On a graph, show the effect of Gunvor going to the loanable funds market to finance its operation. Explain the effect on the real interest rate, private saving, and investment.

23. The table sets out the data for an economy when the government's budget is balanced.

Real interest rate (percent per year)	Loanable funds demanded (trillions of 2009 dollars)	Loanable funds supplied (trillions of 2009 dollars)
2	8.0	4.0
3	7.0	5.0
4	6.0	6.0
5	5.0	7.0
6	4.0	8.0
7	3.0	9.0
8	2.0	10.0

a. Calculate the equilibrium real interest rate, investment, and private saving.

b. If planned saving decreases by $1 trillion at each real interest rate, explain the change in the real interest rate and investment.

c. If planned investment decreases by $1 trillion at each real interest rate, explain the change in saving and the real interest rate.

Government in the Loanable Funds Market

Use the following information to work Problems 24 and 25.

India's Economy Hits the Wall

At the start of 2008, India had an annual growth of 9 percent, huge consumer demand, and increasing investment. But by July 2008, India had large government deficits and rising interest rates. Economic growth is expected to fall to 7 percent by the end of 2008. A Goldman Sachs report suggests that India needs to lower the government's deficit and raise educational achievement.

Source: *BusinessWeek*, July 1, 2008

24. If the Indian government reduces its deficit and returns to a balanced budget, how will the demand for or supply of loanable funds in India change?

25. With economic growth forecasted to slow, future incomes are expected to fall. If other things remain the same, how will the demand or supply of loanable funds in India change?

26. **Sovereign Debt Markets in Turbulent Times: A View of the European Crisis**

At the end of 2009, the share of debt held by the private sector increased and as domestic banks allocated increasing amounts of funds to the public sector, product investment declined, further deepening the recession in Greece.

Source: VoxEU.org, July 23, 2014

Explain how the increase in public debt would deepen the Greek crisis..

Economics in the News

27. After you have studied *Economics in the News* on pp. 620–621, answer the following questions.

a. Why does the news article say that bond prices and interest rates move in opposite directions? Is it correct? Explain.

b. How does a government budget deficit influence the loanable funds market and why does a decrease in the deficit lower the real interest rate?

c. When an economic expansion gets going, what happens to the demand for loanable funds and the real interest rate?

d. If an expanding economy increases government tax revenue, how will that affect the loanable funds market and the real interest rate?

e. Looking at Fig. 1 on p. 621, what must have happened to either the demand for or the supply of loanable funds during 2011, 2012, and 2013?

28. **Huge Growth in Private Students Taking State Loans**

Compared to £52 million for 6,574 students in 2010, around 53,000 students received about £675 million a year in 2013-14 in the form of student loans from the state.

Source: BBC News, January 26, 2015

a. How do state loans influence the government's budget?

b. If there is a budget deficit, how would you expect it to influence the demand for loanable funds and the equilibrium real interest rate?

25 MONEY, THE PRICE LEVEL, AND INFLATION

After studying this chapter, you will be able to:

- Define money and describe its functions
- Explain the economic functions of banks
- Describe the structure and functions of the Federal Reserve System (the Fed)
- Explain how the banking system creates money
- Explain what determines the quantity of money and the nominal interest rate
- Explain how the quantity of money influences the price level and the inflation rate

Money, like fire and the wheel, has been around for a long time, and it has taken many forms. It was beads made from shells for North American Indians and tobacco for early American colonists. Today, we use dollar bills or swipe a card or, in some places, tap a cell phone. Are all these things money?

In this chapter, we study money, its functions, how it gets created, how the Federal Reserve regulates its quantity, and what happens when its quantity changes. In *Economics in the News* at the end of the chapter, we look at the extraordinary increase in the quantity of money in recent years and the prospect it will begin to shrink.

What Is Money?

What do wampum, tobacco, and nickels and dimes have in common? They are all examples of **money**, which is defined as any commodity or token that is generally acceptable as a means of payment. A **means of payment** is a method of settling a debt. When a payment has been made, there is no remaining obligation between the parties to a transaction. So what wampum, tobacco, and nickels and dimes have in common is that they have served (or still do serve) as the means of payment. Money serves three other functions:

- Medium of exchange
- Unit of account
- Store of value

Medium of Exchange

A *medium of exchange* is any object that is generally accepted in exchange for goods and services. Without a medium of exchange, goods and services must be exchanged directly for other goods and services—an exchange called *barter*. Barter requires a *double coincidence of wants*, a situation that rarely occurs. For example, if you want a hamburger, you might offer a CD in exchange for it. But you must find someone who is selling hamburgers and wants your CD.

A medium of exchange overcomes the need for a double coincidence of wants. Money acts as a medium of exchange because people with something to sell will always accept money in exchange for it. But money isn't the only medium of exchange. You can buy with a credit card, but a credit card isn't money. It doesn't make a final payment, and the debt it creates must eventually be settled by using money.

Unit of Account

A *unit of account* is an agreed measure for stating the prices of goods and services. To get the most out of your budget, you have to figure out whether seeing one more movie is worth its opportunity cost. But that cost is not dollars and cents. It is the number of ice-cream cones, sodas, or cups of coffee that you must give up. It's easy to do such calculations when all these goods have prices in terms of dollars and cents (see Table 25.1). If the price of a movie is $8 and the price of a cappuccino is $4, you know right away that seeing one movie costs you 2 cappuccinos.

TABLE 25.1 The Unit of Account Function of Money Simplifies Price Comparisons

Good	Price in money units	Price in units of another good
Movie	$8.00 each	2 cappuccinos
Cappuccino	$4.00 each	2 ice-cream cones
Ice cream	$2.00 per cone	2 packs of jelly beans
Jelly beans	$1.00 per pack	2 sticks of gum
Gum	$0.50 per stick	

Money as a unit of account: The price of a movie is $8 and the price of a stick of gum is 50¢, so the opportunity cost of a movie is 16 sticks of gum ($8.00 ÷ 50¢ = 16).

No unit of account: You go to a movie theater and learn that the cost of seeing a movie is 2 cappuccinos. You go to a grocery store and learn that a pack of jelly beans costs 2 sticks of gum. But how many sticks of gum does seeing a movie cost you? To answer that question, you go to the coffee shop and find that a cappuccino costs 2 ice-cream cones. Now you head for the ice-cream shop, where an ice-cream cone costs 2 packs of jelly beans. Now you get out your pocket calculator: 1 movie costs 2 cappuccinos, or 4 ice-cream cones, or 8 packs of jelly beans, or 16 sticks of gum!

If jelly beans are $1 a pack, one movie costs 8 packs of jelly beans. You need only one calculation to figure out the opportunity cost of any pair of goods and services.

Imagine how troublesome it would be if your local movie theater posted its price as 2 cappuccinos, the coffee shop posted the price of a cappuccino as 2 ice-cream cones, the ice-cream shop posted the price of an ice-cream cone as 2 packs of jelly beans, and the grocery store priced a pack of jelly beans as 2 sticks of gum! Now how much running around and calculating will you have to do to find out how much that movie is going to cost you in terms of the cappuccinos, ice-cream cones, jelly beans, or gum that you must give up to see it? You get the answer for cappuccinos right away from the sign posted on the movie theater. But for all the other goods, you're going to

have to visit many different stores to establish the price of each good in terms of another and then calculate the prices in units that are relevant for your own decision. The hassle of doing all this research might be enough to make a person swear off movies! You can see how much simpler it is if all the prices are expressed in dollars and cents.

Store of Value

Money is a *store of value* in the sense that it can be held and exchanged later for goods and services. If money were not a store of value, it could not serve as a means of payment.

Money is not alone in acting as a store of value. A house, a car, and a work of art are other examples.

The more stable the value of a commodity or token, the better it can act as a store of value and the more useful it is as money. No store of value has a completely stable value. The value of a house, a car, or a work of art fluctuates over time. The values of the commodities and tokens that are used as money also fluctuate over time.

Inflation lowers the value of money and the values of other commodities and tokens that are used as money. To make money as useful as possible as a store of value, a low inflation rate is needed.

Money in the United States Today

In the United States today, money consists of

- Currency
- Deposits at banks and other depository institutions

Currency The notes and coins held by individuals and businesses are known as **currency**. Notes are money because the government declares them so with the words "This note is legal tender for all debts, public and private." You can see these words on every dollar bill. Notes and coins *inside* banks are not counted as currency because they are not held by individuals and businesses.

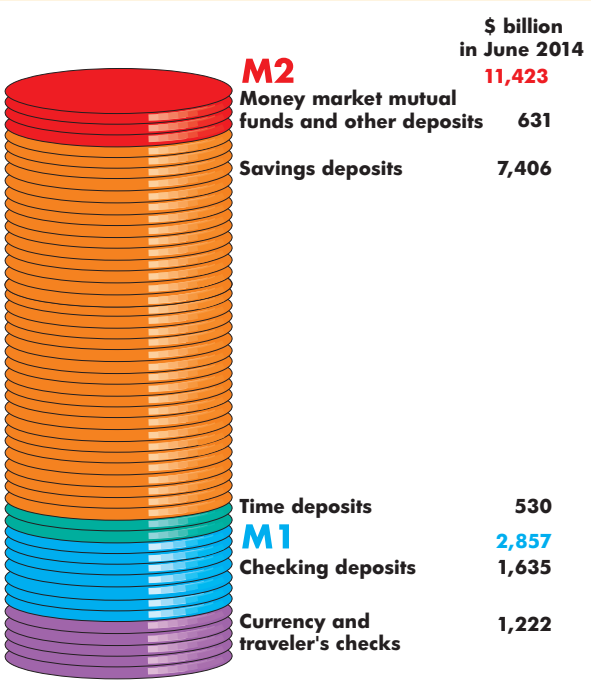
Deposits Deposits of individuals and businesses at banks and other depository institutions, such as savings and loan associations, are also counted as money. Deposits are money because the owners of the deposits can use them to make payments.

Official Measures of Money Two official measures of money in the United States today are known as M1 and M2. **M1** consists of currency and traveler's checks plus checking deposits owned by individuals and businesses. M1 does *not* include currency held by banks, and it does not include currency and checking deposits owned by the U.S. government. **M2** consists of M1 plus time deposits, savings deposits, and money market mutual funds and other deposits.

ECONOMICS IN ACTION

Official Measures of U.S. Money

The figure shows the relative magnitudes of the items that make up M1 and M2. Notice that M2 is almost five times as large as M1 and that currency is a small part of our money.



Two Measures of Money

M1
- Currency and traveler's checks
- Checking deposits at commercial banks, savings and loan associations, savings banks, and credit unions

M2
- M1
- Time deposits
- Savings deposits
- Money market mutual funds and other deposits

Source of data: The Federal Reserve Board. The data are for June 2014.

Are M1 and M2 Really Money? Money is the means of payment. So the test of whether an asset is money is whether it serves as a means of payment. Currency passes the test. But what about deposits? Checking deposits are money because they can be transferred from one person to another by writing a check or using a debit card. Such a transfer of ownership is equivalent to handing over currency. Because M1 consists of currency plus checking deposits and each of these is a means of payment, *M1 is money*.

But what about M2? Some of the savings deposits in M2 are just as much a means of payment as the checking deposits in M1. You can use an ATM to get funds from your savings account to pay for your purchase at the grocery store or the gas station. But some savings deposits are not means of payment. These deposits are known as liquid assets. *Liquidity* is the property of being easily convertible into a means of payment without loss in value. Because the deposits in M2 that are not means of payment are quickly and easily converted into a means of payment—currency or checking deposits—they are counted as money.

Deposits Are Money but Checks Are Not In defining money, we include, along with currency, deposits at banks and other depository institutions. But we do not count the checks that people write as money. Why are deposits money and checks not?

To see why deposits are money but checks are not, think about what happens when Colleen buys some roller-blades for $100 from Rocky's Rollers. When Colleen goes to Rocky's shop, she has $500 in her deposit account at the Laser Bank. Rocky has $1,000 in his deposit account—at the same bank, as it happens. The deposits of these two people total $1,500. Colleen writes a check for $100. Rocky takes the check to the bank right away and deposits it. Rocky's bank balance rises from $1,000 to $1,100, and Colleen's balance falls from $500 to $400. The deposits of Colleen and Rocky still total $1,500. Rocky now has $100 more than before, and Colleen has $100 less.

This transaction has transferred money from Colleen to Rocky, but the check itself was never money. There wasn't an extra $100 of money while the check was in circulation. The check instructs the bank to transfer money from Colleen to Rocky.

