Chapter 13 (25)

Money, Banks, and the Federal Reserve System

Chapter Summary

Money plays a key role in the functioning of an economy by facilitating trade in goods and services and by making specialization possible. No advanced economy can prosper without specialization. This chapter explores the functions of money, the definitions of money, and how banks create money.

A *barter economy* is an economy that does not use money and in which people trade goods and services directly for other goods and services. Because barter is inefficient, there is strong incentive to use **money**, which is any **asset** that people are generally willing to accept in exchange for goods or services or in payment of debts. Money has four functions. It is:

1. a medium of exchange
2. a unit of account
3. a store of value
4. a standard of deferred payment

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

Reserves are deposits that the bank has retained rather than loaned out or invested. **Required reserves** are reserves that banks are legally required to hold. The fraction of deposits that banks are required to keep as reserves is called the **required reserve ratio**. Any reserves banks hold over and above the legal requirement are called **excess reserves**. When a bank accepts a deposit, it keeps only a fraction of the funds as reserves and loans out the remainder. In making a loan, a bank increases the checking account balance of the borrower. When the borrower uses a check to buy something with the funds the bank has loaned, the seller deposits the check in his bank. The seller's bank keeps part of the deposit as reserves and loans out the remainder. This process continues until no banks have excess reserves. In this way, the process of banks making new loans increases the volume of checking account balances and the money supply. The **simple deposit multiplier** is the ratio of the amount of deposits created by banks to the amount of new reserves. An expression for the simple deposit multiplier is $1/RR$.

The United States has a **fractional reserve banking system** in which banks keep less than 100 percent of deposits as reserves. In a **bank run**, many depositors decide simultaneously to withdraw money from a bank. In a **bank panic**, many banks experience runs at the same time. The **Federal Reserve System** (the Fed) is the central bank of the United States. It was originally established in 1913 to stop bank panics, but

today its main role is to carry out *monetary policy*. **Monetary policy** refers to the actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy objectives. The Fed's three monetary policy tools are open market operations, discount policy, and reserve requirements. **Open market operations** are the buying and selling of Treasury securities by the Federal Reserve. The loans the Fed makes to banks are called **discount loans**, and the interest rate the Fed charges on discount loans is the **discount rate**. The **Federal Open Market Committee (FOMC)** meets in Washington, DC, eight times per year to discuss monetary policy.

The *quantity equation* relates the money supply to the price level: $M \times V = P \times Y$, where M is the money supply, V is the *velocity of money*, P is the price level, and Y is real output. The **velocity of money** is the average number of times each dollar in the money supply is spent during the year. Economist Irving Fisher developed the **quantity theory of money**, which assumes that the velocity of money is constant.

Learning Objectives

When you finish this chapter, you should be able to:

1. **Define money and discuss its four functions.** A **barter economy** is an economy that does not use money and in which people trade goods and services directly for other goods and services. Barter trade only occurs if there is a *double coincidence of wants*, where both parties to the trade want what the other one has. Because barter is inefficient, there is strong incentive to use **money,** which is anything that people are generally willing to accept in exchange for goods or services or in payment of debts. Money has four functions: a medium of exchange, a unit of account, a store of value, and a standard of deferred payment. The *gold standard* was a monetary system under which the government produced gold coins and paper currency convertible into gold. The gold standard collapsed in the early 1930s. Today, no government in the world issues paper currency that can be redeemed for gold. Instead, paper currency is **fiat money**, which has no value except as money.

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

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

4. **Discuss the three policy tools the Federal Reserve uses to manage the money supply.** The Federal Reserve System (the Fed) is the central bank of the United States and was created by Congress in 1913. It was originally established to stop banking panics, but today its main role is to control the money supply. **Monetary policy** refers to the actions the Federal Reserve takes to manage the money supply and interest rates to pursue economic objectives. The Fed's three monetary policy tools are: open market operations, discount policy, and reserve requirements. **Open market operations** are the buying and selling of Treasury securities by the Federal Reserve. The loans the Fed makes to banks are called **discount loans**, and the interest rate the Fed charges on discount loans is the **discount rate**. The **Federal Open Market Committee (FOMC)** meets in Washington, D.C. every six weeks to discuss monetary policy. Required reserves are the reserves that the Fed requires banks to hold, based on their checking account deposits.

