrowing from other banks, but if many banks simultaneously experience runs, the banking system may be in trouble.

A central bank, like the Federal Reserve in the United States, can help stop a bank panic by acting as a *lender of last resort*. In acting as a lender of last resort, a central bank makes loans to banks that cannot borrow funds elsewhere. The banks can use these loans to pay off depositors. When the panic ends and the depositors put their money back in their accounts, the banks can repay the loans to the central bank.

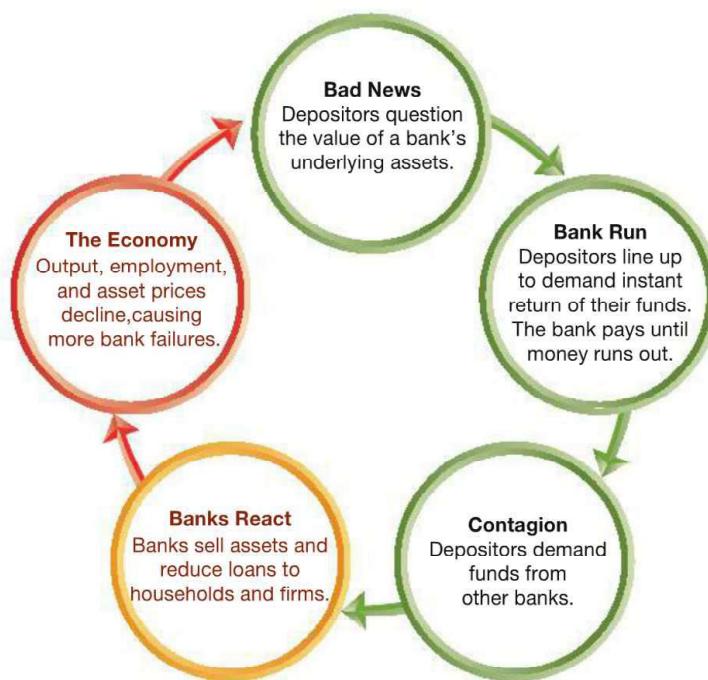
The Establishment of the Federal Reserve System

Bank panics lead to severe disruptions in business activity because households and firms have trouble gaining access to their accounts and may be unable to borrow money. As we saw in the chapter opener, in 2015, bank runs in Greece prompted the

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Figure 14.3**The Feedback Loop during a Bank Panic**

Bank runs can cause good banks, as well as bad banks, to fail. Bank failures are costly because they reduce the ability of households and firms to get loans. Once a panic starts, falling incomes, employment, and asset prices can cause more bank failures. This feedback loop means that a panic can continue unless the government intervenes.



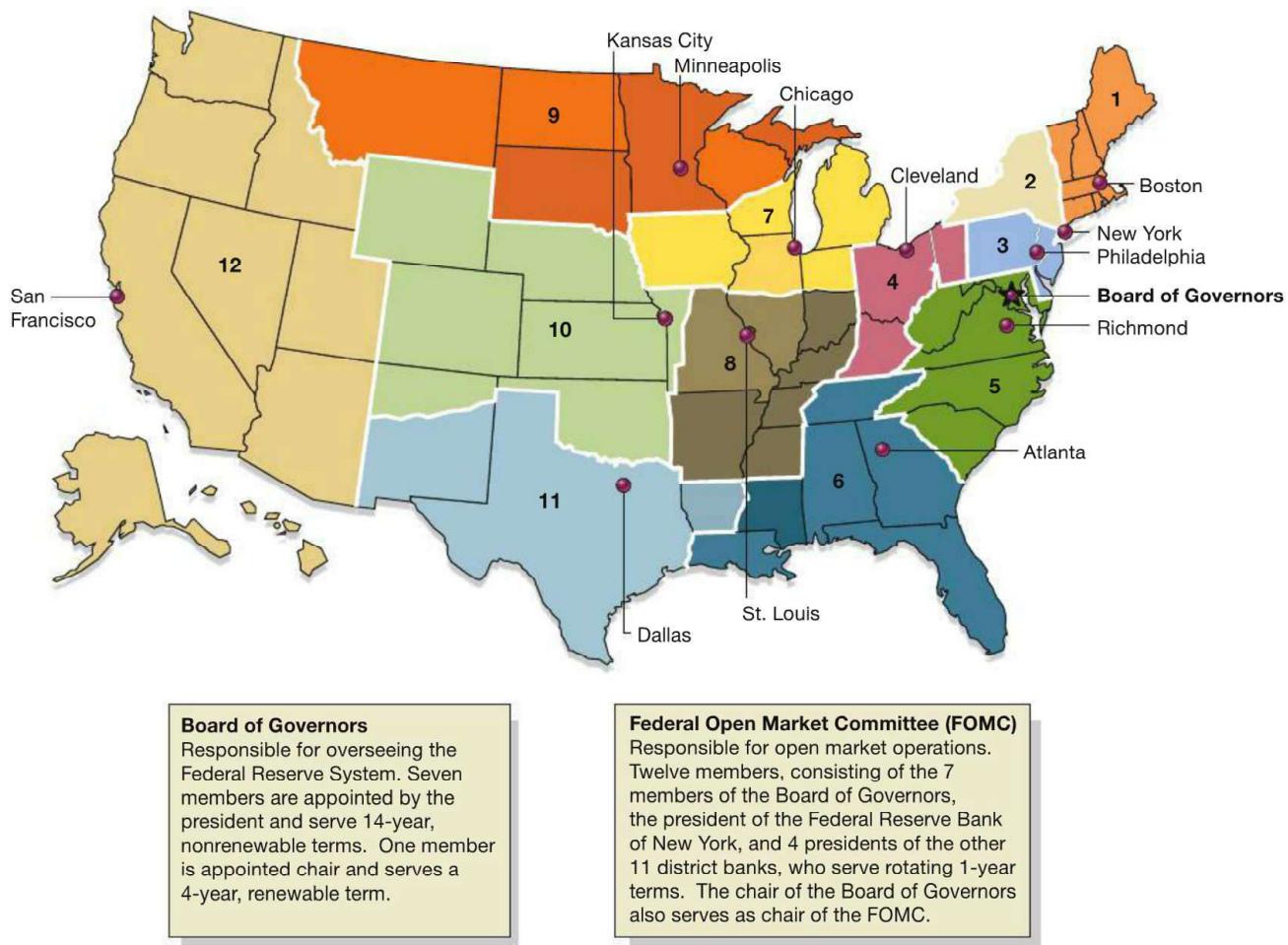
government to order banks closed for three weeks, which led to disruptions in the Greek economy, with declines in output and employment. In the United States, each bank panic in the late nineteenth and early twentieth centuries was accompanied by a recession. Figure 14.3 shows how a feedback loop during a bank run can lead to a recession. With the intention of putting an end to bank panics, in 1913, Congress passed the Federal Reserve Act, which set up the Federal Reserve System—often referred to as “the Fed.” The system began operation in 1914, with the authority to make loans to banks. The loans the Fed makes to banks are called **discount loans**, and the interest rate it charges on the loans is called the **discount rate**. When a bank receives a loan from the Fed, its reserves increase by the amount of the loan.

The Fed’s first test as a lender of last resort came in the early years of the Great Depression of the 1930s, when many banks were hit by bank runs as depositors pulled funds out of checking and savings accounts. Although the Fed had been established to act as a lender of last resort, Fed officials declined to make loans to many banks because the officials were worried that banks experiencing runs had made bad loans and other investments. The Fed believed that making loans to banks that were in financial trouble because of bad investments might reduce the incentive bank managers had to be careful in their investment decisions. Partly due to the Fed’s unwillingness to act as a lender of last resort, more than 5,000 banks failed during the early 1930s. Today, many economists are critical of the Fed’s decisions in the early 1930s because they believe these decisions increased the severity of the Great Depression. In 1934, Congress established the Federal Deposit Insurance Corporation (FDIC) to insure deposits in most banks up to a limit, which is currently \$250,000 per deposit. If the bank you have your checking account in goes out of business, the FDIC will refund your money after a wait of at most two days. Deposit insurance has greatly reduced bank runs because it has reassured all but the largest depositors that their deposits are safe, even if their bank goes out of business. During the financial crisis of 2007–2009, some banks experienced runs when depositors with funds exceeding the deposit insurance limit feared that they would suffer losses if their banks failed.

In setting up the Federal Reserve System, Congress divided the country into 12 Federal Reserve districts, as shown in Figure 14.4. Each district has its own Federal Reserve Bank, which provides services to banks in that district. The real power of the Fed, however, lies in Washington, DC, with the Board of Governors. The seven members of the Board of Governors are appointed by the president of the United States to 14-year,

Discount loans Loans the Federal Reserve makes to banks.