If Colleen and Rocky use different banks, there is an extra step. Rocky's bank credits $100 to Rocky's account and then takes the check to a check-clearing center. The check is then sent to Colleen's bank, which pays Rocky's bank $100 and then debits Colleen's account $100. This process can take a few days, but the principles are the same as when two people use the same bank.

Credit Cards Are Not Money You've just seen that checks are not money, but what about credit cards? Isn't having a credit card in your wallet and presenting the card to pay for your roller-blades the same thing as using money? Why aren't credit cards somehow valued and counted as part of the quantity of money?

When you pay by check, you are frequently asked to prove your identity by showing your driver's license. It would never occur to you to think of your driver's license as money. It's just an ID card. A credit card is also an ID card, but one that lets you take out a loan at the instant you buy something. When you sign a credit card sales slip, you are saying, "I agree to pay for these goods when the credit card company bills me." Once you get your statement from the credit card company, you must make at least the minimum payment due. To make that payment, you need money—you need to have currency or a checking deposit to pay the credit card company. So although you use a credit card when you buy something, the credit card is not the *means of payment* and it is not money.

REVIEW QUIZ

1. What makes something money? What functions does money perform? Why do you think packs of chewing gum don't serve as money?
2. What are the problems that arise when a commodity is used as money?
3. What are the main components of money in the United States today?
4. What are the official measures of money? Are all the measures really money?
5. Why are checks and credit cards not money?

Work these questions in Study Plan 25.1 and get instant feedback. Do a Key Terms Quiz. MyEconLab

We've seen that the main component of money in the United States is deposits at banks and other depository institutions. Let's take a closer look at these institutions.

Depository Institutions

A **depository institution** is a financial firm that takes deposits from households and firms. These deposits are components of M1 and M2. You will learn what these institutions are, what they do, the economic benefits they bring, how they are regulated, and how they have innovated to create new financial products.

Types of Depository Institutions

The deposits of three types of financial firms make up the nation's money. They are

- Commercial banks
- Thrift institutions
- Money market mutual funds

Commercial Banks A *commercial bank* is a firm that is licensed to receive deposits and make loans. In 2014, about 6,800 commercial banks operated in the United States but mergers make this number fall each year as small banks disappear and big banks expand.

A few very large commercial banks offer a wide range of banking services and have extensive international operations. The largest of these banks are JPMorgan Chase, Bank of America, Wells Fargo, and Citigroup. Most commercial banks are small and serve their regional and local communities.

The deposits of commercial banks represent 50 percent of M1 and 71 percent of M2.

Thrift Institutions Savings and loan associations, savings banks, and credit unions are *thrift institutions*.

Savings and Loan Association A *savings and loan association* (S&L) is a depository institution that receives deposits and makes personal, commercial, and home-purchase loans.

Savings Bank A *savings bank* is a depository institution that accepts savings deposits and makes mostly home-purchase loans.

Credit Union A *credit union* is a depository institution owned by a social or economic group, such as a firm's employees, that accepts savings deposits and makes mostly personal loans.

The deposits of the thrift institutions represent 8 percent of M1 and 13 percent of M2.

Money Market Mutual Funds A *money market mutual fund* is a fund operated by a financial institution that sells shares in the fund and holds assets such as U.S. Treasury bills and short-term commercial bills.

Money market mutual fund shares act like bank deposits. Shareholders can write checks on their money market mutual fund accounts, but there are restrictions on most of these accounts. For example, the minimum deposit accepted might be $2,500, and the smallest check a depositor is permitted to write might be $500.

Money market mutual funds do not feature in M1 and represent 6 percent of M2.

What Depository Institutions Do

Depository institutions provide services such as check clearing, account management, and credit cards, all of which provide an income from service fees.

But depository institutions earn most of their income by using the funds they receive from depositors to buy securities and make loans that earn a higher interest rate than that paid to depositors. In this activity, a depository institution must perform a balancing act weighing return against risk. To see this balancing act, we'll focus on the commercial banks.

A commercial bank puts the funds it receives from depositors and other funds that it borrows into three types of assets:

- Cash assets
- Securities
- Loans

Cash Assets A bank's cash assets consist of notes and coins in the bank's vault (called *vault cash*), a deposit account at the Federal Reserve (the Fed), and loans to other banks. The first two items, vault cash and deposits at the Fed, are the bank's **reserves**. Loans to other banks earn interest and the interest rate on these loans is called the **federal funds rate** and the Fed sets a target for this interest rate to influence the economy. We explain how and why on pp. 798–799.

A bank holds cash assets as a first line of funds to ensure that it is always able to meet depositors' currency withdrawals and make payments to other banks. In normal times, a bank kept about a half of one percent of deposits as cash assets. But today, these assets earn interest and their quantity has swollen to 28 percent of total deposits.

Securities A bank holds U.S. government Treasury bills and commercial bills that earn a low but risk-free return, and U.S. government bonds and mortgage-backed securities that earn a higher but riskier return. Securities would be sold and converted into cash assets if a bank ran short of reserves.

Loans A loan is an advance of funds for a specified period of time to businesses to finance investment and to households to finance the purchase of homes, cars, and other durable goods. The outstanding balances on credit card accounts are also bank loans. Loans are a bank's riskiest and highest-earning assets: They can't be converted into cash assets until they are due to be repaid, and some borrowers default and never repay. To spread the risk on loans, some get converted to securities.

Table 25.2 provides a snapshot of the sources and uses of funds of the commercial banks in June 2014 and serves as a summary of what they do.

Economic Benefits Provided by Depository Institutions

You've seen that a depository institution earns part of its profit because it pays a lower interest rate on deposits than what it earns on loans. What benefits do these institutions provide that make depositors willing to put up with a low interest rate and borrowers willing to pay a higher one?

Depository institutions provide four benefits:

- Create liquidity
- Pool risk
- Lower the cost of borrowing
- Lower the cost of monitoring borrowers

Create Liquidity Depository institutions create liquidity by *borrowing short and lending long*—taking deposits and standing ready to repay them on short notice or on demand and making loan commitments that run for terms of many years.

Pool Risk A loan might not be repaid—a default. If you lend to one person who defaults, you lose the entire amount loaned. If you lend to 1,000 people (through a bank) and one person defaults, you lose almost nothing. Depository institutions pool risk.

Lower the Cost of Borrowing Imagine there are no depository institutions and a firm is looking for $1 million to buy a new factory. It hunts around for several dozen people from whom to borrow the funds. Depository institutions lower the cost of this search. The firm gets its $1 million from a single institution that gets deposits from a large number of people but spreads the cost of this activity over many borrowers.

Lower the Cost of Monitoring Borrowers By monitoring borrowers, a lender can encourage good decisions that prevent defaults. But this activity is costly. Imagine how costly it would be if each household that lent money to a firm incurred the costs of monitoring that firm directly. Depository institutions can perform this task at a much lower cost.

TABLE 25.2 Commercial Banks: Sources and Uses of Funds

	Funds (billions of dollars)	Percentage of deposits
Total funds	14,662	144.3
Sources		
Deposits	10,161	100.0
Borrowing	1,698	16.7
Own capital and other sources (net)	2,803	27.6
Uses		
Cash Assets	2,850	28.0
Securities	2,809	27.6
Loans	7,666	75.4
Other assets	1,337	13.2

Commercial banks get most of their funds from depositors and use most of them to make loans. In normal times, banks hold less than 1 percent of deposits as cash assets. But in 2014, cash assets were 28 percent of deposits, most of which were at the Fed earning a low interest rate.

Source of data: The Federal Reserve Board. The data are for June 2014.

How Depository Institutions Are Regulated

Depository institutions are engaged in a risky business, and a failure, especially of a large bank, would have damaging effects on the entire financial system and the economy. To make the risk of failure small, depository institutions are required to hold levels of reserves and owners' capital that equal or surpass ratios laid down by regulation. If a depository institution fails, its deposits are guaranteed up to $250,000 per depositor per bank by the *Federal Deposit Insurance Corporation* or FDIC. The FDIC can take over management of a bank that appears to be heading toward failure.

AT ISSUE

Fractional-Reserve Banking Versus 100 Percent Reserve Banking

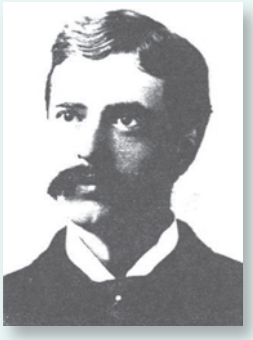
Fractional-reserve banking, a system in which banks keep a fraction of their depositors' funds as a cash reserve and lend the rest, was invented by goldsmiths in sixteenth century Europe and is the only system in use today.

This system contrasts with **100 percent reserve banking**, a system in which banks keep the full amount of their depositors' funds as a cash reserve.

The 2008 global financial crisis raises the question: Should banks be required to keep 100 percent cash reserves to prevent them from failing and bringing recession?

Yes

- The most unrelenting advocates of 100 percent reserve banking are a group of economists known as the *Austrian School*, who say that fractional-reserve banking violates property rights.
- Because a deposit is owned by the depositor and not the bank, the bank has no legal right to lend the deposit to someone else.
- Mainstream economists Irving Fisher in the 1930s and Milton Friedman in the 1950s supported 100 percent reserve banking.
- They said it enables the central bank to exercise more precise control over the quantity of money as well as eliminating the risk of a bank running out of cash.



Irving Fisher of Yale University supported 100 percent reserve banking.

No

- The requirement to hold 100 percent reserves would prevent the banks making loans and lower their profits.
- Lower bank profits weaken rather than strengthen the banks.
- The demand for loans would be met by a supply from unregulated institutions, and they might be riskier than the current fractional-reserve banks.
- Nonetheless, banks do need to be regulated.
- The Financial Stability Board, based in Basel, Switzerland, has drawn up rules, called Basel III, which are designed to eliminate the risk that a major bank will fail.
- Mark Carney, Chairman of the Financial Stability Board and Governor of the Bank of England, wants all banks to adopt the Basel III principles, which increase the amount of a bank's own capital that must be held as a buffer against a fall in asset values.

Mark Carney, Chairman of the Financial Stability Board and Governor of the Bank of England.

"Our destination should be one where financial institutions and markets play critical—and complementary—roles to support long-term economic prosperity. This requires institutions that are adequately capitalized, with sufficient liquidity buffers to manage shocks."
Mark Carney, remarks at the Institute of International Finance, Washington, D.C., September 25, 2011

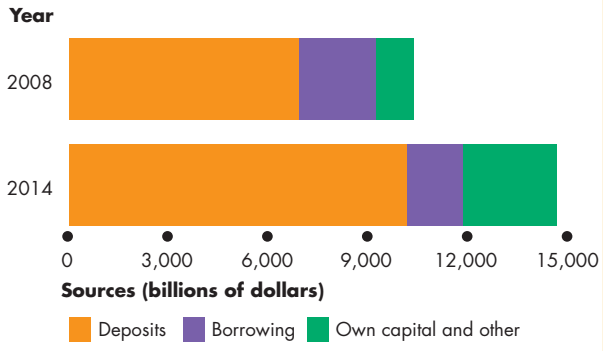
ECONOMICS IN ACTION

Commercial Banks Flush with Reserves

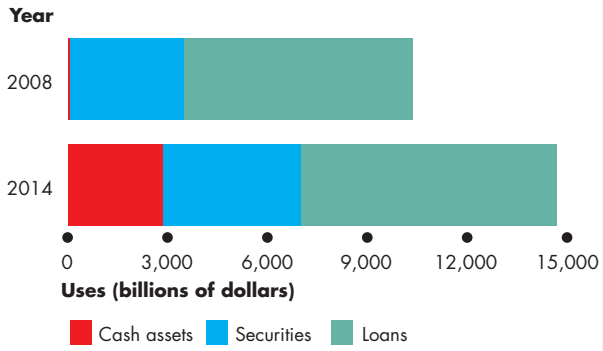
When Lehman Brothers (a New York investment bank) failed in October 2008, panic spread through financial markets. Banks that are normally happy to lend to each other overnight for an interest rate barely above the rate they can earn on safe Treasury bills lost confidence and the interest rate in this market shot up to 3 percentage points above the Treasury bill rate. Banks wanted to be safe and to hold cash and the Fed injected $1.5 trillion or 17.5 percent of deposits into the banks.

From 2009 through 2014, bank reserves grew to $3 trillion. The Fed pays interest on reserve balances, so the banks willingly hold these very large quantities of reserves.

The figure compares the commercial banks' sources and uses of funds (sources are liabilities and uses are assets) in 2008 with those in 2014.



(a) Sources of commercial bank funds



(b) Uses of commercial bank funds

Changes in the Sources and Uses of Commercial Bank Funds

Source of data: The Federal Reserve Board.