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

Chapter Review

Chapter Opener: McDonald's Money Problems in Argentina (pages 430-431)

Money is an asset with one special feature: It can be used to purchase goods and services. Today our money has value not because of the materials used to make it, but because people have confidence that if they accept it in exchange for goods and services they will be able to use it to purchase goods and services. In Argentina recently, the public lost confidence in the official currency, the peso, and people resorted to using barter (or U.S. dollars) instead of using Argentina's official money. One Argentine province decided to issue its own money, called the patacone. McDonalds franchises in Argentina decided to accept that new currency for a meal they labeled the Patacombo: two cheeseburgers, an order of French fries, and a soft drink. When people lack confidence in money, there are serious macroeconomic consequences.

📖 Helpful Study Hint

Read *An Inside Look* at the end of the chapter to learn how China's central bank is trying to control the money supply by raising banks' reserve requirement in order to slow bank lending.

Would you like to live in a country where the purchasing power of your money rose every year? The *Economics in YOUR Life!* at the start of this chapter poses this question. Keep the question in mind as you read the chapter. The authors will answer the question at the end of the chapter.

13.1 What is Money and Why Do We Need It? (432-435)

Learning Objective 1   Define money and discuss its four functions.

Money is an asset that people are generally willing to accept in exchange for goods and services or payments of debts. Economies where goods and services are traded for other goods and services are called barter economies. Societies evolve from barter economies to economies that use money for transactions. Money serves several functions. It is a:

- ▪   *Medium of exchange*. Money is the asset that we use to buy goods and services. In the United States, we buy and sell goods and services using dollars.
- ▪   *Unit of account*. All goods and services are priced in terms of money. In the United States, goods and services are priced in dollars.
- ▪   *Store of value*. Dollars not spent on goods and services in one time period can be held for use in the future.
- ▪   *Standard for deferred payments*. In the United States, contracts involving future payments are usually written specifying payment in dollars.

For an asset to serve as a medium of exchange, it must be generally acceptable, of standardized quality, durable, valuable relative to its weight, and divisible. At one time, all money was commodity money. Commodity money has usefulness as money or as a commodity (such as a gold coin, which can be used as a coin or as jewelry). **Commodity money** can be awkward to use and inefficient, so all countries have replaced commodity money with fiat money. **Fiat money**, such as dollar bills in the United States, has no value as a commodity and is money because it has been declared money by the government and because people have confidence in it.

Extra Solved Problem 13-1

Chapter 13 of the textbook includes two Solved Problems. Here is an extra Solved Problem to help you build your skills solving economic problems:

Unit of Account and the Number of Unique Prices

Supports Learning Objective 1: Define money and discuss its four functions.

One of the functions of money is to serve as a unit of account. The prices of goods are expressed in terms of the thing we call money. This makes comparisons easier. Suppose music CDs cost $10, and DVDs cost $20. So, we can say CDs cost twice as much as DVDs. Without money, each good would have to be priced in terms of all other goods. If an economy has 100 different goods, how many prices will there be in this system?

SOLVING THE PROBLEM

Step 1: **Review the chapter material.**
This problem is about the function of money called unit of account, so you may want to review the section "The Functions of Money," which begins on page 433 in the textbook.

Step 2: **Calculate the number of prices.**
If the economy had three goods, *A*, *B*, and *C*, then there would be a price between *A* and *B*, between *A* and *C*, and between *B* and *C*, or three unique prices. For more than three goods, the formula we would use is n x $[(n-1)/2]$, where n is the number of goods, so in an economy with 100 goods, the number of unique prices is 100 x (99/2) = 4,950 prices. Each good would have a price tag with 99 different prices written on it.

📖 Helpful Study Hint

Read ***Making the Connection: Money Without a Government? The Strange Case of the Iraqi Dinar*** for an example of how something without value can be used as money as long as people are willing to accept it in exchange for goods and services. Even after the fall of Saddam Hussein's government in 2003, the currency with his picture on it—the dinar—continued to circulate. Iraqis somewhat preferred the dinar to the U.S. dollar, because the dinar was more familiar to them. Eventually the old Saddam dinar was replaced with a new dinar printed by the new Iraqi government.