Discount rate The interest rate the Federal Reserve charges on discount loans.



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Figure 14.4 The Federal Reserve System

The United States is divided into 12 Federal Reserve districts, each of which has a Federal Reserve Bank. The real power within the Federal Reserve System, however, lies in Washington, DC, with the Board of Governors, which consists of 7 members appointed by the president.

The 12-member Federal Open Market Committee carries out monetary policy.

Source: Board of Governors of the Federal Reserve System.

Monetary policy The actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy objectives.

nonrenewable terms. One member of the Board of Governors is appointed chair and serves a 4-year, renewable term. In addition to acting as a lender of last resort to banks, the Fed acts as a bankers' bank, providing services such as check clearing to banks, and has the responsibility of managing the U.S. money supply.

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How the Federal Reserve Manages the Money Supply

Although Congress established the Fed primarily to stop bank panics by acting as a lender of last resort, today the Fed is also responsible for managing the money supply. As we will discuss in more detail in Chapter 15, managing the money supply is part of **monetary policy**, which the Fed undertakes to pursue macroeconomic policy objectives. To manage the money supply, the Fed uses three *monetary policy tools*:

1. Open market operations
2. Discount policy
3. Reserve requirements

Remember that the most important component of the money supply is checking account deposits. Not surprisingly, all three of the Fed's policy tools are aimed at affecting the reserves of banks as a means of changing the volume of checking account deposits.

Open Market Operations Eight times per year, the **Federal Open Market Committee (FOMC)** meets in Washington, DC, to discuss monetary policy. The committee has 12 voting members:

- The 7 members of the Federal Reserve's Board of Governors.
- The president of the Federal Reserve Bank of New York.
- The presidents of 4 of the other 11 Federal Reserve Banks. These 4 presidents serve one-year rotating terms as voting members of the FOMC.

All 12 Federal Reserve Bank presidents attend meetings and participate in discussions. The chair of the Board of Governors also serves as the chair of the FOMC.

The U.S. Treasury borrows money by selling bills, notes, and bonds. Remember that the *maturity* of a financial asset is the period of time until the purchaser receives payment of the face value or principal. Usually, bonds have face values of \$1,000. Treasury bills have maturities of 1 year or less, Treasury notes have maturities of 2 years to 10 years, and Treasury bonds have maturities of 30 years. To control the size of the money supply, the Fed buys and sells Treasury securities in a process called **open market operations**.

To increase the money supply, the FOMC directs the *trading desk*, located at the Federal Reserve Bank of New York, to carry out an *open market purchase* by buying U.S. Treasury securities—most frequently bills, but sometimes notes or bonds—from banks. The Fed pays for the Treasury bills by depositing the funds in the reserve accounts banks maintain with the Fed.

Suppose that the Fed engages in an open market purchase of \$10 million. We can illustrate the results with two T-accounts: one for the Fed and one for the banking system. The banking system's T-account is based on the banking system's balance sheet, which simply adds together all the assets and liabilities of all the commercial banks in the United States. As a result of the open market purchase, the banking system's holdings of Treasury bills fall by \$10 million and its reserves increase by \$10 million:

Banking System	
Assets	Liabilities
Treasury bills	-\$10 million
Reserves	+\$10 million

The Fed's holdings of Treasury bills increase by \$10 million, and the value of the banking system's reserve balances—which are a liability to the Fed—also increase by \$10 million:

Federal Reserve	
Assets	Liabilities
Treasury bills	+\$10 million
Reserves	+\$10 million

This increase in reserves starts the process of expanding loans and checking account deposits that increases the money supply.

To decrease the money supply, the FOMC directs the trading desk to carry out an *open market sale* by selling Treasury securities. When the buyers of the Treasury securities pay for them with checks, the banking system's reserves fall. This decrease in reserves starts a contraction of loans and checking account deposits that reduces the money supply.

There are three reasons the Fed conducts monetary policy principally through open market operations:

1. Because the Fed initiates open market operations, it completely controls their volume, which means the Fed can carry out both large and small open market operations.

Federal Open Market Committee (FOMC) The Federal Reserve committee responsible for open market operations and managing the money supply in the United States.

Open market operations The buying and selling of Treasury securities by the Federal Reserve in order to control the money supply.

2. Open market operations are easily reversible. For example, if the Fed believes that previous open market purchases have caused the money supply to increase too rapidly, it can engage in open market sales.
3. The Fed can implement its open market operations quickly, with no administrative delay or required changes in regulations.

Many other central banks, including the European Central Bank and the Bank of Japan, also use open market operations to conduct monetary policy.

The Federal Reserve is responsible for putting the paper currency of the United States into circulation. (The currency is actually printed by the U.S. Treasury.) Recall that if you look at the top of a dollar bill, you see the words “Federal Reserve Note.” When the Fed takes actions to increase the money supply, commentators sometimes say that it is “printing more money.” The main way the Fed increases the money supply, however, is not by printing more currency but by buying Treasury securities. Similarly, to reduce the money supply, the Fed doesn’t set fire to stacks of paper currency. Instead, it sells Treasury securities. We will spend more time discussing the Fed’s management of the money supply in [Chapter 15](#) when we discuss monetary policy.

Discount Policy As we have seen, when a bank borrows money from the Fed by taking out a discount loan, the interest rate the bank pays is called the discount rate. By lowering the discount rate, the Fed can encourage banks to take additional loans and thereby increase their reserves. With more reserves, banks will make more loans to households and firms, which will increase checking account deposits and the money supply. Raising the discount rate will have the reverse effect.

Reserve Requirements When the Fed reduces the required reserve ratio, it converts required reserves into excess reserves. For example, suppose a bank has \$100 million in checking account deposits, and the required reserve ratio is 10 percent. The bank will be required to hold \$10 million as reserves. If the Fed reduces the required reserve ratio to 8 percent, the bank will need to hold only \$8 million as reserves. The Fed can thereby convert \$2 million worth of reserves from required reserves to excess reserves. This \$2 million is then available for the bank to lend out. If the Fed raises the required reserve ratio from 10 percent to 12 percent, it will have the reverse effect.

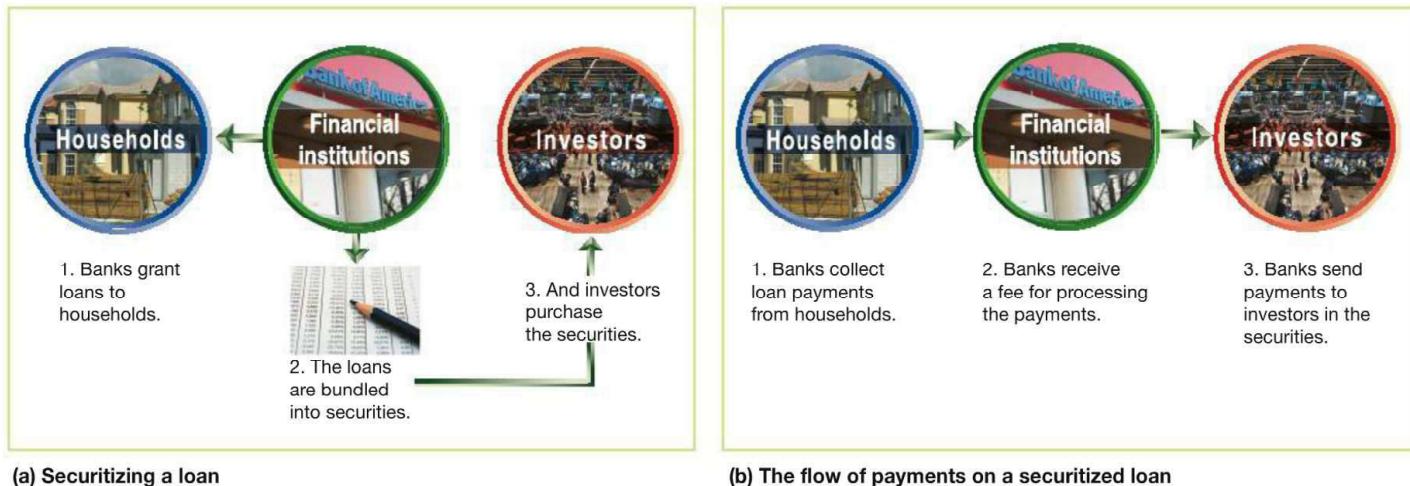
The Fed rarely changes reserve requirements because doing so can disrupt banks’ operations by forcing them to significantly change their holdings of loans, bonds, and other securities. Also, because the Fed pays banks only a low interest rate on reserves, the use of reserve requirements to manage the money supply effectively places a tax on banks’ deposit-taking and lending activities, which can be costly for the economy. The Fed relies instead on open market operations as its main tool for managing the money supply.