Financial Innovation

In the pursuit of larger profit, depository institutions are constantly seeking ways to improve their products in a process called *financial innovation*.

During the late 1970s, a high inflation rate sent the interest rate on home-purchase loans to 15 percent a year. Traditional fixed interest rate mortgages became unprofitable and variable interest rate mortgages were introduced.

During the 2000s, when interest rates were low and depository institutions were flush with funds, sub-prime mortgages were developed. To avoid the risk of carrying these mortgages, mortgage-backed securities were developed. The original lending institution sold these securities, lowered their own exposure to risk, and obtained funds to make more loans.

The development of low-cost computing and communication brought financial innovations such as credit cards and daily interest deposit accounts.

Financial innovation has brought changes in the composition of money. Checking deposits at thrift institutions have become an increasing percentage of M1 while checking deposits at commercial banks have become a decreasing percentage. Savings deposits have decreased as a percentage of M2, while time deposits and money market mutual funds have expanded. Surprisingly, the use of currency has not fallen much.

REVIEW QUIZ

1. What are depository institutions?
2. What are the functions of depository institutions?
3. How do depository institutions balance risk and return?
4. How do depository institutions create liquidity, pool risks, and lower the cost of borrowing?
5. How have depository institutions made innovations that have influenced the composition of money?

Work these questions in Study Plan 25.2 and get instant feedback. Do a Key Terms Quiz. MyEconLab

You now know what money is. Your next task is to learn about the Federal Reserve System and the ways in which it can influence the quantity of money.

The Federal Reserve System

The **Federal Reserve System** (usually called the **Fed**) is the central bank of the United States. A **central bank** is a bank's bank and a public authority that regulates a nation's depository institutions and conducts *monetary policy,* which means that it adjusts the quantity of money in circulation and influences interest rates.

We begin by describing the structure of the Fed.

The Structure of the Fed

Three key elements of the Fed's structure are

- The Board of Governors
- The regional Federal Reserve banks
- The Federal Open Market Committee

The Board of Governors A seven-member board appointed by the President of the United States and confirmed by the Senate governs the Fed. Members have 14-year (staggered) terms and one seat on the board becomes vacant every two years. The President appoints one board member as chairman for a 4-year renewable term—currently Janet Yellen, a former economics professor at UC Berkeley.

The Federal Reserve Banks The nation is divided into 12 Federal Reserve districts (shown in Fig. 25.1). Each district has a Federal Reserve Bank that provides check-clearing services to commercial banks and issues bank notes.

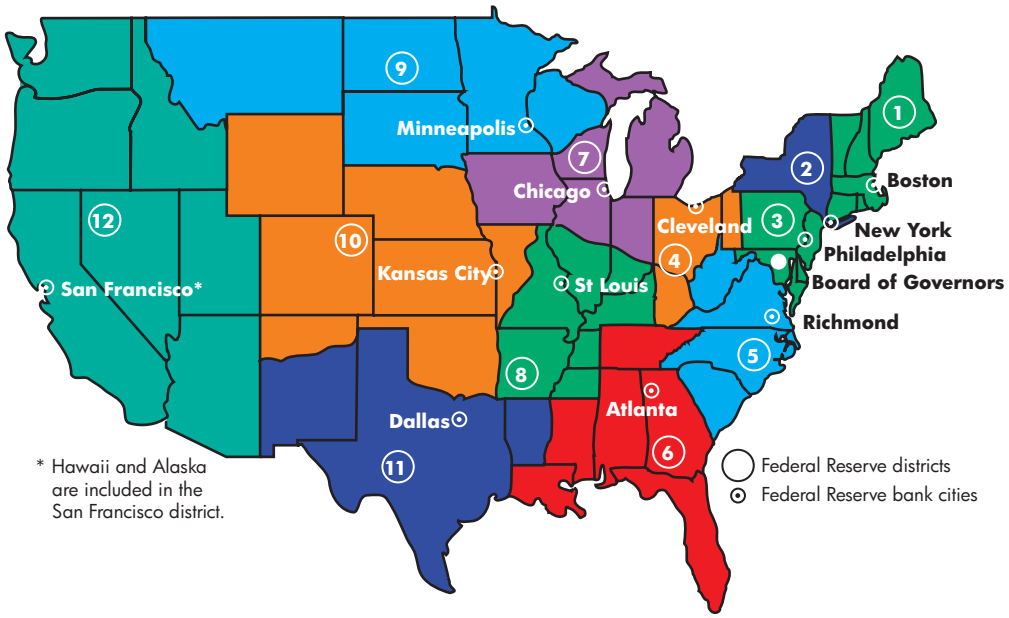
The Federal Reserve Bank of New York (known as the New York Fed) occupies a special place in the Federal Reserve System because it implements the Fed's policy decisions in the financial markets.

The Federal Open Market Committee The **Federal Open Market Committee** (FOMC) is the main policy-making organ of the Federal Reserve System. The FOMC consists of the following voting members:

- The chairman and the other six members of the Board of Governors
- The president of the Federal Reserve Bank of New York
- The presidents of the other regional Federal Reserve banks (of whom, on a yearly rotating basis, only four vote)

The FOMC meets approximately every six weeks to review the state of the economy and to decide the actions to be carried out by the New York Fed.

FIGURE 25.1 The Federal Reserve System



The nation is divided into 12 Federal Reserve districts, each having a Federal Reserve bank. (Some of the larger districts also have branch banks.) The Board of Governors of the Federal Reserve System is located in Washington, D.C.

Source: Federal Reserve Bulletin.

MyEconLab Animation

The Fed's Balance Sheet

The Fed influences the economy through the size and composition of its balance sheet—the assets that the Fed owns and the liabilities that it owes.

The Fed's Assets The Fed has two main assets:

1. U.S. government securities
2. Mortgage-backed securities

U.S. Government Securities The U.S. government securities held by the Fed are Treasury bonds. The Fed buys and sells these bonds in the *loanable funds market* (see pp. 611–612). The Fed does not buy bonds directly from the U.S. government.

Mortgage-Backed Securities Traditionally, the Fed held only U.S. government securities. But in recent years, the Fed has purchased large quantities of mortgage-backed securities to increase the supply of *loanable funds* (see pp. 614–617).

The Fed's Liabilities The Fed has two liabilities:

1. Currency
2. Reserves of depository institutions

Currency Currency is the dollar bills that we use in our daily transactions. Some currency is in circulation and is a component of M1, and some is in banks and other depository institutions in their vaults and cash machines and is *vault cash*. (Coins are not a liability of the Fed. They are issued by the U.S. Mint.)

Reserves of Depository Institutions The Fed is the banker for the banks and the reserves that the banks deposit at the Fed are a liability of the Fed.

The Monetary Base The Fed's total liabilities make up the monetary base. That is, the **monetary base** is the sum of currency and the reserves of depository institutions.

The Fed's assets are the sources of the monetary base. They are also called the backing for the monetary base. The Fed's liabilities are the uses of the monetary base as currency and bank reserves. Table 25.3 provides a snapshot of the sources and uses of the monetary base in June 2014.

When the Fed changes the monetary base, the quantity of money and interest rate change. You're going to see how these changes come about later in this chapter. First, we'll look at the Fed's tools that enable it to influence money and interest rates.

TABLE 25.3 The Sources and Uses of the Monetary Base

Sources (billions of dollars)		Uses (billions of dollars)	
U.S. government securities	2,330	Currency	1,280
Mortgage-backed securities	1,618	Reserves of depository institutions	2,668
Monetary base	3,948	Monetary base	3,948

Source of data: The Federal Reserve Board. The data are for June 2014.

The Fed's Policy Tools

The Fed influences the quantity of money and interest rates by adjusting the quantity of reserves available to the banks and the reserves the banks must hold. To do this, the Fed manipulates three tools:

- Open market operations
- Last resort loans
- Required reserve ratio

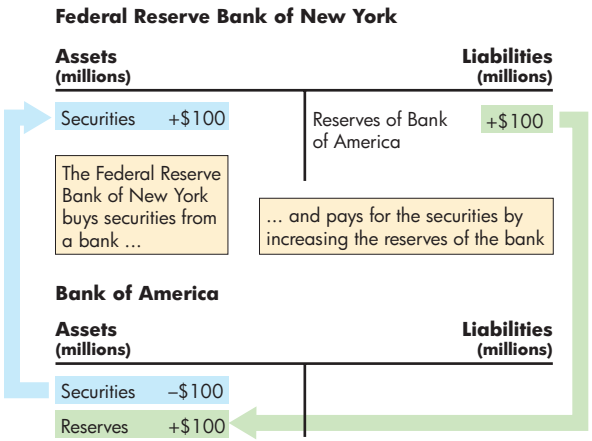
Open Market Operations An **open market operation** is the purchase or sale of securities by the Fed in the *loanable funds market*. When the Fed buys securities, it pays for them with newly created bank reserves. When the Fed sells securities, the Fed is paid with reserves held by banks. So open market operations directly influence the reserves of banks. By changing the quantity of bank reserves, the Fed changes the quantity of monetary base, which influences the quantity of money.

An Open Market Purchase To see how an open market operation changes bank reserves, suppose the Fed buys $100 million of government securities from the Bank of America. When the Fed makes this transaction, two things happen:

1. The Bank of America has $100 million less securities, and the Fed has $100 million more securities.
2. The Fed pays for the securities by placing $100 million in the Bank of America's deposit account at the Fed.

Figure 25.2 shows the effects of these actions on the balance sheets of the Fed and the Bank of America. Ownership of the securities passes from the

FIGURE 25.2 The Fed Buys Securities in the Open Market



When the Fed buys securities in the open market, it creates bank reserves. The Fed's assets and liabilities increase, and the Bank of America exchanges securities for reserves.

MyEconLab Animation

Bank of America to the Fed, so the Bank of America's assets decrease by $100 million and the Fed's assets increase by $100 million, as shown by the blue arrow running from the Bank of America to the Fed.

The Fed pays for the securities by placing $100 million in the Bank of America's reserve account at the Fed, as shown by the green arrow running from the Fed to the Bank of America.

The Fed's assets and liabilities increase by $100 million. The Bank of America's total assets are unchanged: It sold securities to increase its reserves.

An Open Market Sale If the Fed sells $100 million of government securities to the Bank of America in the open market,

1. The Bank of America has $100 million more securities, and the Fed has $100 million less securities.
2. The Bank of America pays for the securities by using $100 million of its reserve deposit at the Fed.

You can follow the effects of these actions on the balance sheets of the Fed and the Bank of America by reversing the arrows and the plus and minus signs in Fig. 25.2. Ownership of the securities passes from the Fed to the Bank of America, so the Fed's assets decrease by $100 million and the Bank of America's assets increase by $100 million.

ECONOMICS IN ACTION

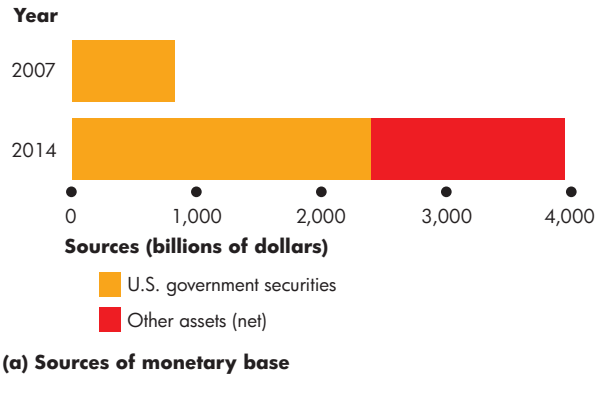
The Fed's Balance Sheet Explodes

The Fed's balance sheet underwent some remarkable changes following the financial crisis of 2007–2008 and the recession that the crisis triggered. The figure shows the effects of these changes on the size and composition of the monetary base by comparing the situation in 2014 with that before the financial crisis began in late 2007.

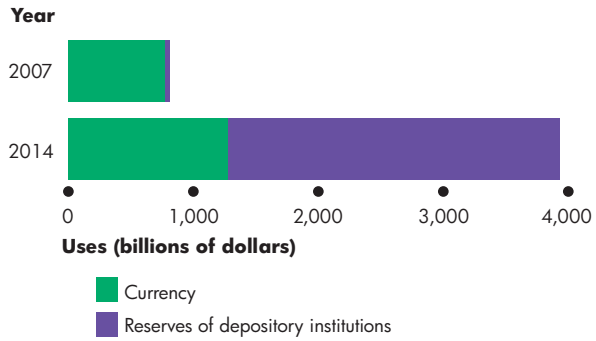
In a normal year, 2007, the Fed's holding of U.S. government securities is almost as large as the monetary base and the monetary base is composed of almost all currency.