13.2 LEARNING OBJECTIVE

13.2 How Is Money Measured in the United States Today? (pages 436-440)

Learning Objective 2 Discuss the definitions of the money supply used in the United States today.

In the United States, the Federal Reserve System uses two definitions of the money supply. The two definitions of money are based on the different functions of money. The current definitions of money are:

M1, which includes:
▪ currency – currency is all the paper money and coins in circulation (in circulation means not held by banks or the government)
▪ checking account balances at banks
▪ the value of outstanding traveler's checks

M2, which includes:
▪ M1
▪ savings accounts and small (less than $100,000) time deposits accounts, such as certificates of deposit (CDs)
▪ money market deposit accounts at banks
▪ noninstitutional money market share funds

The M1 definition of money is more closely related to the function of money as a medium of exchange, while the M2 definition of money adds assets that are thought of as stores of value. We can write checks against M1 checking account deposits, but we can't write checks against savings accounts and CDs. Because checking accounts are a part of M1, banks play an important role in determining the supply of money and how the supply of money changes.

📖 Helpful Study Hint

Do you have pennies in your wallet? Would you bother picking up a penny if you saw it on the sidewalk? Read *Making the Connection: Do We Still Need the Penny?* to learn why some economists recommend we stop producing the penny. It now costs about 4 cents to print a $20 bill, and it costs more than 1 cent to produce a penny. In the 1980's, to reduce costs of producing pennies, the U.S. government switched from copper to zinc. There have been many suggestions to deal with the higher costs of producing pennies, such as rounding transactions to the nearest 5 cents and eliminating pennies from our currency. Some fear that this rounding will usually result in rounding up of transactions, creating a rounding tax. Evidence, however, indicates that the number of transactions that would be rounded up is about equal to the number of transactions that would be rounded down.

Read *Don't Let this Happen to YOU!* for tips on how to distinguish income from wealth. Remember that we use money to measure income and wealth. Someone that has wealth of $10 million may not have $10 million of the medium of exchange, but has assets, which when valued in money terms (for instance, they may own a house worth $500,000) add up to $10 million.

13.3 LEARNING OBJECTIVE

13.3 How Do Banks Create Money? (pages 440–448)

Learning Objective 3   Explain how banks create money.

In the United States, checking account deposit balances are about half of M1. Checking accounts at banks are owned by households, business firms, and the government. One way to look at bank operations is to look at a bank's balance sheet. The balance sheet lists what the bank owns (assets), what the bank owes (liabilities), and its stockholders' equity. The bank's net worth is the difference between the values of the bank's assets and the value of its liabilities. By definition, then:

$$\text{Assets} = \text{Liabilities} + \text{Stockholders' equity.}$$

A sample balance sheet for a bank, Andover Bank, might look as follows with assets listed on the left-hand side and liabilities and stockholders' equity on the right-hand side (values are in thousands of dollars):

Assets		Liabilities and Stockholders' Equity	
Reserves	$2,737	Deposits	$69,380
		Short-Term Borrowing	3,217
Loans and Securities	87,908	Long-Term Borrowing	12,558
		Other Liabilities	5,492
Buildings	2,142	Total Liabilities	90,647
Other Assets	7,882		
		Stockholders' Equity	10,022
Total Assets	$100,669	Total Liabilities and Stockholders' Equity	$100,669

Banks do not keep all their deposits as cash. Most banks are required by law to keep 10 percent of their deposits either physically in the bank, as vault cash, or on deposit at their regional Federal Reserve Bank. Vault cash plus deposits at the Fed are called the bank's **reserves**. Reserves are deposits that have not been loaned out or used to purchase securities. The amount of reserves a bank must keep, called **required reserves**, is determined by the **required reserve ratio** (*RR*). If a bank has more reserves than required, these reserves are called **excess reserves**.

$$\text{Excess reserves} = \text{Reserves} - \text{Required reserves}$$

We can use a T-account to look at changes in a bank's balance sheet. A T-account is a stripped down version of a balance sheet that shows only how a transaction changes a bank's balance sheet. Suppose that someone deposits $5,000 in currency in her checking account. The bank now has additional deposits and additional reserves, both equal to $5,000. The balance sheet's changes are shown in the T-account below:

Andover Bank

Assets		Liabilities	
Reserves	+$5,000	Deposits	+$5,000

📖 Helpful Study Hint

To keep the balance sheet balanced, the change in assets must be equal to the change in liabilities plus the change in stockholders' equity.