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The “Shadow Banking System” and the Financial Crisis of 2007–2009

The banks we have been discussing in this chapter are *commercial banks*, whose most important economic role is to accept funds from depositors and lend those funds to borrowers. Large firms can sell stocks and bonds on financial markets, but investors are typically unwilling to buy stocks and bonds from small and medium-sized firms because they lack sufficient information about the financial health of smaller firms (see [Chapter 6](#)). So, smaller firms—and households—have traditionally relied on bank loans for their credit needs. In the past 25 years, however, two important developments have occurred in the financial system: (1) Banks have begun to resell many of their loans rather than keeping them until borrowers pay them off, and (2) financial firms other than commercial banks have become important sources of credit to businesses.

Securitization Comes to Banking Traditionally, when a bank made a *residential mortgage loan* to a household to buy a home or made a commercial loan to a business, the bank would keep the loan and collect the payments until the borrower paid off the loan. A financial asset—such as a loan or a stock or a bond—is considered



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Figure 14.5 The Process of Securitization

Panel (a) shows how in the securitization process banks grant loans to households and bundle the loans into securities that are then sold to investors.

Panel (b) shows that banks collect payments on the original loans and, after taking a fee, send the payments to the investors who bought the securities.

a **security** if it can be bought and sold in a *financial market*. Shares of stock issued by the Coca-Cola Company are an example of a security because they can be bought and sold on the New York Stock Exchange. When a financial asset is first sold, the sale takes place in the *primary market*. If an investor resells the asset, the sale takes place in the *secondary market*. Prior to 1970, most loans were not securities because they could not be resold—there was no secondary market for them. After 1970, residential mortgages and then other loans, including car loans and commercial loans, began to be *securitized*. The process of **securitization** creates a secondary market in which loans that have been bundled together can be bought and sold in financial markets, just as corporate or government bonds are. Figure 14.5 outlines the securitization process. We will discuss the process of securitization further in Chapter 15 when we consider monetary policy.

✓ **Security** A financial asset—such as a stock or a bond—that can be bought and sold in a financial market.

Securitization The process of transforming loans or other financial assets into securities.

The Shadow Banking System In addition to the changes resulting from securitization, the financial system was transformed in the 1990s and 2000s by the increasing importance of *nonbank financial firms*. Investment banks, such as Goldman Sachs and Morgan Stanley, differ from commercial banks in that they do not accept deposits, and they rarely lend directly to households. Instead, investment banks traditionally concentrated on providing advice to firms issuing stocks and bonds or considering mergers with other firms. In the late 1990s, investment banks expanded their buying of mortgages, bundling large numbers of them together as bonds known as *mortgage-backed securities*, and reselling them to investors. Mortgage-backed securities proved very popular with investors because they often paid higher interest rates than other securities that seemed to have comparable default risk.

Money market mutual funds have also increased their importance in the financial system over time. These funds sell shares to investors and use the money to buy short-term securities such as Treasury bills and commercial paper issued by corporations. Commercial paper represents short-term borrowing corporations use to fund their day-to-day operations. Many corporations that previously met such needs by borrowing from banks began instead to sell commercial paper to money market mutual funds.

Hedge funds raise money from wealthy investors and use sophisticated investment strategies that often involve significant risk. By the mid-2000s, hedge funds had become an important source of demand for securitized loans and an important source of loans to other financial firms.

In 2008, Timothy Geithner, who became Treasury secretary in the Obama administration, used the term the *shadow banking system* to refer to investment banks, money market mutual funds, hedge funds, and other nonbank financial firms engaged in similar activities. By raising money from investors and lending it directly or indirectly to firms and households, these firms were carrying out a function that at one time was almost exclusively carried out by commercial banks.

The Financial Crisis of 2007–2009 The firms in the shadow banking system differed from commercial banks in two important ways: First, the government agencies—including the Federal Reserve—that regulated the commercial banking system did not regulate these firms. Second, these firms were more highly leveraged—that is, they relied more heavily on borrowed money to finance their operations—than were commercial banks. If a firm uses a small amount of its own money and a lot of borrowed money to make an investment, both the firm's potential profits and its potential losses are increased. Suppose a firm invests \$100 of its own money. If the investment earns a return of \$3, the firm has earned 3 percent ($\$3/\100) on its funds. But if the firm's investment consists of \$10 of its own money and \$90 it has borrowed, a profit of \$3 becomes a return of 30 percent ($\$3/\10) on the firm's \$10 investment. If the investment loses \$2, however, the firm's return is -20 percent ($-\$2/\10). Leveraged investments have a potential for both large gains and large losses.

As mentioned earlier, commercial banks rarely experienced runs after Congress established federal deposit insurance in the 1930s. However, beginning in 2007, some firms in the shadow banking system experienced runs. As we will discuss further in Chapter 15, the underlying cause of the financial crisis of 2007–2009 was problems in the U.S. housing market. As housing prices began to fall, a significant number of borrowers defaulted on their mortgages, which caused mortgage-backed securities to lose value. Financial firms that had invested in these securities, including both commercial banks and many firms in the shadow banking system, suffered losses. The more leveraged the firm, the larger the losses. Although deposit insurance helped commercial banks avoid runs, investment banks and other financial firms that had borrowed short term and invested the funds long term were in trouble. As lenders refused to renew their short-term loans, many of these firms had to sell their holdings of securities in an attempt to raise cash. But as the prices of the securities continued to fall, the losses to these firms increased.

In the spring of 2008, the investment bank Bear Stearns was saved from bankruptcy only when the Federal Reserve arranged for it to be acquired by JPMorgan Chase. In the fall of 2008, the Federal Reserve and the U.S. Treasury decided not to take action to save the investment bank Lehman Brothers, which failed. The failure of Lehman Brothers echoed throughout the financial system, setting off a panic. The process of securitization—apart from government-guaranteed residential mortgages—ground to a halt. The well-publicized difficulties of a money market mutual fund that had suffered losses on loans to Lehman Brothers led to a wave of withdrawals from these funds. In turn, the funds were no longer able to fulfill their role as buyers of corporate commercial paper. As banks and other financial firms sold assets and cut back on lending to shore up their financial positions, the flow of funds from savers to borrowers was disrupted. The resulting credit crunch significantly worsened the recession that had begun in December 2007.

The Fed's Response The Fed, in combination with the U.S. Treasury, took vigorous action to deal with the financial crisis. We will discuss the Fed's actions further in Chapter 15, but for now, we can mention several particularly important policy actions:

- In the fall of 2008, under the Troubled Asset Relief Program (TARP), the Fed and Treasury began attempting to stabilize the commercial banking system by providing funds to banks in exchange for stock. Taking partial ownership of private commercial banks was an unprecedented move by the federal government.
- The Fed also modified its discount policy by setting up several new “lending facilities.” These lending facilities made it possible for the Fed to grant discount loans to financial firms—such as investment banks—that had not previously been eligible.

- The Fed addressed problems in the commercial paper market by directly buying commercial paper for the first time since the 1930s.

Although the recession continued into 2009, the extraordinary actions of the Treasury and Fed stabilized the financial system. It took several years, however, for the flow of funds from savers to borrowers to return to normal levels, and economists and policymakers continue to debate the wisdom of some of the Fed's actions.

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14.5

The Quantity Theory of Money

LEARNING OBJECTIVE: Explain the quantity theory of money and use it to explain how high rates of inflation occur.

People have been aware of the connection between increases in the money supply and inflation for centuries. In the sixteenth century, the Spanish conquered Mexico and Peru and shipped large quantities of gold and silver from those countries back to Spain. The gold and silver were minted into coins and spent across Europe to further the political ambitions of the Spanish kings. Prices in Europe rose steadily during these years, and many observers discussed the relationship between this inflation and the flow of gold and silver into Europe from the Americas.

Connecting Money and Prices: The Quantity Equation

In the early twentieth century, Irving Fisher, an economist at Yale University, formalized the connection between money and prices by using the *quantity equation*:

$$M \times V = P \times Y.$$

The quantity equation states that the money supply (M) multiplied by the velocity of money (V) equals the price level (P) multiplied by real output (Y). Fisher defined the **velocity of money**, often called simply “velocity,” as the average number of times each dollar of the money supply is used to purchase goods and services included in GDP. Rewriting the original equation by dividing both sides by M , we have the equation for velocity:

$$V = \frac{P \times Y}{M}.$$

If we use M1 to measure the money supply, the GDP price deflator to measure the price level, and real GDP to measure real output, the value for velocity for 2014 was:

$$V = \frac{1.09 \times \$16.0 \text{ trillion}}{\$2.8 \text{ trillion}} = 6.2.$$

This result tells us that, during 2014, each dollar of M1 was on average spent about six times on goods or services included in GDP.