But between 2007 and 2014 the Fed more than quadrupled the monetary base. Almost all of this increase was composed of bank reserves.

When, and how quickly, to unwind the large increase in the monetary base and bank reserves is an ongoing source of challenge for the Fed.



(a) Sources of monetary base



(b) Uses of monetary base

Changes in the Sources and Uses of Monetary Base

Source of data: The Federal Reserve Board.

The Bank of America uses $100 million of its reserves to pay for the securities.

Both the Fed's assets and liabilities decrease by $100 million. The Bank of America's total assets are unchanged: It has used reserves to buy securities.

The New York Fed conducts these open-market transactions on directions from the FOMC.

Last Resort Loans The Fed is the **lender of last resort**, which means that if a bank is short of reserves, it can borrow from the Fed. But the Fed sets the interest rate on last resort loans and this interest rate is called the *discount rate*.

During the period since August 2007 when the first effects of the financial crisis started to be felt, the Fed has been especially active as lender of last resort and, with the U.S. Treasury, has created a number of new lending facilities and initiatives to prevent banks from failing.

Required Reserve Ratio The **required reserve ratio** is the minimum percentage of deposits that depository institutions are required to hold as reserves. In 2014, required reserves were 3 percent of checking deposits between $13.3 million and $89 million and 10 percent of checking deposits in excess of $89 million. If the Fed requires the banks to hold more reserves, they must cut their lending.

REVIEW QUIZ

1. What is the central bank of the United States and what functions does it perform?
2. What is the monetary base and how does it relate to the Fed's balance sheet?
3. What are the Fed's three policy tools?
4. What is the Federal Open Market Committee and what are its main functions?
5. How does an open market operation change the monetary base?

Work these questions in Study Plan 25.3 and get instant feedback. Do a Key Terms Quiz. MyEconLab

Next, we're going to see how the banking system—the banks and the Fed—creates money and how the quantity of money changes when the Fed changes the monetary base.

How Banks Create Money

Banks create money. But this doesn't mean that they have smoke-filled back rooms in which counterfeiters are busily working. Remember, money is both currency and bank deposits. What banks create is deposits, and they do so by making loans.

Creating Deposits by Making Loans

The easiest way to see that banks create deposits is to think about what happens when Andy, who has a Visa card issued by Citibank, uses his card to buy a tank of gas from Chevron. When Andy swipes his card, two financial transactions occur. First, Andy takes a loan from Citibank and obligates himself to repay the loan at a later date. Second, a message is transmitted to Chevron's bank and the bank credits Chevron's account with the amount of Andy's purchase (minus the bank's commission).

For now, let's assume that Chevron, like Andy, banks at Citibank so that the two transactions we've just described both occur at the one bank.

You can see that these transactions have created a bank deposit and a loan. Andy has increased the size of his loan (his credit card balance), and Chevron has increased the size of its bank deposit. Because bank deposits are money, Citibank has created money.

If, as we've just assumed, Andy and Chevron use the same bank, no further transactions take place. But if two banks are involved, there is another transaction. To see this additional transaction and its effects, assume that Chevron's bank is Bank of America. To fully settle the payment for Andy's gas purchase, Citibank must pay Bank of America.

To make this payment, Citibank uses its reserves. Citibank's reserves decrease by the amount of its loan to Andy; Bank of America's reserves increase by the amount that Chevron's deposit increases. Payments like this one between the banks are made at the end of the business day. So, at the end of the business day the banking system as a whole has an increase in loans and deposits but no change in reserves.

Three factors limit the quantity of loans and deposits that the banking system can create through transactions like Andy's. They are

- The monetary base
- Desired reserves
- Desired currency holding

The Monetary Base You've seen that the *monetary base* is the sum of Federal Reserve notes, coins, and banks' deposits at the Fed. The size of the monetary base limits the total quantity of money that the banking system can create. The reason is that banks have a desired level of reserves, households and firms have a desired holding of currency, and both of these desired holdings of the monetary base depend on the quantity of deposits.

Desired Reserves A bank's *desired reserves* are the reserves that it *plans* to hold. They contrast with a bank's *required reserves*, which is the minimum quantity of reserves that a bank *must* hold.

The quantity of desired reserves depends on the level of deposits and is determined by the **desired reserve ratio**—the ratio of reserves to deposits that the banks *plan* to hold. The *desired* reserve ratio exceeds the *required* reserve ratio by an amount that the banks determine to be prudent on the basis of their daily business requirements and in the light of the current outlook in financial markets.

Desired Currency Holding The proportions of money held as currency and bank deposits—the ratio of currency to deposits—depend on how households and firms choose to make payments: Whether they plan to use currency or debit cards and checks.

Choices about how to make payments change slowly so the ratio of desired currency to deposits also changes slowly, and at any given time this ratio is fixed. If bank deposits increase, desired currency holding also increases. For this reason, when banks make loans that increase deposits, some currency leaves the banks—the banking system leaks reserves. We call the leakage of bank reserves into currency the *currency drain*, and we call the ratio of currency to deposits the **currency drain ratio**.

We've sketched the way that a loan creates a deposit and described the three factors that limit the amount of loans and deposits that can be created. We're now going to examine the money creation process more closely and discover a money multiplier.

The Money Creation Process

The money creation process begins with an increase in the monetary base, which occurs if the Fed conducts an open market operation in which it buys securities from banks and other institutions. The Fed pays for the securities it buys with newly created bank reserves.

When the Fed buys securities from a bank, the bank's reserves increase but its deposits don't change. So the bank has excess reserves. A bank's **excess reserves** are its actual reserves minus its desired reserves.

When a bank has excess reserves, it makes loans and creates deposits. When the entire banking system has excess reserves, total loans and deposits increase and the quantity of money increases.

One bank can make a loan and get rid of excess reserves. But the banking system as a whole can't get rid of excess reserves so easily. When the banks make loans and create deposits, the extra deposits lower excess reserves for two reasons. First, the increase in deposits increases desired reserves. Second, a currency drain decreases total reserves. But excess reserves don't completely disappear. So the banks lend some more and the process repeats.

As the process of making loans and increasing deposits repeats, desired reserves increase, total reserves decrease through the currency drain, and eventually enough new deposits have been created to use all the new monetary base.

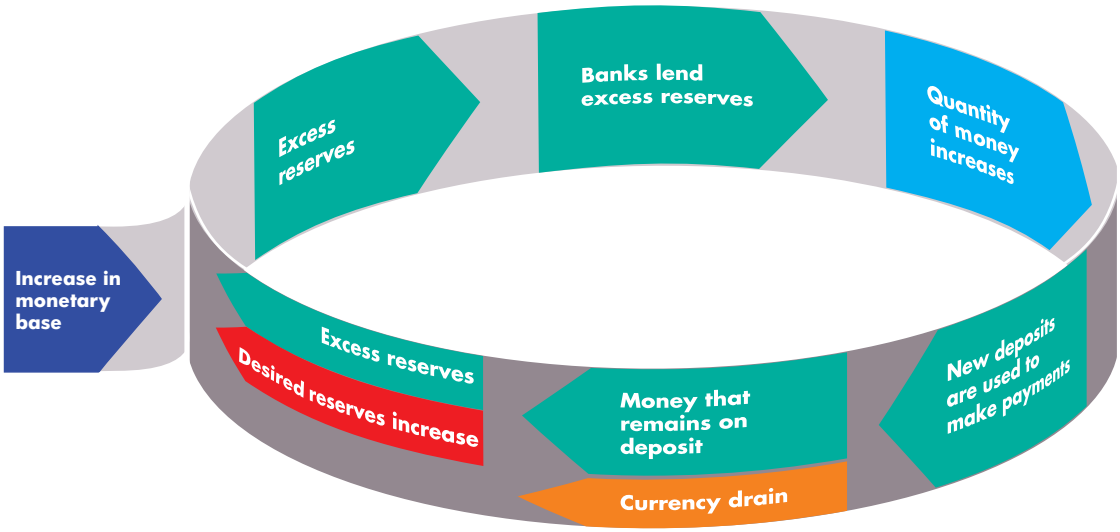
Figure 25.3 summarizes one round in the process we've just described. The sequence has the following eight steps:

1. Banks have excess reserves.
2. Banks lend excess reserves.
3. The quantity of money increases.
4. New money is used to make payments.
5. Some of the new money remains on deposit.
6. Some of the new money is a *currency drain*.
7. Desired reserves increase because deposits have increased.
8. Excess reserves decrease.

If the Fed *sells* securities in an open market operation, then banks have negative excess reserves—they are short of reserves. When the banks are short of reserves, loans and deposits decrease and the process we've described above works in a downward direction until desired reserves plus desired currency holding has decreased by an amount equal to the decrease in monetary base.

A money multiplier determines the change in the quantity of money that results from a change in the monetary base.

FIGURE 25.3 How the Banking System Creates Money by Making Loans



The Federal Reserve increases the monetary base, which increases bank reserves and creates excess reserves. Banks lend the excess reserves, which creates new deposits. The quantity of money increases. New deposits are used to make payments. Some of the new money remains on deposit at banks and some leaves the banks in a currency drain. The increase in bank deposits increases banks' desired reserves. But the banks still have excess reserves, though less than before. The process repeats until excess reserves have been eliminated.

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ECONOMICS IN ACTION

The Variable Money Multipliers

We can measure the money multiplier, other things remaining the same, as the ratio of the quantity of money (M1 or M2) to the monetary base. In normal times, these ratios (and the money multipliers) change slowly.

In the early 1990s, the M1 multiplier—the ratio of M1 to the monetary base—was about 3 and the M2 multiplier—the ratio of M2 to the monetary base—was about 12. Through the 1990s and 2000s, the currency drain ratio gradually increased and the money multipliers decreased. By 2007, the M1 multiplier was 2 and the M2 multiplier was 9.

Since 2008, the unprecedented increase in the monetary base has been willingly held by banks as reserves. In an environment of uncertainty, desired reserves increased by a similar amount to the increase in actual reserves. The quantity of money changed by much less than the change in monetary base.

The Money Multiplier

The **money multiplier** is the ratio of the change in the quantity of money to the change in monetary base. For example, if a $1 million increase in the monetary base increases the quantity of money by $2.5 million, then the money multiplier is 2.5.

The smaller the banks' desired reserve ratio and the smaller the currency drain ratio, the larger is the money multiplier. (See the Mathematical Note on pp. 650–651 for details on the money multiplier).

REVIEW QUIZ

1. How do banks create money?
2. What limits the quantity of money that the banking system can create?
3. A bank manager tells you that she doesn't create money. She just lends the money that people deposit. Explain why she's wrong.

Work these questions in Study Plan 25.4 and get instant feedback. Do a Key Terms Quiz. MyEconLab

ECONOMICS IN THE NEWS

A Massive Open Market Operation

QE2 Is No Silver Bullet

The Federal Reserve's $600 billion bond-buying program initiated last year, known as the second round of quantitative easing or QE2, will end on schedule this month with a mixed legacy, having proved to be neither the economy's needed elixir nor the scourge that critics describe.

Source: *The Wall Street Journal*, June 22, 2011

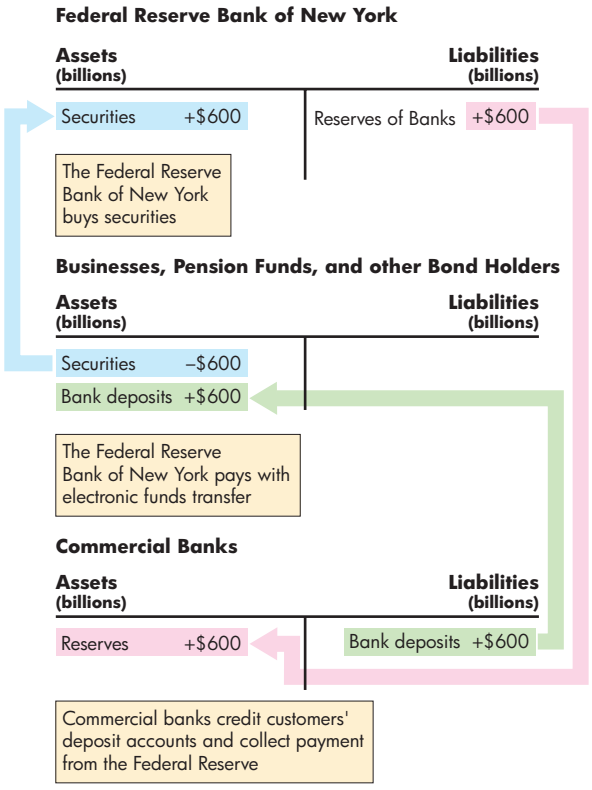
THE QUESTIONS

- What is *quantitative easing*? What transactions does the Fed undertake in a period of quantitative easing?
- How did QE2 affect the quantity of reserves, loans, and deposits of the commercial banks?
- Why was QE2 neither "elixir" nor "scourge"?