📖 Helpful Study Hint

Notice that this $5,000 deposit did not change the money supply, because the increase in deposits is matched by an equal decrease in currency held by the public.

Banks are required to keep only 10 percent of their deposits as reserves. In this case, required reserves will increase by $500 ($500 = 0.1 x $5,000). This bank now has $4,500 in excess reserves; that is, reserves over and above the level of required reserves. The bank can use these funds to grant loans or purchase securities. If the bank loans $4,500 to an individual, the bank will deposit $4,500 in the borrower's checking account. After this loan, the changes in the bank's balance sheet look like this:

Andover Bank

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

When the person who received the loan purchases goods and services using a check written against the deposits created by the loan, Andover Bank will lose reserves to another bank. Andover Bank loses these reserves because the check written by the borrower will be presented to Andover Bank for payment by the bank that receives the check. The changes in Andover Bank's balance sheet will then look like this:

Andover Bank

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

If we assume the bank that receives the check is Bank of America, then Bank of America's balance sheet will also change:

Bank of America

Assets		Liabilities	
Reserves	+$4,500	Deposits	+$4,500

📖 Helpful Study Hint

Notice that the Andover Bank's loan caused an increase in the supply of money. After the loan, there was a new deposit account of $4,500. This deposit may leave Andover Bank, but it stays in the banking system as a whole. In our example, the check from the loan is deposited in the Bank of America. So, we started the story with $5,000 in currency, and we now have $5,000 less in currency because the currency is inside the banking system and so is not counted in the money supply. However, we have $9,500 more in checking account deposits. So, the money supply has increased by $4,500 (or, $9,500 − $5,000).

📖 Helpful Study Hint

Bank loans increase the money supply by the amount of the loan.

Bank of America now has excess reserves of $4,050, because it needs to keep only 10 percent of its new deposit of $4,500 as reserves ($4,500 – (0.01 x $4,500) = $4,050). Suppose Bank of America grants a loan for the amount of their excess reserves. Then the changes in Bank of America's balance sheet will look like this:

Bank of America

Assets		Liabilities	
Reserves	+$4,500	Deposits	+$4,500
Loans	+$4,050	Deposits	+$4,050

This loan created new deposits, and new money of $4,050. After the funds for that loan are used and a check in that amount is presented to Bank of America for payment, the changes in that bank's balance sheet will look like this:

Bank of America

Assets		Liabilities	
Reserves	+ $450	Deposits	+$4,500
Loans	+$4,050		

📖 Helpful Study Hint

Notice that at this point, Bank of America has no excess reserves.

📖 Helpful Study Hint

The newly created money at the Bank of America is not lost when it is loaned out, it just moves to another bank. The actions of individuals and firms (other than banks) do not create or destroy money; these actions can only transfer checking account balances between individuals and banks.

The $4,050 of reserves that are lost by Bank of America are gained by another bank. This bank will be able to loan (and create new money of) $3,645. This process of loans being made and new checking account deposits being created continues through many banks in the economy. We can summarize the results in the following table:

Bank	Increase in Checking Account Deposits
Andover Bank	$5,000
Bank of America	$4,500 (= 0.9 x $5,000)
The Third Bank	$4,050 (= 0.9 x $4,050)
The Fourth Bank	$3,645 (= 0.9 x $4050)
The Fifth Bank	$3280.50 (= 0.9 x $3,645)
.	.
.	.
.	.
Total Change in Checking Accounts	$50,000

The end result can be computed with the formula:

$$\Delta D = \frac{1}{RR} \Delta R,$$

where ΔD is the total change in checking account deposits, ΔR is the change in reserves, and ($1/RR$) is the **simple deposit multiplier**. In this example, the change in reserves was $5,000, and with a required reserve ratio (RR) of 10 percent, which implies a simple deposit multiplier of 10 (10 = 1/0.10), the change in deposits is:

$$\Delta D = \frac{1}{0.1} \$5,000 = \$50,000.$$

> ## 📖 Helpful Study Hint
>
> In this example, deposits increased by $50,000, but the supply of money increased by only $45,000, because the initial deposit of $5,000 resulted in a $5,000 decline in the currency component of M1.