Because velocity is defined to be equal to $(P \times Y)/M$, we know that the quantity equation must always hold true: The left side of the equation must be equal to the right side. A theory is a statement about the world that might possibly be false. Therefore, the quantity equation is not a theory. Irving Fisher turned the quantity equation into the **quantity theory of money** by arguing that velocity was constant. He argued that the average number of times a dollar is spent depends on factors that do not change often, such as how often people get paid, how often they do their grocery shopping, and how often businesses mail bills. Because this assertion may be true or false, the quantity theory of money is, in fact, a theory.

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Velocity of money The average number of times each dollar in the money supply is used to purchase goods and services included in GDP.

Quantity theory of money A theory about the connection between money and prices that assumes that the velocity of money is constant.

The Quantity Theory Explanation of Inflation

The quantity equation gives us a way of showing the relationship between changes in the money supply and changes in the price level, or inflation. To see this relationship more clearly, we can use a handy mathematical rule that states that an equation

in which variables are multiplied together is equal to an equation in which the *growth rates* of these variables are *added* together. So, we can transform the quantity equation from:

$$M \times V = P \times Y$$

to:

$$\begin{aligned} \text{Growth rate of the money supply} + \text{Growth rate of velocity} = \\ \text{Growth rate of the price level (or the inflation rate)} + \text{Growth rate of real output}. \end{aligned}$$

This way of writing the quantity equation is more useful for investigating the effect of changes in the money supply on the inflation rate. Remember that the growth rate for any variable is the percentage change in the variable from one year to the next. The growth rate of the price level is the inflation rate, so we can rewrite the quantity equation to help understand the factors that determine inflation:

$$\begin{aligned} \text{Inflation rate} = & \text{Growth rate of the money supply} + \\ & \text{Growth rate of velocity} - \text{Growth rate of real output}. \end{aligned}$$

If Irving Fisher was correct that velocity is constant, then the growth rate of velocity will be zero. For example, if velocity is always equal to six, then its percentage change from one year to the next will always be zero. This assumption allows us to rewrite the equation one last time:

$$\text{Inflation rate} = \text{Growth rate of the money supply} - \text{Growth rate of real output}.$$

This equation leads to the following predictions:

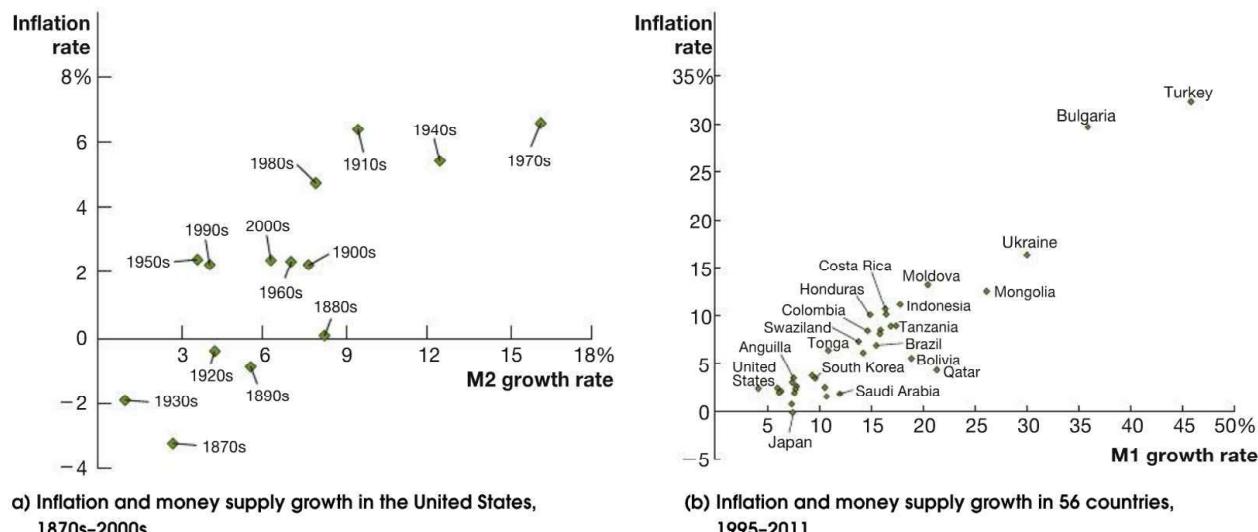
1. If the money supply grows at a faster rate than real GDP, there will be inflation.
2. If the money supply grows at a slower rate than real GDP, there will be deflation. (Recall that *deflation* is a decline in the price level.)
3. If the money supply grows at the same rate as real GDP, the price level will be stable, and there will be neither inflation nor deflation.

It turns out that Irving Fisher was wrong in asserting that the velocity of money is constant. From year to year, there can be significant fluctuations in velocity. As a result, the predictions of inflation based on the quantity theory of money do not hold every year, but most economists agree that the quantity theory provides useful insight into the long-run relationship between the money supply and inflation: *In the long run, inflation results from the money supply growing at a faster rate than real GDP.*

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How Accurate Are Forecasts of Inflation Based on the Quantity Theory?

Note that the accuracy of the quantity theory depends on whether the key assumption that velocity is constant is correct. If velocity is not constant, there may not be a tight link between increases in the money supply and increases in the price level. For example, an increase in the quantity of money might be offset by a decline in velocity, leaving the price level unaffected. Because velocity can move erratically in the short run, we would not expect the quantity equation to provide good forecasts of inflation in the short run. Over the long run, however, there is a strong link between changes in the money supply and inflation. Panel (a) of Figure 14.6 shows by decade the relationship in the United States between the growth of the M2 measure of the money supply and the inflation rate. (We use M2 here because data on M2 are available for a longer period of time than are data for M1.) Because of variations in the rate of growth of real GDP and in velocity, there is not an exact relationship between the growth rate of M2 and the inflation rate. But there is a clear pattern that decades with higher growth rates in the money supply were also decades with higher inflation rates. In other words, most of the variation in inflation rates across decades can be explained by variation in the rates of growth of the money supply.



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Figure 14.6 The Relationship between Money Growth and Inflation over Time and around the World

Panel (a) shows that, by and large, the rate of inflation in the United States has been highest during the decades in which the money supply has increased most rapidly, and the rate of inflation has been lowest during the decades in which the money supply has increased least rapidly. Panel (b) shows the relationship between money supply growth and inflation for 56 countries between 1995 and 2011. There is not an exact relationship between money supply growth and inflation, but countries such as Bulgaria, Turkey, and Ukraine that had high rates of money supply growth had high inflation rates, and countries such as the United

States and Japan had low rates of money supply growth and low inflation rates.

Sources: Panel (a): For the 1870s to the 1960s, Milton Friedman and Anna J. Schwartz, *Monetary Trends in the United States and United Kingdom: Their Relation to Income, Prices, and Interest Rates, 1867–1975*, Chicago: University of Chicago Press, 1982, Table 4.8; and for the 1970s to the 2000s, Federal Reserve Board of Governors and U.S. Bureau of Economic Analysis; Panel (b): International Monetary Fund, *International Monetary Statistics*.

Panel (b) provides further evidence consistent with the quantity theory by looking at rates of growth of the money supply and rates of inflation across 56 countries for the years 1995–2011. Although there is not an exact relationship between rates of growth of the money supply and rates of inflation across countries, panel (b) shows that countries where the money supply grew rapidly tended to have high inflation rates, while countries where the money supply grew more slowly tended to have much lower inflation rates. Not included in panel (b) are data for Zimbabwe, which may be the most extreme case of inflation in recent years. In some years since 1995, the money supply in Zimbabwe grew by more than 7,500 percent. The result was an accelerating rate of inflation that eventually reached 15 billion percent during 2008. Zimbabwe was suffering from *hyperinflation*—that is, a rate of inflation that exceeds 50 percent per month.

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High Rates of Inflation

The quantity theory can help us understand the reasons for very high rates of inflation. Hyperinflation is caused by central banks increasing the money supply at a rate far in excess of the growth rate of real GDP. A high rate of inflation causes money to lose its value so rapidly that households and firms avoid holding it. If, as happened in Zimbabwe, the inflation rate becomes high enough, people stop using paper currency, so it no longer serves the important functions of money discussed earlier in this chapter. Economies suffering from high inflation usually also suffer from very slow growth, if not severe recession.