THE ANSWERS

- *Quantitative easing* or QE is an open market purchase of securities by the Fed. QE2 was the purchase of $600 billion of long-term securities from businesses, pension funds, and other holders.
- The purchase was an open market operation similar to that described in Fig. 25.2 on p. 637 but with one more step because the Fed buys the securities from holders who are not banks.
- The figure illustrates the QE2 open market operation and the extra step in the chain of transactions.
- When the Fed buys securities, its assets increase. Its liabilities also increase because it creates monetary base to pay for the securities.
- For the businesses that sell bonds, their assets change: Securities decrease and bank deposits increase.
- For the commercial banks, deposit liabilities increase and reserves, an asset, also increase.
- You saw on p. 634 that the commercial banks are flush with reserves. They held on to the increase in reserves created by QE2. There was no multiplier effect on loans and deposits.
- QE2 would have been an "elixir" if it had resulted in a boost to bank lending, business investment, and economic expansion. It didn't have these effects mainly because the banks held on to the newly created reserves.

The New York Fed building where open market operations are conducted.



The QE2 Transactions

- QE2 would have been a "scourge" if it had caused inflation. That didn't happen.
- *Economics in the News* on pp. 648–649 looks at some other effects of QE2.

MyEconLab More Economics in the News

The Money Market

There is no limit to the amount of money we would like to *receive* in payment for our labor or as interest on our savings. But there *is* a limit to how big an inventory of money we would like to *hold* and neither spend nor use to buy assets that generate an income. The *quantity of money demanded* is the inventory of money that people plan to hold on any given day. It is the quantity of money in our wallets and in our deposit accounts at banks. The quantity of money held must equal the quantity supplied, and the forces that bring about this equality in the money market have powerful effects on the economy, as you will see in the rest of this chapter.

But first, we need to explain what determines the amount of money that people plan to hold.

The Influences on Money Holding

The quantity of money that people plan to hold depends on four main factors:

- The price level
- The *nominal* interest rate
- Real GDP
- Financial innovation

The Price Level The quantity of money measured in dollars is *nominal money*. The quantity of nominal money demanded is proportional to the price level, other things remaining the same. If the price level rises by 10 percent, people hold 10 percent more nominal money than before, other things remaining the same. If you hold $20 to buy your weekly movies and soda, you will increase your money holding to $22 if the prices of movies and soda—and your wage rate—increase by 10 percent.

The quantity of money measured in constant dollars (for example, in 2009 dollars) is real money. *Real money* is equal to nominal money divided by the price level and is the quantity of money measured in terms of what it will buy. In the above example, when the price level rises by 10 percent and you increase your money holding by 10 percent, your *real* money holding is constant. Your $22 at the new price level buys the same quantity of goods and is the same quantity of *real money* as your $20 at the original price level. The quantity of real money demanded is independent of the price level.

The *Nominal* Interest Rate A fundamental principle of economics is that as the opportunity cost of something increases, people try to find substitutes for it. Money is no exception. The higher the opportunity cost of holding money, other things remaining the same, the smaller is the quantity of real money demanded. The nominal interest rate on other assets minus the nominal interest rate on money is the opportunity cost of holding money.

The interest rate that you earn on currency and checking deposits is zero. So the opportunity cost of holding these items is the nominal interest rate on other assets such as a savings bond or Treasury bill. By holding money instead, you forgo the interest that you otherwise would have received.

Money loses value because of inflation, so why isn't the inflation rate part of the cost of holding money? It is. Other things remaining the same, the higher the expected inflation rate, the higher is the nominal interest rate.

Real GDP The quantity of money that households and firms plan to hold depends on the amount they are spending. The quantity of money demanded in the economy as a whole depends on aggregate expenditure—real GDP.

Again, suppose that you hold an average of $20 to finance your weekly purchases of movies and soda. Now imagine that the prices of these goods and of all other goods remain constant but that your income increases. As a consequence, you now buy more goods and services and you also keep a larger amount of money on hand to finance your higher volume of expenditure.

Financial Innovation Technological change and the arrival of new financial products influence the quantity of money held. Financial innovations include

1. Daily interest checking deposits
2. Automatic transfers between checking and saving deposits
3. Automatic teller machines
4. Credit cards and debit cards
5. Internet banking and bill paying

These innovations have occurred because of the development of computing power that has lowered the cost of calculations and record keeping.

We summarize the effects of the influences on money holding by using a demand for money curve.

The Demand for Money

The **demand for money** is the relationship between the quantity of real money demanded and the nominal interest rate when all other influences on the amount of money that people wish to hold remain the same.

Figure 25.4 shows a demand for money curve, *MD*. When the interest rate rises, other things remaining the same, the opportunity cost of holding money rises and the quantity of real money demanded decreases—there is a movement up along the demand for money curve. Similarly, when the interest rate falls, the opportunity cost of holding money falls, and the quantity of real money demanded increases—there is a movement down along the demand for money curve.

When any influence on money holding other than the interest rate changes, there is a change in the demand for money and the demand for money curve shifts. Let's study these shifts.

Shifts in the Demand for Money Curve

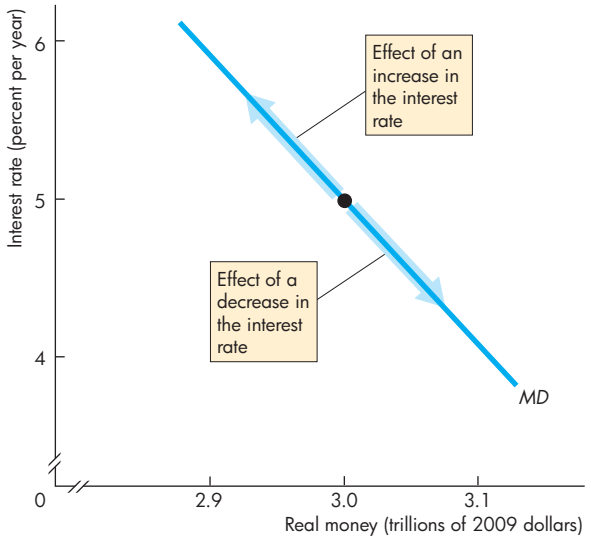
A change in real GDP or financial innovation changes the demand for money and shifts the demand for money curve.

Figure 25.5 illustrates the change in the demand for money. A decrease in real GDP decreases the demand for money and shifts the demand for money curve leftward from MD_0 to MD_1. An increase in real GDP has the opposite effect: It increases the demand for money and shifts the demand for money curve rightward from MD_0 to MD_2.

The influence of financial innovation on the demand for money curve is more complicated. It decreases the demand for currency and might increase the demand for some types of deposits and decrease the demand for others. But generally, financial innovation decreases the demand for money.

Changes in real GDP and financial innovation have brought large shifts in the demand for money in the United States.

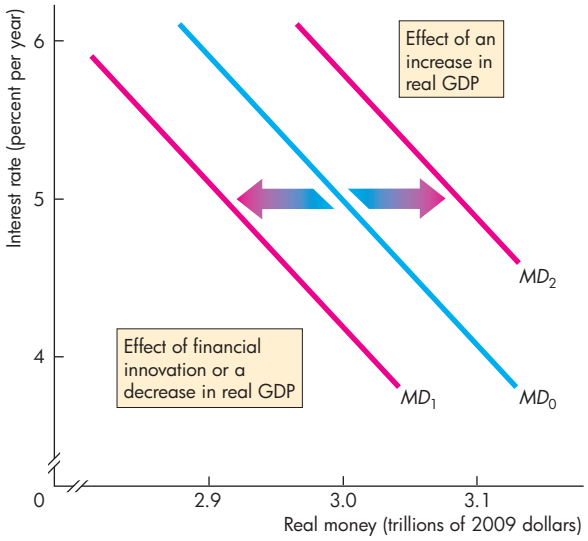
FIGURE 25.4 The Demand for Money



The demand for money curve, *MD*, shows the relationship between the quantity of real money that people plan to hold and the nominal interest rate, other things remaining the same. The interest rate is the opportunity cost of holding money. A change in the interest rate brings a movement along the demand for money curve.

MyEconLab Animation

FIGURE 25.5 Changes in the Demand for Money



A decrease in real GDP decreases the demand for money. The demand for money curve shifts leftward from MD_0 to MD_1. An increase in real GDP increases the demand for money. The demand for money curve shifts rightward from MD_0 to MD_2. Financial innovation generally decreases the demand for money.

MyEconLab Animation

Money Market Equilibrium

You now know what determines the demand for money, and you've seen how the banking system creates money. Let's now see how the money market reaches an equilibrium.

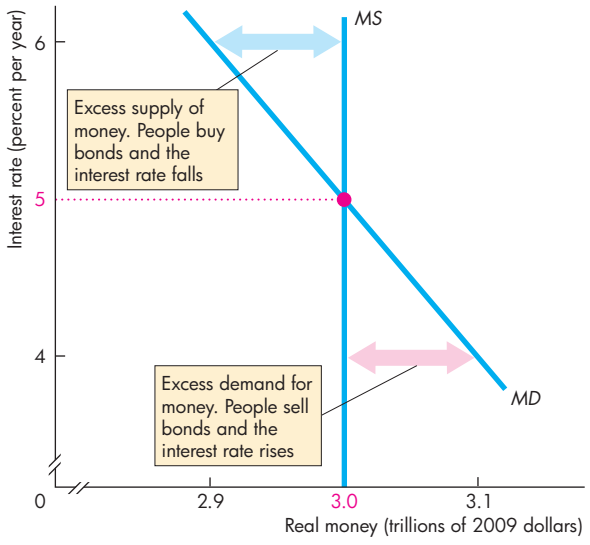
Money market equilibrium occurs when the quantity of money demanded equals the quantity of money supplied. The adjustments that occur to bring money market equilibrium are fundamentally different in the short run and the long run.

Short-Run Equilibrium The quantity of money supplied is determined by the actions of the banks and the Fed. As the Fed adjusts the quantity of money, the interest rate changes.

In Fig. 25.6, the Fed uses open market operations to make the quantity of real money supplied equal to $3.0 trillion and the supply of money curve *MS*. With demand for money curve *MD*, the equilibrium interest rate is 5 percent a year.

If the interest rate were 4 percent a year, people would want to hold more money than is available.

FIGURE 25.6 Money Market Equilibrium



Money market equilibrium occurs when the quantity of money demanded equals the quantity supplied. In the short run, real GDP determines the demand for money curve, *MD*, and the Fed determines the quantity of real money supplied and the supply of money curve, *MS*. The interest rate adjusts to achieve equilibrium, here 5 percent a year.

MyEconLab Animation and Draw Graph

They would sell bonds, bid down their price, and the interest rate would rise. If the interest rate were 6 percent a year, people would want to hold less money than is available. They would buy bonds, bid up their price, and the interest rate would fall.

The Short-Run Effect of a Change in the Quantity of Money Starting from a short-run equilibrium, if the Fed increases the quantity of money, people find themselves holding more money than the quantity demanded. With a surplus of money holding, people enter the loanable funds market and buy bonds. The increase in demand for bonds raises the price of a bond and lowers the interest rate (refresh your memory by looking at Chapter 24, p. 610).

If the Fed decreases the quantity of money, people find themselves holding less money than the quantity demanded. They now enter the loanable funds market to sell bonds. The decrease in the demand for bonds lowers their price and raises the interest rate.

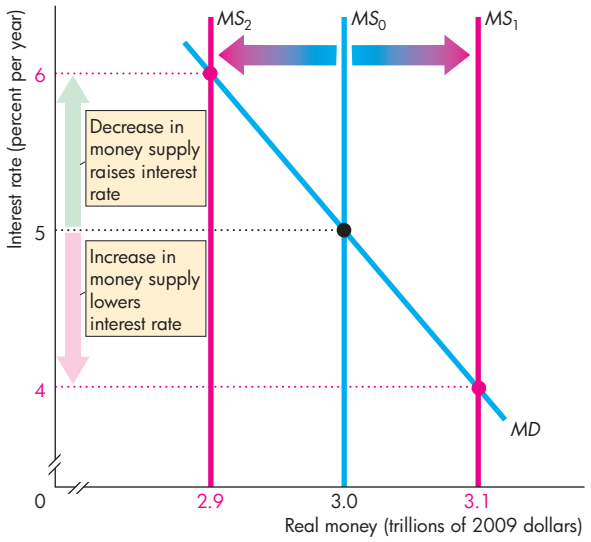
Figure 25.7 illustrates the effects of the changes in the quantity of money that we've just described. When the supply of money curve shifts rightward from MS_0 to MS_1, the interest rate falls to 4 percent a year; when the supply of money curve shifts leftward to MS_2, the interest rate rises to 6 percent a year.