The real world increase in the money supply as a result of an increase in bank reserves is much smaller than the increase shown by the simple deposit multiplier. This is because some reserves leave the banking system when the public takes currency from their checking accounts and because banks sometimes hold excess reserves.

The important point is that whenever banks gain reserves, they make new loans and the money supply expands. Whenever banks lose reserves, they reduce loans and the money supply contracts.

> ## 📖 Helpful Study Hint
>
> Whenever banks gain reserves, they will make new loans and the level of deposits (and the money supply) will increase. Banks have a powerful incentive to lend excess reserves because reserves earn banks zero interest.
>
> Read ***Don't Let This Happen to YOU!*** to learn how to distinguish between an asset and liability. Remember, your checking account is an asset to you, but a liability to your bank.

Extra Solved Problem 13-3

Chapter 13 of the textbook includes two Solved Problems. Here is an extra Solved Problem to help you build your skills solving economic problems:

Determining Actual, Excess, and Required Reserves

Supports Learning Objective 3: Explain how banks create money.

Suppose that Lehigh Bank has $500,000 in deposits and $60,000 in reserves. If the required reserve ratio for the bank is 10 percent, determine the level of actual, required, and excess reserves.

SOLVING THE PROBLEM

Step 1:   Review the chapter material.
This problem is about bank reserves, so you may want to review the section "How Do Banks Create Money?" which begins on page 440 of the textbook.

Step 2:   Determine the level of actual and required reserves.
Actual reserves represent the amount of vault cash and deposits that the bank has at the Federal Reserve. Actual reserves are determined from the bank's balance sheet. For Lehigh Bank, actual reserves are $60,000. Required reserves are calculated from the level of deposits and the required reserve ratio. The formula for required reserves is:

Required reserves = Required reserve ratio x deposits.

Given that Lehigh Bank has $500,000 in deposits:

Required reserves = 0.10 x $500,000 = $50,000.

Step 3: **Determine the level of excess reserves.**
To meet the Fed's requirements, Lehigh Bank must keep $50,000 as reserves. Any reserves that the bank has above the level of required reserves are called excess reserves. Excess reserves are calculated with the formula:

Excess reserves = Actual reserves – required reserves.

So for Lehigh Bank,

Excess reserves = $60,000 – $50,000 = $10,000.

Lehigh Bank has $10,000 in reserves above the required level. The bank can use these reserves to make loans or buy securities, allowing the bank to earn interest and increase its revenues.

13.4 LEARNING OBJECTIVE

13.4 The Federal Reserve System (pages 448-452)

Learning Objective 4 Discuss the three policy tools the Federal Reserve uses to manage the money supply.

The **Federal Reserve System** (or the Fed) is the central bank for the U.S. Congress created the Federal Reserve System in 1913. Congress divided the country into twelve Federal Reserve districts, each with a Federal Reserve Bank that provides services to banks in that district. The Board of Governors was created to oversee the system. The Board of Governors has seven members, who are appointed by the President to 14-year, nonrenewable terms. Look at Figure 13-3 on page 450 in the main text for a map showing the 12 Federal Reserve districts.

As part of **monetary policy**, the Fed has the task of managing the U.S. money supply. The Fed has three monetary policy tools: open market operations, discount policy, and reserve requirements.

Open market operations is the buying and selling of Treasury securities, such as Treasury bills. Eight times per year the **Federal Open Market Committee (FOMC)** meets in Washington, D.C. to discuss monetary policy. When the FOMC orders an open market purchase, the payment it makes for the securities puts more reserves in the banking system. When banks make new loans with these new reserves, the level of deposits and the money supply will increase. When the Fed sells securities, the payment for the securities by the public takes reserves out of the banking system and causes the money supply to fall.