Given the dire consequences that follow from high inflation, why do governments cause it by expanding the money supply so rapidly? The main reason is that governments often want to spend more than they are able to raise through taxes. Developed countries, such as the United States, can usually bridge gaps between spending and

taxes by borrowing through selling bonds to the public. Developing countries often have difficulty selling bonds because investors are skeptical of their ability to pay back the money. If they are unable to sell bonds to the public, governments in developing countries will force their central banks to purchase them. As we discussed previously, when a central bank buys government bonds, the money supply will increase. In the United States, the Federal Reserve always buys Treasury securities from banks, never directly from the U.S. Treasury. This procedure helps ensure that the Treasury only issues bonds in amounts that private investors—rather than the central bank—are willing to buy.

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During the German hyperinflation of the 1920s, paper currency became so worthless that people used it to light their stoves.

Making the Connection

[MyEconLab Video](#)

The German Hyperinflation of the Early 1920s

When Germany lost World War I, a revolution broke out that overthrew Kaiser Wilhelm II and installed a new government known as the Weimar Republic. In the peace treaty of 1919, the Allies—the United States, Great Britain, France, and Italy—imposed payments called *reparations* on the new German government. The reparations were meant as compensation to the Allies for the damage Germany had caused during the war. It was very difficult for the German government to use tax revenue to cover both its normal spending and the reparations.

The German government decided to pay for the difference between its spending and its tax revenues by selling bonds to the central bank, the Reichsbank. After a few years, the German government fell far behind in its reparations payments. In January 1923, the French government sent troops into the German industrial area known as the Ruhr to try to collect the payments directly. German workers in the Ruhr went on strike, and the German government decided to support them by paying their salaries. The government raised the funds by selling additional bonds to the Reichsbank, thereby further increasing the money supply.

The inflationary increase in the money supply was very large: The total number of marks—the German currency—in circulation rose from 115 million in January 1922 to 1.3 billion in January 1923 and then to 497 billion billion, or 497,000,000,000,000,000, in December 1923. Just as the quantity theory predicts, the result was a staggeringly high rate of inflation. The German price index that stood at 100 in 1914 and 1,440 in January 1922 had risen to 126,160,000,000,000 in December 1923. The German mark became worthless. The German government ended the hyperinflation by (1) negotiating a new agreement with the Allies that reduced its reparations payments, (2) reducing other government expenditures and raising taxes to balance its budget, and (3) replacing the existing mark with a new mark. Each new mark was worth 1 trillion old marks. The German central bank was also limited to issuing a total of 3.2 billion new marks.

These steps were enough to bring the hyperinflation to an end—but not before the savings of anyone holding the old marks had been wiped out. Most middle-income Germans were extremely resentful of this outcome. Many historians believe that the hyperinflation greatly reduced the allegiance of many Germans to the Weimar Republic and may have helped pave the way for Adolf Hitler and the Nazis to seize power 10 years later.

Sources: Thomas Sargent, "The Ends of Four Big Inflations," *Rational Expectations and Inflation*, 3rd ed., Princeton, NJ: Princeton University Press, 2013; and John Parke Young, *European Currency and Finance*, Washington, DC: Government Printing Office, 1925.

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Your Turn: Test your understanding by doing related problem 5.10 on page 509 at the end of this chapter.

Continued from page 475

Economics in Your Life

What if Money Became Increasingly Valuable?

At the beginning of this chapter, we asked you to consider whether you would like to live in an economy in which the purchasing power of money rises every year. The first thing to consider when thinking about the advantages and disadvantages of this situation is that the only way for the purchasing power of money to increase is for the price level to fall; in other words, *deflation* must occur. Because the price level in the United States hasn't fallen for an entire year since the 1930s, most people alive today have experienced only rising price levels—and declining purchasing power of money. Would replacing rising prices with falling prices necessarily be a good thing? It might be tempting to say "yes," because if you have a job, your salary will buy more goods and services each year. But, in fact, just as a rising price level results in most wages and salaries rising each year, a falling price level is likely to mean falling wages and salaries each year. So, it is likely that, on average, people would not see the purchasing power of their incomes increase, even if the purchasing power of any currency they held increased. There can also be a significant downside to deflation, particularly if the transition from inflation to deflation happens suddenly. Recall that the real interest rate is equal to the nominal interest rate minus the inflation rate. If an economy experiences deflation, then the real interest rate will be greater than the nominal interest rate. A rising real interest rate can be bad news for anyone who has borrowed, including homeowners who may have substantial mortgage loans. So, you are probably better off living in an economy experiencing mild inflation than one experiencing deflation.

Conclusion

Money plays a key role in the functioning of an economy by facilitating trade in goods and services and by making specialization possible. Without specialization, no advanced economy can prosper. Households and firms, banks, and the central bank (the Federal Reserve in the United States) are participants in the process of creating the money supply. In Chapter 15, we will discuss how the Federal Reserve uses monetary policy to promote its economic objectives.

Visit [MyEconLab](#) for a news article and analysis related to the concepts of this chapter.

CHAPTER SUMMARY AND PROBLEMS

Key Terms

Asset, p. 476	Federal Open Market Committee (FOMC), p. 495	Monetary policy, p. 494	Reserves, p. 484
Bank panic, p. 492	Federal Reserve, p. 478	Money, p. 476	Securitization, p. 497
Bank run, p. 492	Fiat money, p. 478	Open market operations, p. 495	Security, p. 497
Commodity money, p. 476	Fractional reserve banking system, p. 492	Quantity theory of money, p. 499	Simple deposit multiplier, p. 488
Discount loans, p. 493	M1, p. 480	Required reserve ratio, p. 484	Velocity of money, p. 499
Discount rate, p. 493	M2, p. 481	Required reserves, p. 484	
Excess reserves, p. 484			

14.1 What Is Money, and Why Do We Need It? pages 476–479

LEARNING OBJECTIVE: Define money and discuss the four functions of money.

Summary

A **barter economy** is an economy that does not use money and in which people trade goods and services directly for other goods and services. Barter trade occurs only if there is a *double coincidence of wants*, where both parties to the trade want what the other one has. Because barter is inefficient, there is strong incentive to use **money**, which is any **asset** that people are generally willing to accept in exchange for goods or services or in payment of debts. An **asset** is anything of value owned by a person or a firm. A **commodity money** is a good used as money that also has value independent of its use as money. Money has four functions: It is a medium of exchange, a unit of account, a store of value, and a standard of deferred payment. At one time, governments issued gold coins and paper currency that were convertible into gold. Today, no government in the world issues paper currency that can be redeemed for gold. Instead, paper currency is **fiat money**, which has no value except as money.

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Review Questions

- 1.1 A baseball fan with a Mike Trout baseball card wants to trade it for a Miguel Cabrera baseball card, but everyone the fan knows who has a Cabrera card doesn't want a Trout card. What do economists call the problem this fan is having?
- 1.2 What is the difference between commodity money and fiat money?
- 1.3 What are the four functions of money? Can something be considered money if it does not fulfill all four functions?
- 1.4 Why do businesses accept paper currency when they know that, unlike a gold coin, the paper the currency is printed on is worth very little?

Problems and Applications

- 1.5 The English economist William Stanley Jevons described a world tour during the 1880s by a French singer, Mademoiselle Zélie. One stop on the tour was a theater in the Society

Islands, part of French Polynesia in the South Pacific. She performed for her usual fee, which was one-third of the receipts. This turned out to be 3 pigs, 23 turkeys, 44 chickens, 5,000 coconuts, and “considerable quantities of bananas, lemons, and oranges.” She estimated that all of this would have had a value in France of 4,000 francs. According to Jevons, “as Mademoiselle could not consume any considerable portion of the receipts herself, it became necessary in the meantime to feed the pigs and poultry with the fruit.” Do the goods Mademoiselle Zélie received as payment fulfill the four functions of money described in this chapter? Briefly explain.

Source: W. Stanley Jevons, *Money and the Mechanism of Exchange*, New York: D. Appleton and Company, 1889, pp. 1–2.

- 1.6 (Related to the Chapter Opener on page 475) An article in the *New York Times* in 2015 noted, “A rising number of Greeks in rural areas are swapping goods and services in cashless transactions since the government shut down banks on June 28 for three weeks.” If Greeks were able to swap goods and services for other goods and services, did it matter that currency was not available because the banks had been closed? Briefly explain.