Long-Run Equilibrium You've just seen how the nominal interest rate is determined in the money market at the level that makes the quantity of money demanded equal the quantity supplied by the Fed. You learned in Chapter 24 (on p. 615) that the real interest rate is determined in the loanable funds market at the level that makes the quantity of loanable funds demanded equal the quantity of loanable funds supplied. You also learned in Chapter 24 (on p. 612) that the real interest rate equals the nominal interest rate minus the inflation rate.

When the inflation rate equals the expected (or forecasted) inflation rate and when real GDP equals potential GDP, the money market, the loanable funds market, the goods market, and the labor market are in long-run equilibrium—the economy is in long-run equilibrium.

If in long-run equilibrium, the Fed increases the quantity of money, eventually a new long-run equilibrium is reached in which nothing real has changed. Real GDP, employment, the real quantity of money, and the real interest rate all return to their original levels. But something does change: the price level. The price level rises by the same percentage as the rise

FIGURE 25.7 A Change in the Quantity of Money



An increase in the quantity of money increases the supply of money. The supply of money curve shifts from MS_0 to MS_1 and the interest rate falls. A decrease in the quantity of money decreases the supply of money. The supply of money curve shifts from MS_0 to MS_2 and the interest rate rises.

MyEconLab Animation and Draw Graph

in the quantity of money. Why does this outcome occur in the long run?

The reason is that real GDP and employment are determined by the demand for labor, the supply of labor, and the production function—the real forces described in Chapter 23 (pp. 584–586); and the real interest rate is determined by the demand for and supply of (real) loanable funds—the real forces described in Chapter 24 (pp. 613–615). The only variable that is free to respond to a change in the supply of money in the long run is the price level. The price level adjusts to make the quantity of real money supplied equal to the quantity demanded.

So when the Fed changes the nominal quantity of money, in the long run the price level changes by a percentage equal to the percentage change in the quantity of nominal money. In the long run, the change in the price level is proportional to the change in the quantity of money.

The Transition from the Short Run to the Long Run

How does the economy move from the first short-run response to an increase in the quantity of money to the long-run response?

The adjustment process is lengthy and complex. Here, we'll only provide a sketch of the process. A more thorough account must wait until you've studied Chapter 27.

We start out in long-run equilibrium and the Fed increases the quantity of money by 10 percent. Here are the steps in what happens next.

First, the nominal interest rate falls (just like you saw on p. 644 and in Fig. 25.6). The real interest rate falls too, as people try to get rid of their excess money holdings and buy bonds.

With a lower real interest rate, people want to borrow and spend more. Firms want to borrow to invest and households want to borrow to invest in bigger homes or to buy more consumer goods.

The increase in the demand for goods cannot be met by an increase in supply because the economy is already at full employment. So there is a general shortage of all kinds of goods and services.

The shortage of goods and services forces the price level to rise.

As the price level rises, the real quantity of money decreases. The decrease in the quantity of real money raises the nominal interest rate and the real interest rate. As the interest rate rises, spending plans are cut back, and eventually the original full-employment equilibrium is restored. At the new long-run equilibrium, the price level has risen by 10 percent and nothing real has changed.

REVIEW QUIZ

1. What are the main influences on the quantity of real money that people and businesses plan to hold?
2. Show the effects of a change in the nominal interest rate and a change in real GDP using the demand for money curve.
3. How is money market equilibrium determined in the short run?
4. How does a change in the quantity of money change the interest rate in the short run?
5. How does a change in the quantity of money change the interest rate in the long run?

Work these questions in Study Plan 25.5 and get instant feedback. Do a Key Terms Quiz. MyEconLab

Let's explore the long-run link between money and the price level a bit further.

The Quantity Theory of Money

In the long run, the price level adjusts to make the quantity of real money demanded equal the quantity supplied. A special theory of the price level and inflation—the quantity theory of money—explains this long-run adjustment of the price level.

The **quantity theory of money** is the proposition that in the long run, an increase in the quantity of money brings an equal percentage increase in the price level. To explain the quantity theory of money, we first need to define *the velocity of circulation*.

The **velocity of circulation** is the average number of times a dollar of money is used annually to buy the goods and services that make up GDP. But GDP equals the price level (P) multiplied by *real* GDP (Y). That is,

$$GDP = PY.$$

Call the quantity of money M. The velocity of circulation, V, is determined by the equation

$$V = PY/M.$$

For example, if GDP is $1,000 billion ($PY$ = $1,000 billion) and the quantity of money is $250 billion, then the velocity of circulation is 4.

From the definition of the velocity of circulation, the *equation of exchange* tells us how M, V, P, and Y are connected. This equation is

$$MV = PY.$$

Given the definition of the velocity of circulation, the equation of exchange is always true—it is true by definition. It becomes the quantity theory of money if the quantity of money does not influence the velocity of circulation or real GDP. In this case, the equation of exchange tells us that in the long run, the price level is determined by the quantity of money. That is,

$$P = M(V/Y),$$

where (V/Y) is independent of M. So a change in M brings a proportional change in P.

We can also express the equation of exchange in growth rates,[1] in which form it states that

$$\text{Money growth rate} + \text{Rate of velocity change} = \text{Inflation rate} + \text{Real GDP growth rate}$$

ECONOMICS IN ACTION

Does the Quantity Theory Work?

On average, as predicted by the quantity theory of money, the inflation rate fluctuates in line with fluctuations in the money growth rate minus the real GDP growth rate. Figure 1 shows the relationship between money growth (M2 definition) and inflation in the United States. You can see a clear relationship between the two variables.

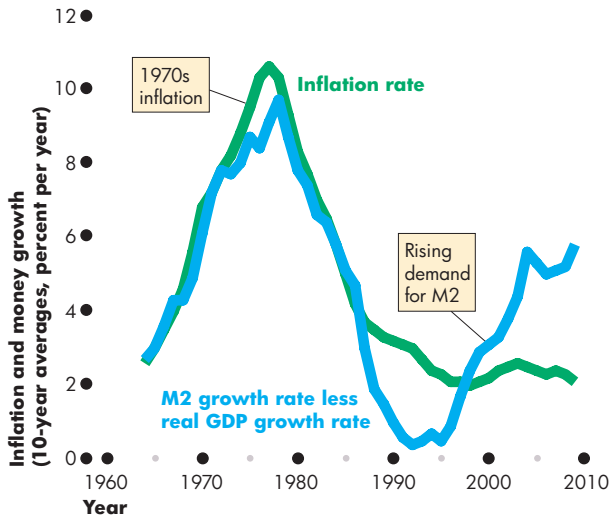


Figure 1 U.S. Money Growth and Inflation

Sources of data: Federal Reserve and Bureau of Labor Statistics.

Solving this equation for the inflation rate gives

$$\text{Inflation rate} = \text{Money growth rate} + \text{Rate of velocity change} - \text{Real GDP growth rate}$$

In the long run, the rate of velocity change is not influenced by the money growth rate. More strongly, in the long run, the rate of velocity change is

[1] To obtain this equation, begin with

$$MV = PY.$$

Then changes in these variables are related by the equation

$$V\Delta M + M\Delta V = Y\Delta P + P\Delta Y.$$

Divide this equation by the equation of exchange to obtain

$$\Delta M/M + \Delta V/V = \Delta P/P + \Delta Y/Y.$$

The term $\Delta M/M$ is the money growth rate, $\Delta V/V$ is the rate of velocity change, $\Delta P/P$ is the inflation rate, and $\Delta Y/Y$ is the real GDP growth rate.

International data also support the quantity theory. Figure 2 shows a scatter diagram of the inflation rate and the money growth rate in 134 countries and Fig. 3 shows the inflation rate and money growth rate in countries with inflation rates below 20 percent a year. You can see a general tendency for money growth and inflation to be correlated, but the quantity theory (the red line) does not predict inflation precisely.

The correlation between money growth and inflation isn't perfect, and the correlation does not tell us that money growth *causes* inflation. Money growth might cause inflation; inflation might cause money growth; or some third variable might cause both inflation and money growth. Other evidence does confirm, though, that causation runs from money growth to inflation.

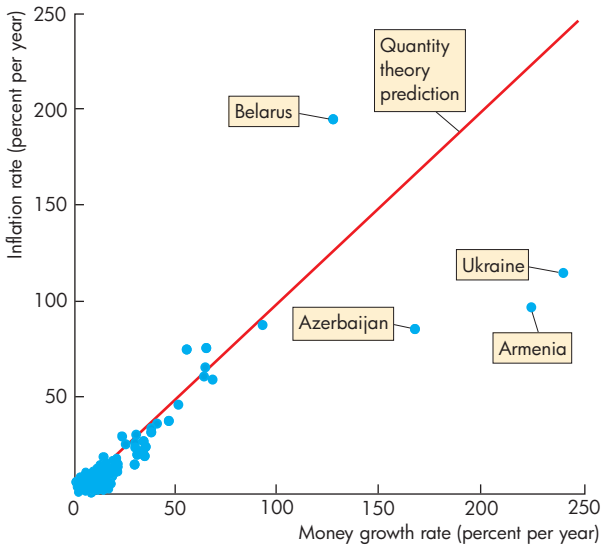


Figure 2 134 Countries: 1990–2005

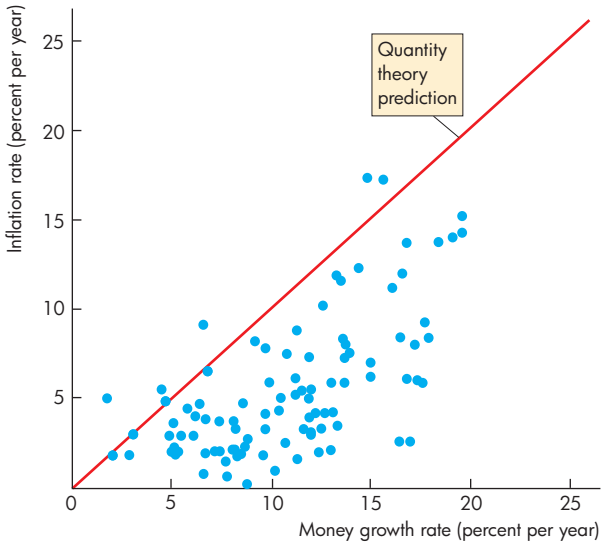


Figure 3 Lower-Inflation Countries: 1990–2005

Sources of data: International Financial Statistics Yearbook, 2008, and International Monetary Fund, *World Economic Outlook,* October 2008.

approximately zero. With this assumption, the inflation rate in the long run is determined as

$$\text{Inflation rate} = \text{Money growth rate} - \text{Real GDP growth rate}.$$

In the long run, fluctuations in the money growth rate minus the real GDP growth rate bring equal fluctuations in the inflation rate.

Also, in the long run, with the economy at full employment, real GDP equals potential GDP, so the real GDP growth rate equals the potential GDP growth rate. This growth rate might be influenced by inflation, but the influence is most likely small and the quantity theory assumes that it is zero. So the real GDP growth rate is given and doesn't change when the money growth rate changes—inflation is correlated with money growth.

REVIEW QUIZ

1 What is the quantity theory of money?
2 How is the velocity of circulation calculated?
3 What is the equation of exchange?
4 Does the quantity theory correctly predict the effects of money growth on inflation?

Work these questions in Study Plan 25.6 and get instant feedback. Do a Key Terms Quiz. MyEconLab

You now know what money is, how the banks create it, and how the quantity of money influences the nominal interest rate in the short run and the price level in the long run. *Economics in the News* on pp. 648–649 looks at what will happen to the quantity of money when interest rates begin to rise.

Money and the Interest Rate

U.S. Banks Braced for Large Deposit Outflows

The Financial Times
July 30, 2014

U.S. banks are steeling themselves for the possibility of losing as much as $1trillion in deposits as the Federal Reserve reverses its emergency economic policies and raises interest rates.

JPMorgan Chase, the biggest U.S. bank by deposits, has estimated that money funds may withdraw $100 billion in deposits in the second half of next year as the Fed uses a new tool to help wind down its asset purchase program and normalize rates.