Source: Lefteris Karagiannopoulos, “Hay for Cheese? Barter Booms in Cash-Squeezed Rural Greece,” *New York Times*, July 29, 2015.

- 1.7 In the late 1940s, the Communists under Mao Zedong were defeating the government of China in a civil war. The paper currency issued by the Chinese government was losing much of its value, and most businesses refused to accept it. At the same time, there was a paper shortage in Japan. During these years, Japan was still under military occupation by the United States, following its defeat in World War II. Some of the U.S. troops in Japan realized that they could use dollars to buy up vast amounts of paper currency in China, ship it to Japan to be recycled into paper, and make a substantial profit. Under these circumstances, was the Chinese paper currency a commodity money or a fiat money? Briefly explain.

- 1.8 According to Peter Heather, a historian at King’s College London, during the time of the Roman Empire, the German tribes east of the Rhine River (the area the Romans called Germania) produced no coins of their own but used Roman coins instead:

Although no coinage was produced in Germania, Roman coins were in plentiful circulation and could easily have provided a medium of exchange (already in the first century, Tacitus tells us, Germani of the Rhine region were using good-quality Roman silver coins for this purpose).

- What is a medium of exchange?
- What does the author mean when he writes that Roman coins could have provided the German tribes with a medium of exchange?
- Why would any member of a German tribe have been willing to accept a Roman coin from another member of the tribe in exchange for goods or services when the tribes were not part of the Roman Empire and were not governed by Roman law?

Source: Peter Heather, *The Fall of the Roman Empire: A New History of Rome and the Barbarians*, New York: Oxford University Press, 2006, p. 89.

- 1.9** **(Related to the Making the Connection on page 479)** Suppose that Congress passes a new law that requires all firms to accept paper currency in exchange for whatever they are selling. Briefly discuss who would gain and who would lose from this legislation.

- 1.10** On January 1, 2002, Germany officially adopted the euro as its currency, and the deutsche mark stopped being legal tender. According to an article in the *Wall Street Journal*, even 10 years later many Germans continued using the deutsche mark, and many stores in Germany continued to accept it. Briefly explain how it is possible for people to continue to use a currency when the government that issued it has replaced it with another currency.

Source: Vanessa Fuhrmans, "Who Needs the Euro When You Can Pay with Deutsche Marks?" *Wall Street Journal*, July 18, 2012.

14.2

How Is Money Measured in the United States Today? pages 479–483

LEARNING OBJECTIVE: Discuss the definitions of the money supply used in the United States today.

Summary

The narrowest definition of the money supply in the United States today is **M1**, which includes currency, checking account balances, and traveler's checks. A broader definition of the money supply is **M2**, which includes everything that is in M1, plus savings accounts, small-denomination time deposits (such as certificates of deposit [CDs]), money market deposit accounts in banks, and noninstitutional money market fund shares.

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Review Questions

- What is the main difference between the M1 and M2 definitions of the money supply?
- Why does the Federal Reserve use two definitions of the money supply rather than one?
- Distinguish among money, income, and wealth. Which one of the three does the central bank of a country control?

Problems and Applications

- Briefly explain whether each of the following is counted in M1.
 - The coins in your pocket
 - The funds in your checking account
 - The funds in your savings account
 - The traveler's checks that you have left over from a trip
 - Your Citibank Platinum MasterCard
- (Related to the Don't Let This Happen to You on page 481)** Briefly explain whether you agree with the following statement: "I recently read that more than half of the money the government prints is actually held by people in foreign

countries. If that's true, then the United States is less than half as wealthy as government statistics indicate."

- 2.6** **(Related to the Don't Let This Happen to You on page 481)** An article in the *New York Times* contains the statement: "Income is only one way of measuring wealth." Do you agree that income is a way of measuring wealth?

Source: Sam Roberts, "As the Data Show, There's a Reason the Wall Street Protesters Chose New York," *New York Times*, October 25, 2011.

- 2.7** **(Related to Solved Problem 14.2 on page 482)** Suppose you decide to withdraw \$100 in currency from your checking account. What is the effect on M1? Ignore any actions the bank may take as a result of your having withdrawn the \$100.

- 2.8** **(Related to Solved Problem 14.2 on page 482)** Suppose you withdraw \$1,000 from a money market mutual fund and deposit the funds in your bank checking account. Briefly explain how this action will affect M1 and M2.

- 2.9** Based on a Survey of Consumer Payment Choice, researchers from the Federal Reserve Bank of Boston estimated that the average consumer, 18 years of age and older, held about \$340 in currency. However, as noted in the chapter, there is actually about \$4,000 of currency for every person in the United States.

- How can the amount of U.S. currency in circulation be so much higher than the amount held by the U.S. population?
- What does the difference in part (a) imply about the measures of the money supply of the United States?

Source: Kevin Foster, Scott Schuh, and Hanbing Zhang, "The 2010 Survey of Consumer Payment Choice," Federal Reserve Bank of Boston Research Data Report, No. 13-2, November 2013.

- 2.10** Friedrich Schneider, an economist at the Johannes Kepler University of Linz in Austria, made the following observation about China: "The average Chinese trusts neither the Chinese banks nor the Communist Party."

- If Schneider is correct, how might businesses and consumers prefer to carry out transactions?

- b. The Chinese government has refused to print currency in denominations higher than the 100-renminbi note, which is the equivalent of about \$16. The United States prints \$100 bills, and all other countries print currency in denominations that are at least that high. Given your answer to part (a), why might the Chinese government be reluctant to print currency in high denominations?

Source: David Barboza, "Chinese Way of Doing Business: In Cash We Trust," *New York Times*, April 30, 2013.

- 2.11** (Related to the Making the Connection on page 482) In 2015, some business startups were offering the service of transferring money in the form of bitcoins among individuals and businesses in developing countries. At the same time, an article in the *Wall Street Journal* noted that in the United States, "Most ordinary consumers remain wary of using an unproven, six-year-old digital currency that many associate with illicit drugs, extreme price fluctuations and security risks." Why might using bitcoins

be more attractive to individuals and firms in developing countries than to individuals and firms in the United States?

Source: Michael J. Casey and Paul Vigna, "Interest in Bitcoin Grows on Wall Street," *Wall Street Journal*, March 29, 2015.

- 2.12** The U.S. penny is made primarily of zinc. There have been several times in recent years when zinc prices have been high, and it has cost the U.S. Treasury more than one cent to manufacture a penny. There are currently about 1.4 billion pennies in circulation. Economist François Velde of the Federal Reserve Bank of Chicago has proposed making the current penny worth 5 cents. If the U.S. Treasury adopted Velde's proposal, what would be the effect on the value of M1? Is this change likely to have much effect on the economy? (Hint: According to the information given in this chapter, what is the current value of M1?)

Source: Austan Goolsbee, "Now That a Penny Isn't Worth Much, It's Time to Make It Worth 5 Cents," *New York Times*, February 1, 2007.

14.3

How Do Banks Create Money? pages 483–492

LEARNING OBJECTIVE: Explain how banks create money.

Summary

On a bank's balance sheet, reserves and loans are assets, and deposits are liabilities. **Reserves** are deposits that the bank has retained rather than loaned out or invested. **Required reserves** are reserves that banks are legally required to hold. The fraction of deposits that banks are required to keep as reserves is called the **required reserve ratio**. Any reserves banks hold over the legal requirement are called **excess reserves**. When a bank accepts a deposit, it keeps only a fraction of the funds as reserves and loans out the remainder. In making a loan, a bank increases the checking account balance of the borrower. When the borrower uses a check to buy something with the funds the bank has loaned, the seller deposits the check in his or her bank. The seller's bank keeps part of the deposit as reserves and loans out the remainder. This process continues until no banks have excess reserves. In this way, the process of banks making new loans increases the volume of checking account balances and the money supply. This money creation process can be illustrated with T-accounts, which are stripped-down versions of balance sheets that show only how a transaction changes a bank's balance sheet. The **simple deposit multiplier** is the ratio of the change in deposits to the change in reserves. An expression for the simple deposit multiplier is $1/RR$.

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Review Questions

- 3.1** What are the largest asset and the largest liability of a typical bank?
- 3.2** Suppose you decide to withdraw \$100 in cash from your checking account. Draw a T-account showing the effect of this transaction on your bank's balance sheet.
- 3.3** What does it mean to say that banks "create money"?

- 3.4** Give the formula for the simple deposit multiplier. If the required reserve ratio is 20 percent, what is the maximum increase in checking account deposits that will result from an increase in bank reserves of \$20,000? Is this maximum increase likely to occur? Briefly explain.

Problems and Applications

- 3.5** Following the financial crisis of 2007–2009, Congress passed the Wall Street Reform and Consumer Protection Act, also known as the Dodd-Frank Act. The act increased regulation of the banking system, and from 2010 to 2015 only one new bank opened in the United States. According to an article in the *Wall Street Journal*, "Lawmakers are concerned about the dearth of new banks because small banks make the majority of farm and small-business loans." Why might farms and small-businesses be more likely to rely on banks for funding than would large corporations?

Source: Ryan Tracy, "A Local Bank in Amish Country Flourishes amid Dearth of Small Lenders," *Wall Street Journal*, March 29, 2015.

- 3.6** The following is from an article on community banks: "Their commercial-lending businesses, funded by their stable deposit bases, make them steady earners." What is commercial lending? In what sense are loans "funded" by deposits?

Source: Karen Richardson, "Clean Books Bolster Traditional Lenders," *Wall Street Journal*, April 30, 2007.

- 3.7** (Related to the Making the Connection on page 484) In a newspaper column, author Delia Ephron described a conversation with a friend who had a large balance on her credit card with an interest rate of 18 percent per year. The friend was worried about paying off the debt. Ephron was earning only 0.4 percent interest on her bank certificate

of deposit (CD). She considered withdrawing the money from her CD and loaning it to her friend so her friend could pay off her credit card balance: "So I was thinking that all of us earning 0.4 percent could instead loan money to our friends at 0.5 percent. ... [M]y friend would get out of debt [and] I would earn \$5 a month instead of \$4." Why don't more people use their savings to make loans rather than keeping the funds in bank accounts that earn very low rates of interest?

Source: Delia Ephron, "Banks Taketh, but Don't Giveth," *New York Times*, January 27, 2012.

- 3.8** (Related to the Making the Connection on page 484) An economist commented on the situation a bank faces when making personal loans to subprime borrowers: "You have to be alert to the trade-off between serving consumers and being viewed as taking advantage of them." If banks charge subprime borrowers a higher interest on loans than they charge prime borrowers, are the banks taking advantage of the subprime borrowers? Briefly explain.

Source: Ianthe Jeanne Dugan and Telis Demos, "New Lenders Spring Up to Cater to Subprime Sector," *Wall Street Journal*, March 5, 2014.

- 3.9** Suppose that Deja owns a McDonald's franchise. She decides to move her restaurant's checking account to Wells Fargo, which causes the changes shown on the following T-account. If the required reserve ratio is 0.10, or 10 percent, and Wells Fargo currently has no excess reserves, what is the maximum loan Wells Fargo can make as result of this transaction?

Wells Fargo

Assets		Liabilities	
Reserves	+\$100,000	Deposits	+\$100,000

- 3.10** Consider the following simplified balance sheet for a bank:

Assets		Liabilities	
Reserves	\$10,000	Deposits	\$70,000
Loans	\$66,000	Stockholders' equity	\$6,000

14.4 The Federal Reserve System, pages 492–499

LEARNING OBJECTIVE: Compare the three policy tools the Federal Reserve uses to manage the money supply.

Summary

The United States has a **fractional reserve banking system** in which banks keep less than 100 percent of deposits as reserves. In a **bank run**, many depositors decide simultaneously to withdraw money from a bank. In a **bank panic**, many banks experience runs at the same time. The **Federal Reserve System** ("the Fed") is the central bank of the United States. It was originally established in 1913 to stop bank panics. The recession of 2007–2009 put renewed emphasis on the Fed's goal of financial market stability. **Monetary policy** refers to the actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy objectives. The Fed's three monetary policy tools are open market operations, discount policy, and reserve requirements. **Open market operations** are the buying and selling of Treasury securities by

- If the required reserve ratio is 0.10, or 10 percent, how much in excess reserves does the bank hold?
- What is the maximum amount by which the bank can expand its loans?
- If the bank makes the loans in part (b), show the immediate effect on the bank's balance sheet.

3.11 (Related to the Don't Let This Happen to You on page 489)

Briefly explain whether you agree with the following statement: "Assets are things of value that people own. Liabilities are debts. Therefore, a bank will always consider a checking account deposit to be an asset and a car loan to be a liability."

3.12 (Related to Solved Problem 14.3 on page 489)

Suppose you deposit \$2,000 in currency into your checking account at a branch of Bank of America, which we will assume has no excess reserves at the time you make your deposit. Also assume that the required reserve ratio is 0.20, or 20 percent.

- Use a T-account to show the initial effect of this transaction on Bank of America's balance sheet.
- Suppose that Bank of America makes the maximum loan it can from the funds you deposited. Using a T-account, show the initial effect of granting the loan on Bank of America's balance sheet. Also include on this T-account the transaction from part (a).
- Now suppose that whoever took out the loan in part (b) writes a check for this amount and that the person receiving the check deposits it in a branch of Citibank. Show the effect of these transactions on the balance sheets of Bank of America and Citibank after the check has been cleared. (On the T-account for Bank of America, include the transactions from parts (a) and (b).)
- What is the maximum increase in checking account deposits that can result from your \$2,000 deposit? What is the maximum increase in the money supply? Briefly explain.

the Federal Reserve. The loans the Fed makes to banks are called **discount loans**, and the interest rate the Fed charges on discount loans is the **discount rate**. The **Federal Open Market Committee (FOMC)** meets in Washington, DC, eight times per year to discuss monetary policy. In the past 20 years, a "shadow banking system" has developed. During the financial crisis of 2007–2009, the existence of the shadow banking system complicated the Fed's policy response. A **security** is a financial asset—such as a stock or a bond—that can be bought and sold in a financial market. The process of **securitization** creates a secondary market in which loans that have been bundled together can be bought and sold in financial markets just as corporate or government bonds are.

Review Questions

- 4.1** Why did Congress decide to establish the Federal Reserve System in 1913?
- 4.2** What policy tools does the Fed use to control the money supply? Which tool is the most important?
- 4.3** Why does an open market purchase of Treasury securities by the Federal Reserve increase bank reserves? Why does an open market sale of Treasury securities by the Federal Reserve decrease bank reserves?
- 4.4** What is the “shadow banking system”? Why were the financial firms of the shadow banking system more vulnerable than commercial banks to bank runs?

Problems and Applications

- 4.5** In an article in the *Wall Street Journal*, Kevin Brady, a member of Congress from Texas, stated, “To get Congress to pass the Federal Reserve Act [in 1913, President Woodrow] Wilson had to retain the support of ... northeastern lawmakers while convincing southern and western Democrats that legislation would not ... create a [single] central bank. Wilson’s ingenious solution was federalism.” Explain what Congressman Brady meant when he stated that Woodrow Wilson used “federalism” to convince Congress to pass the Federal Reserve Act.

Source: Kevin Brady, “How the Fed’s East Coast Tilt Warps Monetary Policy,” *Wall Street Journal*, June 4, 2015.

- 4.6** Suppose that the Federal Reserve makes a \$10 million discount loan to First National Bank (FNB) by increasing FNB’s account at the Fed.
- Use a T-account to show the effect of this transaction on FNB’s balance sheet. Remember that the funds a bank has on deposit at the Fed count as part of its reserves.
 - Assume that before receiving the discount loan, FNB has no excess reserves. What is the maximum amount of this \$10 million that FNB can lend out?
 - What is the maximum total increase in the money supply that can result from the Fed’s discount loan? Assume that the required reserve ratio is 10 percent.

- 4.7** An article in the *New York Times* states that “the Bank of Japan, the central bank ... is creating money on a vast scale by buying government bonds.” How can a central bank “create money” by buying bonds? Doesn’t the government create money by printing currency? Briefly explain.

Source: Jonathan Soble, “Japan’s Economy Expands, but Less Than Expected,” *New York Times*, February 15, 2015.

- 4.8** Suppose that the Federal Reserve engages in an open market sale of \$25 million in U.S. Treasury bills to banks. In the T-accounts for the Fed and for the banking system shown here, fill in the missing information.

Federal Reserve

Assets	Liabilities
_____	-\$25 million Reserves -\$25 million

Banking System

Assets	Liabilities
Treasury bills	+\$25 million _____ -\$25 million

- 4.9** In a speech delivered in June 2008, Timothy Geithner, then president of the Federal Reserve Bank of New York and later U.S. Treasury secretary, said:

The structure of the financial system changed fundamentally during the boom. ... [The] non-bank financial system grew to be very large. ... [The] institutions in this parallel financial system [are] vulnerable to a classic type of run, but without the protections such as deposit insurance that the banking system has in place to reduce such risks.