Other banks including Citigroup, Bank of New York Mellon, and PNC Financial Services have also said they are trying to gauge the potential effect of the Fed's exit on institutional or retail depositors who might choose to switch to higher interest accounts or investments. …

An outflow of deposits would be a reversal of a five-year trend that has seen significant amounts of extra cash poured into banks, thanks to the Fed flooding the financial system with liquidity. These deposits, which act as a cheaper source of funding, have helped banks weather the aftermath of the financial crisis.

Now the worry is that such deposit funding may prove fleeting as the Fed retreats. Banks might have to pay higher rates on deposits to retain customers—potentially hitting their profits and sparking a price war for client funds. …

JPMorgan's $100 billion in projected outflows is roughly 7.8 percent of its deposit base as of the first quarter, according to SNL Financial. …

ESSENCE OF THE STORY

- When the Fed starts to raise interest rates, U.S. bank deposits might decrease by $1 trillion.
- JPMorgan Chase estimates that its deposits will fall by $100 billion (7.8 percent of deposits) in the second half of 2015 if interest rates return to normal.
- A decrease in deposits would be a reversal of a five-year trend.
- Banks might have to pay higher interest rates on deposits.

MyEconLab More Economics in the News

ECONOMIC ANALYSIS

- A global financial crisis started quietly in the summer of 2007.
- In 2006, on the eve of the crisis, the interest rate on U.S. Treasury bills was 4.7 percent and the quantity of M2 money was a bit more than $7 trillion.
- Between 2006 and 2009, the interest rate fell to almost zero and it remained near zero through 2014 (see Fig. 1).
- Between 2006 and 2014, the quantity of M2 money increased by $2.8 trillion, an annual average growth rate of 6.6 percent (see Fig. 2).
- Of the $2.8 trillion increase in M2, bank deposits increased by $2.4 trillion and currency in circulation increased by $0.4 trillion.
- You've learned in this chapter that the quantity of money demanded depends inversely on the interest rate. So it is to be expected that a falling interest rate would bring an increasing quantity of money.
- Figure 3 shows this inverse relationship in the past 20 years (1993–2013). The demand for money is influenced by GDP, so the graph removes the influence of GDP by measuring the quantity of real M2 as a percentage of GDP.
- In Fig. 3, each red dot represents the quantity of money and the interest rate in a given year and the blue curve is the demand for M2 curve.
- Figure 3 highlights the bankers' concerns discussed in the news article, which reports that the banks expect deposits to decrease by $1 trillion if interest rates return to normal.
- The news article does not tell us what the bankers regard as normal. We can use the demand for M2 curve in Fig. 3 to find the quantity of money that will be held at different possible normal interest rates.
- At an interest rate of 1 percent per year the quantity of M2 demanded in Fig. 3 is 52.5 percent of GDP or $8.2 trillion.
- At an interest rate of zero, the quantity of M2 demanded is 64 percent of GDP, which is $10 trillion.
- So, based on the demand for M2 curve in Fig. 3, the quantity of M2 demanded will decrease by $1.8 trillion if the interest rate rises to 1 percent per year.
- Most of the decrease in the quantity of M2 demanded will be a decrease in bank deposits.
- The outcome for which the bankers are bracing themselves looks optimistic!

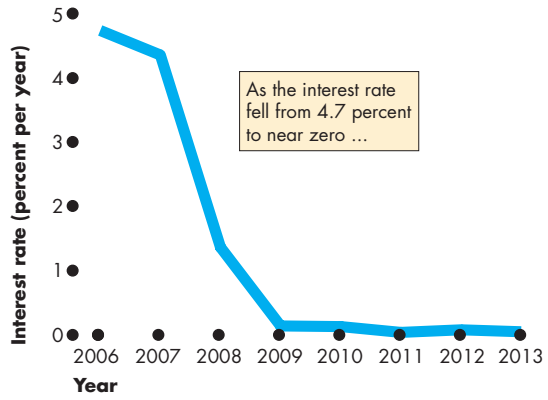


Figure 1 The Falling Interest Rate

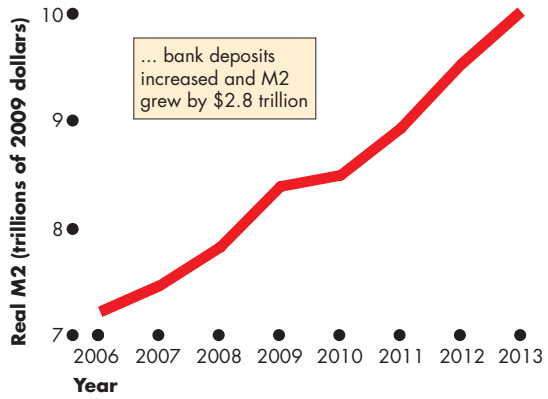


Figure 2 The Increasing Quantity of M2

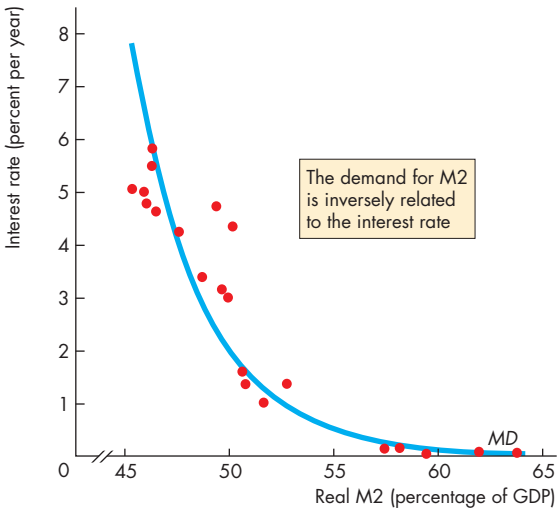


Figure 3 The Demand for M2

MATHEMATICAL NOTE

The Money Multiplier

This note explains the basic math of the money multiplier and shows how the value of the multiplier depends on the banks' desired reserve ratio and the currency drain ratio.

To make the process of money creation concrete, we work through an example for a banking system in which each bank has a desired reserve ratio of 10 percent of deposits and the currency drain ratio is 50 percent of deposits. (Although these ratios are larger than the ones in the U.S. economy, they make the process end more quickly and enable you to see more clearly the principles at work.)

The figure keeps track of the numbers. Before the process begins, all the banks have no excess reserves. Then the monetary base increases by $100,000 and one bank has excess reserves of this amount.

The bank lends the $100,000 of excess reserves. When this loan is made, new money increases by $100,000.

Some of the new money will be held as currency and some as deposits. With a currency drain ratio of 50 percent of deposits, one third of the new money will be held as currency and two thirds will be held as deposits. That is, $33,333 drains out of the banks as currency and $66,667 remains in the banks as deposits. The increase in the quantity of money of $100,000 equals the increase in deposits plus the increase in currency holdings.

The increased bank deposits of $66,667 generate an increase in desired reserves of 10 percent of that amount, which is $6,667. Actual reserves have increased by the same amount as the increase in deposits: $66,667. So the banks now have excess reserves of $60,000.

The process we've just described repeats but begins with excess reserves of $60,000. The figure shows the next two rounds. At the end of the process, the quantity of money has increased by a multiple of the increase in the monetary base. In this case, the increase is $250,000, which is 2.5 times the increase in the monetary base.

The sequence in the figure shows the first stages of the process that finally reaches the total shown in the final row of the "money" column.

To calculate what happens at the later stages in the process and the final increase in the quantity of

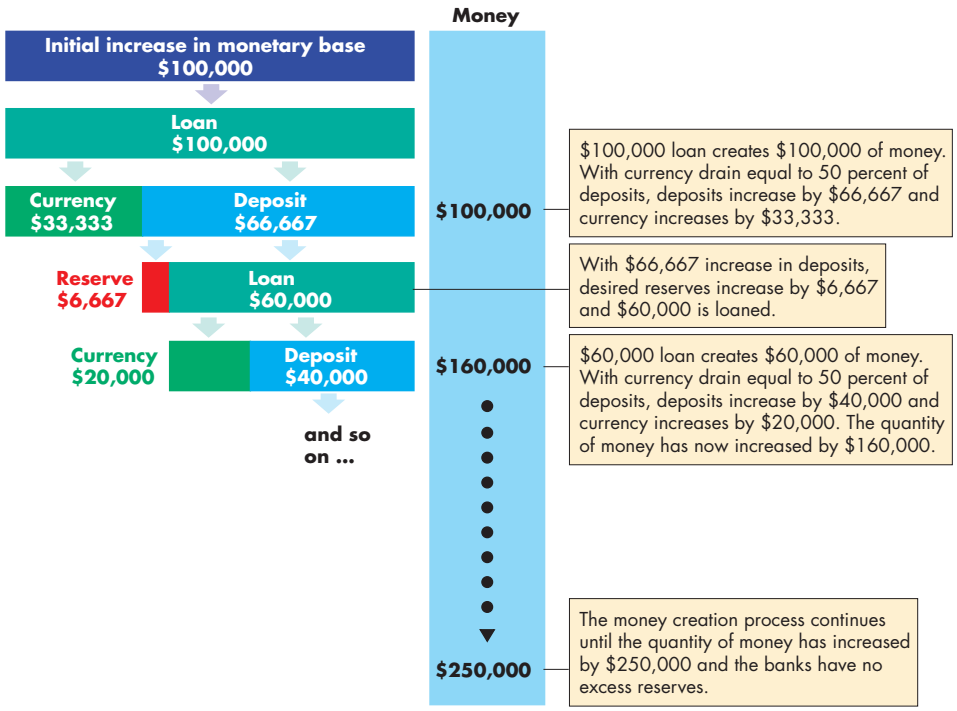


Figure 1 The Money Creation Process

money, look closely at the numbers in the figure. The initial increase in reserves is $100,000 (call it A). At each stage, the loan is 60 percent (0.6) of the previous loan and the quantity of money increases by 0.6 of the previous increase. Call that proportion L ($L = 0.6$). We can write down the complete sequence for the increase in the quantity of money as

$$A + AL + AL^2 + AL^3 + AL^4 + AL^5 + \ldots .$$

Remember, L is a fraction, so at each stage in this sequence, the amount of new loans and new money gets smaller. The total value of loans made and money created at the end of the process is the sum of the sequence, which is[1]

$$A/(1 - L).$$

If we use the numbers from the example, the total increase in the quantity of money is

$$\$100{,}000 + 60{,}000 + 36{,}000 + \ldots$$

$$= \$100{,}000\ (1 + 0.6 + 0.36 + \ldots)$$

$$= \$100{,}000\ (1 + 0.6 + 0.6^2 + \ldots)$$

$$= \$100{,}000 \times 1/(1 - 0.6)$$

$$= \$100{,}000 \times 1/(0.4)$$

$$= \$100{,}000 \times 2.5$$

$$= \$250{,}000.$$

The magnitude of the money multiplier depends on the desired reserve ratio and the currency drain ratio. Let's explore this relationship

The money multiplier is the ratio of money to the monetary base. Call the money multiplier *mm*, the quantity of money M, and the monetary base MB.

[1]The sequence of values is called a convergent geometric series. To find the sum of a series such as this, begin by calling the sum S. Then write the sum as

$$S = A + AL + AL^2 + AL^3 + AL^4 + AL^5 + \ldots .$$

Multiply by L to get

$$LS = AL + AL^2 + AL^3 + AL^4 + AL^5 + \ldots$$

and then subtract the second equation from the first to get

$$S(1 - L) = A$$

or

$$S = A/(1 - L).$$

Then

$$mm = M/MB.$$

Next recall that money, M, is the sum of deposits and currency. Call deposits D and currency C. Then

$$M = D + C.$$

Finally, recall that the monetary base, MB, is the sum of banks' reserves and currency. Call banks' reserves R. Then

$$MB = R + C.$$

Use the equations for M and MB in the *mm* equation to give:

$$mm = M/MB = (D + C)/(R + C).$$

Now divide all the variables on the right side of the equation by D to give:

$$mm = M/MB = (1 + C/D)/(R/D + C/D).$$

In this equation, C/D is the currency drain ratio and R/D is the banks' reserve ratio. If we use the values in the example on the previous page, C/D is 0.5 and R/D is 0.1, and

$$mm = (1 + 0.5)/(0.1 + 0.5).$$

$$= 1.5/0.6 = 2.5.$$

The U.S. Money Multiplier

The money multiplier in the United States can be found by using the formula above along with the values of C/D and R/D in the U.S. economy.

Because we have two definitions of money, M1 and M2, we have two money multipliers. Call the M1 deposits $D1$ and call the M2 deposits $D2$.

The numbers for M1 in 2014 are $C/D1 = 0.81$ and $R/D1 = 1.69$. So

$$\text{M1 multiplier} = (1 + 0.81)/(1.69 + 0.81) = 0.72.$$

The numbers for M2 in 2014 are $C/D2 = 0.13$ and $R/D2 = 0.26$, so

$$\text{M2 multiplier} = (1 + 0.13)/(0.26 + 0.13) = 2.90.$$

SUMMARY

Key Points

What Is Money? (pp. 628–630)

- Money is the means of payment. It functions as a medium of exchange, a unit of account, and a store of value.
- Today, money consists of currency and deposits.

Working Problems 1 and 2 will give you a better understanding of what money is.

Depository Institutions (pp. 631–634)

- Commercial banks, S&Ls, savings banks, credit unions, and money market mutual funds are depository institutions whose deposits are money.
- Depository institutions provide four main economic services: They create liquidity, minimize the cost of obtaining funds, minimize the cost of monitoring borrowers, and pool risks.

Working Problem 3 will give you a better understanding of depository institutions.

The Federal Reserve System (pp. 635–638)

- The Federal Reserve System is the central bank of the United States.
- The Fed influences the quantity of money by setting the required reserve ratio, making last resort loans, and by conducting open market operations.
- When the Fed buys securities in an open market operation, the monetary base increases; when the Fed sells securities, the monetary base decreases.

Working Problem 4 will give you a better understanding of the Federal Reserve System.

How Banks Create Money (pp. 638–641)

- Banks create money by making loans.
- The total quantity of money that can be created depends on the monetary base, the desired reserve ratio, and the currency drain ratio.

Working Problems 5 and 6 will give you a better understanding of how banks create money.

The Money Market (pp. 642–645)

- The quantity of money demanded is the amount of money that people plan to hold.
- The quantity of real money equals the quantity of nominal money divided by the price level.
- The quantity of real money demanded depends on the nominal interest rate, real GDP, and financial innovation.
- The nominal interest rate makes the quantity of money demanded equal the quantity supplied.
- When the Fed increases the quantity of money, the nominal interest rate falls (the short-run effect).
- In the long run, when the Fed increases the quantity of money, the price level rises and the nominal interest rate returns to its initial level.

Working Problem 7 will give you a better understanding of the money market.

The Quantity Theory of Money (pp. 646–647)

- The quantity theory of money is the proposition that money growth and inflation move up and down together in the long run.

Working Problem 8 will give you a better understanding of the quantity theory of money.

Key Terms

MyEconLab Key Terms Quiz

Central bank, 635
Currency, 629
Currency drain ratio, 639
Demand for money, 643
Depository institution, 631
Desired reserve ratio, 639
Excess reserves, 639
Federal funds rate, 631
Federal Open Market Committee, 635
Federal Reserve System (the Fed), 635
Lender of last resort, 638
M1, 629
M2, 629
Means of payment, 628
Monetary base, 636
Money, 628
Money multiplier, 640
Open market operation, 636
Quantity theory of money, 646
Required reserve ratio, 638
Reserves, 631
Velocity of circulation, 646

WORKED PROBLEM

MyEconLab You can work this problem in Chapter 25 Study Plan.

In June 2014, individuals and businesses held

- $50 billion in currency and no traveler's checks
- $1,000 billion in checkable deposits
- $5,000 billion in savings deposits
- $500 billion in time deposits
- $250 billion in money market funds and other deposits.

In June 2014, banks held

- $450 billion in currency
- $100 billion in reserves at the central bank
- $800 billion in loans to households and businesses

Questions

1. Calculate the M1 and M2 measures of money.
2. Calculate the monetary base.
3. What are the currency drain ratio and the banks' reserve ratio?
4. What are the M1 and M2 money multipliers?
5. How is the money multiplier influenced by the banks' reserve ratio?

Solutions

1. M1 is the quantity of money held by individuals and businesses in the form of checkable deposits and currency.

   M1 = $1,000 billion + $50 billion = $1,050 billion.

   M2 is M1 plus other types of deposits and money market mutual funds held by individuals and businesses.

   M2 = $1,050 billion + $5,000 billion + $500 billion + $250 billion = $6,800 billion.

Key Point: M1 is a narrow measure of money that consists of checkable deposits and currency held by individuals and businesses.

M2 is a broad measure of money that consists of M1 plus other deposits and money market mutual funds of individuals and businesses.

2. Monetary base is the sum of bank reserves held at the central bank and currency issued by the central bank.

   Currency issued by the central bank is the currency held by individuals, businesses, and banks.

   Monetary base = $100 billion + $450 billion + $50 billion = $600 billion

Key Point: Monetary base equals the central bank's liabilities—bank reserves held at the central bank and currency issued by the central bank.

3. Currency drain ratio = (Currency held by individuals and businesses ÷ Checkable deposits) × 100.

   Currency drain ratio = ($50 billion ÷ $1,000 billion) × 100 = 5 percent.

   Banks' reserve ratio = (Bank reserves ÷ Checkable deposits) × 100.

   Bank reserves = Currency held by banks + reserves at the central bank.

   Bank reserves = $450 billion + $100 billion = $550 billion.

   Banks' reserve ratio = ($550 billion ÷ $1,000 billion) × 100 = 55 percent.

Key Point: Currency drain ratio is the ratio of currency to checkable deposits held by individuals and businesses, expressed as a percentage.

Banks' reserve ratio is ratio of bank reserves to bank deposits, expressed as a percentage.

4. M1 money multiplier = M1 ÷ Monetary base = $1,050 billion ÷ $600 billion = 1.75.

   M2 money multiplier = M2 ÷ Monetary base = $6,800 billion ÷ $600 billion = 11.33.

Key Point: The money multiplier is the number by which the monetary base is multiplied to equal the quantity of money.

5. Money M is the sum of deposits D and currency C held by individuals and businesses.

   Monetary base MB is the sum of reserves R and currency C.

   Money multiplier = $(D + C) \div (R + C)$

   An increase in the banks' reserves R with no change in D increases the banks' reserve ratio and decreases the money multiplier.

Key Point: The money multiplier equals $(1 + C/D) \div (R/D + C/D)$, where C/D is the currency drain ratio and R/D is the banks' reserve ratio. An increase in the banks' reserve ratio decreases the money multiplier.

STUDY PLAN PROBLEMS AND APPLICATIONS

MyEconLab You can work Problems 1 to 9 in Chapter 25 Study Plan and get instant feedback. Problems marked update with real-time data.

What Is Money? (Study Plan 25.1)

1. Money in the United States today includes which of the following items? Cash in Citibank's cash machines; U.S. dollar bills in your wallet; your Visa card; your loan to pay for school fees.
2. In June 2013, currency held by individuals and businesses was $1,124 billion; traveler's checks were $4 billion; checkable deposits owned by individuals and businesses were $1,402 billion; savings deposits were $6,884 billion; time deposits were $583 billion; and money market funds and other deposits were $647 billion. Calculate M1 and M2 in June 2013.

Depository Institutions (Study Plan 25.2)

3. **Europe's Banks Must Be Forced to Recapitalize**
   E.U. banks must hold more capital. Where private funding is not forthcoming, recapitalization must be imposed by E.U. governments.
   Source: *The Financial Times*, November 24, 2011

   What is the "capital" referred to in the news clip? How might the requirement to hold more capital make banks safer?

The Federal Reserve System (Study Plan 25.3)

4. The FOMC sells $20 million of securities to Wells Fargo. Enter the transactions that take place to show the changes in the following balance sheets.

Federal Reserve Bank of New York

Assets (millions)	Liabilities (millions)

Wells Fargo

Assets (millions)	Liabilities (millions)

How Banks Create Money (Study Plan 25.4)

5. In the economy of Nocoin, bank deposits are $300 billion. Bank reserves are $15 billion, of which two thirds are deposits with the central bank. Households and firms hold $30 billion in bank notes. There are no coins. Calculate
   a. The monetary base and quantity of money.
   b. The banks' desired reserve ratio and the currency drain ratio (as percentages).

6. **China Cuts Banks' Reserve Ratios**
   The People's Bank of China announces it will cut the required reserve ratio.
   Source: *The Financial Times*, February 19, 2012

   Explain how lowering the required reserve ratio will impact banks' money creation process.

The Money Market (Study Plan 25.5)

7. The spreadsheet provides data about the demand for money in Minland. Columns A and B show the demand for money schedule when real GDP (Y_0) is $10 billion and Columns A and C show the demand for money schedule when real GDP (Y_1) is $20 billion. The quantity of money is $3 billion.

	A	B	C
1	r	Y_0	Y_1
2	7	1.0	1.5
3	6	1.5	2.0
4	5	2.0	2.5
5	4	2.5	3.0
6	3	3.0	3.5
7	2	3.5	4.0
8	1	4.0	4.5

   What is the interest rate when real GDP is $10 billion? Explain what happens in the money market in the short run if real GDP increases to $20 billion.

The Quantity Theory of Money (Study Plan 25.6)

8. In year 1, the economy is at full employment and real GDP is $400 million, the GDP deflator is 200 (the price level is 2), and the velocity of circulation is 20. In year 2, the quantity of money increases by 20 percent. If the quantity theory of money holds, calculate the quantity of money, the GDP deflator, real GDP, and the velocity of circulation in year 2.

Mathematical Note (Study Plan 25.MN)

9. In Problem 5, the banks have no excess reserves. Suppose that the central bank in Nocoin increases bank reserves by $0.5 billion.
   a. Explain what happens to the quantity of money and why the change in the quantity of money is not equal to the change in the monetary base.
   b. Calculate the money multiplier.

ADDITIONAL PROBLEMS AND APPLICATIONS

MyEconLab You can work these problems in MyEconLab if assigned by your instructor.

What Is Money?

10. Kristin deposits $5,000 cash into her savings account at the First National Bank. What is the immediate change in M1 and M2?
11. Rapid inflation in Brazil in the early 1990s caused the cruzeiro to lose its ability to function as money. Which of the following commodities would most likely have taken the place of the cruzeiro in the Brazilian economy? Explain why.
    a. Tractor parts
    b. Packs of cigarettes
    c. Loaves of bread
    d. Impressionist paintings
    e. Baseball trading cards
12. **Are You Ready to Pay by smartphone?**
    Starbucks customers can now pay for their coffee using their smartphone. Does this mean the move to electronic payments is finally coming?
    Source: *The Wall Street Journal*, January 20, 2011

    If people can use their smartphone to make payments, will currency disappear? How will the components of M1 change?

Depository Institutions

Use the following news clip to work Problems 13 and 14.

The World's 29 Too Big to Fail Banks, JP Morgan at the Top

The Financial Stability Board has released the latest list of the world's too-big-to-fail banks. Each year, the board examines banks to decide which ones pose a threat to the global economy if they were to fail. Those on the list of too-big-to-fail must hold more capital to absorb potential losses, and therefore protect taxpayers from bailouts. In 2013, JPM and HSBC top the list. This means they must each hold an extra 2.5% of capital on top of the additional 7% that will be required down the road.

Source: www.forbes.com, November 11, 2013

13. Explain how the failure of big banks would be disastrous for the economy?
14. Should such banks receive financial support from their governments to avoid failure?

The Federal Reserve System

15. Explain the distinction between a central bank and a commercial bank.
16. If the Fed makes an open market sale of $1 million of securities to a bank, what initial changes occur in the economy?
17. Set out the transactions that the Fed undertakes to increase the quantity of money.
18. Describe the Fed's assets and liabilities. What is the monetary base and how does it relate to the Fed's balance sheet?
19. **Fed Minutes Show Active Discussion of QE3**
    The FOMC discussed "a new large-scale asset purchase program" commonly called "QE3." Some FOMC members said such a program could help the economy by lowering long-term interest rates and making financial conditions more broadly easier. They discussed whether a new program should snap up more Treasury bonds or buy mortgage-backed securities issued by the likes of Fannie Mae and Freddie Mac.
    Source: *The Wall Street Journal*, August 22, 2012

    What would the Fed do to implement QE3, how would the monetary base change, and how would bank reserves change?

How Banks Create Money

20. Banks in New Transylvania have a desired reserve ratio of 10 percent of deposits and no excess reserves. The currency drain ratio is 50 percent of deposits. Now suppose that the central bank increases the monetary base by $1,200 billion.
    a. How much do the banks lend in the first round of the money creation process?
    b. How much of the initial amount lent flows back to the banking system as new deposits?
    c. How much of the initial amount lent does not return to the banks but is held as currency?
    d. Why does a second round of lending occur?