- What did Geithner mean by the “nonbank financial system”?
- What is a “classic type of run,” and why were institutions in the nonbank financial system vulnerable to such a run?
- Why would deposit insurance provide the banking system with protection against runs?

Source: Timothy F. Geithner, “Reducing Systemic Risk in a Dynamic Financial System,” Remarks at the Economic Club of New York, June 9, 2008.

- 4.10** An article in the *Wall Street Journal* on the shadow banking system contained the following observation: “If investors rush to the exits en masse, acting as a herd, asset prices could plummet and markets could face funding problems.” Why might people who have invested in a money market mutual fund, for example, be more likely to “rush to the exits” if they heard bad news about the fund’s investments than would bank depositors if they received bad news about their bank’s investments?

Source: Ian Talley, “IMF Warns (Again) of Growing Shadow-Banking Risks,” *Wall Street Journal*, April 8, 2015.

- 4.11** An article in the *Wall Street Journal* reported in 2015 that the People’s Bank of China, which is the central bank of China, “is freeing up cash by reducing the amount that banks must keep in reserve.” What monetary policy tool was the People’s Bank of China using? In what sense did this policy change “free up cash”? What was the People’s Bank of China hoping the result of this policy action would be?

Source: Lingling Wei, “China Central Bank Checks Europe Playbook on Credit,” *Wall Street Journal*, April 19, 2015.

14.5**The Quantity Theory of Money, pages 499–502**

LEARNING OBJECTIVE: Explain the quantity theory of money and use it to explain how high rates of inflation occur.

Summary

The *quantity equation*, which relates the money supply to the price level, is $M \times V = P \times Y$, where M is the money supply, V is the *velocity of money*, P is the price level, and Y is real output. The **velocity of money** is the average number of times each dollar in the money supply is spent during the year. Economist Irving Fisher developed the **quantity theory of money**, which assumes that the velocity of money is constant. If the quantity theory of money is correct, the inflation rate should equal the rate of growth of the money supply minus the rate of growth of real output. Although the quantity theory of money is not literally correct because the velocity of money is not constant, it is true that in the long run, inflation results from the money supply growing faster than real GDP. When governments attempt to raise revenue by selling large quantities of bonds to the central bank, the money supply will increase rapidly, resulting in high rates of inflation.

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Review Questions

- 5.1** What is the quantity theory of money? What explanation does the quantity theory provide for inflation?
- 5.2** Is the quantity theory of money better able to explain the inflation rate in the long run or in the short run? Briefly explain.
- 5.3** What is hyperinflation? Why do governments sometimes allow it to occur?

Problems and Applications

- 5.4** If the money supply is growing at a rate of 6 percent per year, real GDP is growing at a rate of 3 percent per year, and velocity is constant, what will the inflation rate be? If velocity is increasing 1 percent per year instead of remaining constant, what will the inflation rate be?
 - 5.5** If velocity does not change when the money supply of a country increases, will nominal GDP definitely increase? Will real GDP definitely increase? Briefly explain.
 - 5.6** During the years from 2010 to 2014, the average annual growth rate of M1 was 12.7 percent, while the inflation rate as measured by the GDP deflator averaged 1.8 percent. Are these values consistent with the quantity equation? If you would need additional information to answer, state what the information is. Are the values consistent with the quantity theory of money? Briefly explain.
- Source:** Data from the Federal Reserve Bank of St. Louis.

- 5.7** In an article in the *American Free Press*, Professor Peter Spencer of York University in England is quoted as saying: "This printing of money 'will keep the [deflation] wolf from the door.'" In the same article, Ambrose Evans-Pritchard, a writer for the London-based newspaper *The Telegraph*, is quoted as saying, "Deflation has ... insidious traits. It causes shoppers to hold back. Once this psychology gains

a grip, it can gradually set off a self-feeding spiral that is hard to stop."

- a. What is price deflation?
- b. What does Professor Spencer mean by the statement, "This printing of money 'will keep the [deflation] wolf from the door'?"
- c. Why would deflation cause "shoppers to hold back," and what does Evans-Pritchard mean when he says, "Once this psychology gains a grip, it can gradually set off a self-feeding spiral that is hard to stop?"

Source: Doug French, "We Should Celebrate Price Deflation," *American Free Press*, November 17, 2008.

5.8

During the Civil War, the Confederate States of America printed large amounts of its own currency—Confederate dollars—to fund the war. By the end of the war, the Confederate government had printed nearly 1.5 billion paper dollars. How would such a large quantity of Confederate dollars have affected the value of the Confederate currency? With the war drawing to an end, would Southerners have been as willing to use and accept Confederate dollars? How else could they have bought and sold goods?

Source: Federal Reserve Bank of Richmond, "Textual Transcript of Confederate Currency."

5.9

An article in the *Economist* notes that the government of Venezuela running a large budget deficit "caused the money supply almost to quadruple in two years and led to the world's highest inflation rate, of over 60% a year."

- a. Why would running a large budget deficit cause the money supply in Venezuela to increase so rapidly?
- b. If the money supply increased by 150 percent per year (or 300 percent over two years) while the inflation rate was 60 percent, what must have happened to velocity in Venezuela during this period?

Source: "Of Oil and Coconut Water," *Economist*, September 20, 2014.

5.10**(Related to the Making the Connection on page 502)**

During the German hyperinflation of the 1920s, many households and firms in Germany were hurt economically. Do you think any groups in Germany benefited from the hyperinflation? Briefly explain.

Real-Time Data Exercises

- D14.1 (The components of M1)** Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/) and find the most recent values for the following four variables: (1) M1 Money Stock (M1), (2) the Currency Component of M1 (CURRENCY), (3) Total Checkable Deposits (TCD), and (4) Travelers Checks Outstanding (WTCSL). Which of the components of M1 is the largest? Which is the smallest?

- D14.2 (Calculating M1 from data on M2)** Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) (research.stlouisfed.org/fred2/) and find the most recent values for the following four variables: (1) M2 Money Stock (M2), (2) the Total Savings Deposits at all Depository Institutions (SAVINGS), (3) Retail Money Funds (WRMFSL), and (4) Small Time Deposits – Total (WSMTIME).

- Using these data, calculate the value of M1.
- What are Retail Money Funds? What percentage of M2 are they?
- If households were to shift funds from savings accounts to checking accounts, what would happen to the values of M1 and M2?

D14.3 (The relationship between M1 and M2) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) ([research.stlouisfed.org/fred2/](#)) and find the most recent monthly values and values from the same month 5 years and 10 years earlier for the M1 Money Stock (M1SL) and the M2 Money Stock (M2SL).

- Using these data, calculate M1 as a proportion of M2 for each of the years.
- Explain whether this proportion has increased, decreased, or remained the same over time. Can you think of an explanation for any changes you observe?

D14.4 (The equation of exchange) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) ([research.stlouisfed.org/fred2/](#)) and find the most recent values and values for the same quarter in 1985 for the following three variables: (1) Nominal Gross Domestic Product (GDP), (2) the Velocity of M1 Money Stock (M1V), and (3) the Velocity of M2 Money Stock (M2V).

- Using these data, calculate M1 and M2 for both periods.
- Describe how M1 velocity and M2 velocity differ in the two quarters.

D14.5 (Applying the equation of exchange) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) ([research.stlouisfed.org/fred2/](#)) and find the most recent values and

values from the same quarter 10 years earlier for the following three variables: (1) Real Gross Domestic Product (GDPC1), (2) the GDP Price Deflator (GDPDEF), and (3) the M2 Money Stock (M2SL).

- Using these data, calculate the average annual rate of change in both real GDP and M2 over this 10-year period.
- If we assume that velocity was constant during this period, what was the average annual inflation rate?
- Using the GDP Price Deflator data, calculate the average annual inflation rate over this 10-year period.
- Use your answers to parts (b) and (c) to discuss what must have happened to velocity during this period.

D14.6 (Applying the equation of exchange) Go to the Web site of the Federal Reserve Bank of St. Louis (FRED) ([research.stlouisfed.org/fred2/](#)) and find the most recent value for Real Gross Domestic Product (GDPC1) and the value from the same quarter eight years in the future for Real Potential Gross Domestic Product (GDPPOT).

- Using these data, calculate the average annual rate of growth in real GDP over this eight-year period, assuming that real GDP equals potential GDP in the quarter that is eight years in the future.
- If the velocity of money is constant during this eight-year period, what will the growth rate of M1 have to be if the annual inflation rate averages 2 percent? Briefly explain.
- Suppose that M1 grows at this rate, but the actual inflation over this period averages more than 2 percent. What can you conclude about velocity during this period?