📖 Helpful Study Hint

When the Fed carries out an open market purchase by buying securities from the public, the amount of bank reserves and the amount of checking account deposits (and the money supply) will increase.

Banks can borrow from the Fed. Loans from the Fed to banks are called **discount loans** and occur at an interest rate called the **discount rate**. The Fed sets the discount rate at the FOMC meetings. The Fed serves as a lender of last resort for banks and is willing to lend to banks when banks cannot borrow elsewhere. Making **discount loans** can help stop **bank runs** and **bank panics**, which occur when many depositors decide simultaneously to withdraw their deposits.

Most banking systems (including the U.S. banking system) are **fractional reserve banking systems** in which banks keep less than 100 percent of their deposits as reserves. U.S. banks keep only about 10 percent of their deposits as reserves. The Fed's reserve policy determines the fraction of deposits banks must keep. These reserves are kept in the bank as vault cash or as deposits at the Fed. The Fed changes the required reserve ratio infrequently.

Extra Solved Problem 13-4

Chapter 13 of the textbook includes two Solved Problems. Here is an extra Solved Problem to help you build your skills solving economic problems:

Open Market Operations and Changes in the Supply of Money

Supports Learning Objective 4: Discuss the three policy tools the Federal Reserve uses to manage the money supply.

Suppose that the Federal Reserve would like to increase the money supply by $500,000. How can the Fed use open market operations to bring about a $500,000 increase in the money supply? Assume the required reserve ratio is 10 percent.

SOLVING THE PROBLEM

Step 1:   Review the chapter material.
This problem is about the Fed using open market operations, so you may want to review the section "The Federal Reserve System," which begins on page 448 of the textbook.

Step 2:   Determine the level of deposits that can be created from an increase in reserves.
When the Federal Reserve uses open market operation to increase the supply of money, it buys Treasury bills from the public. When the public deposits the proceeds from these Treasury bill sales into their banks, the level of deposits and the level of reserves increase in the banking system. The level of deposits that can be created from a given amount of reserves is determined by the formula:

$$\Delta D = \frac{1}{RR}\Delta R,$$

where ΔD is the change in deposits, ΔR is the change in reserves, and RR is the required reserve ratio.

Step 3:   **Calculate the change in reserves needed.**
Using the 10 percent required reserve ratio (RR = 0.10), if the Fed would like to increase the money supply by $500,000, then the desired change in deposits is $500,000. We can use the formula in Step 2:

$$\$500,000 = \frac{1}{RR}\Delta R = \frac{1}{0.10}\Delta R.$$

Solving this formula for ΔR gives a value of $\Delta R = \$50,000$. Therefore, if the Fed buys $50,000 of Treasury bills from the public, reserves will increase by $50,000. As banks create new loans based upon these new reserves, the quantity of bank loans and deposits will increase.

Step 4:   **Determine the money supply change.**
The money supply change will be:

$$\Delta D = \frac{1}{RR}\Delta R = \frac{1}{0.10}\$50,000 = \$500,000.$$

A $50,000 Fed open market purchase will lead to a $500,000 money supply change. If the Fed wants to increase the money supply by $500,000, they must buy $50,000 of Treasury bills from the public.

📖 Helpful Study Hint

The inflation rate in the United States is usually around 2 or 3 percent. In the early 1990s, Argentina experienced an inflation rate of 2,300 percent. Read ***Making the Connection: The 2001 Bank Panic in Argentina*** to learn how the central bank dealt with this high inflation. In the early 1990's, the Argentine Central Bank fixed the value of the Argentine peso to the U.S. dollar, one for one. This policy helped reduce inflation, but placed the banking system in an awkward situation: Banks were encouraged to take deposits and make loans in U.S. dollars. In January 2002, the crisis was ended when the government abandoned its commitment to the one-to-one exchange rate between the peso and the dollar and decreed that dollar deposits in banks would be converted to peso deposits at a rate of 1.4 pesos to the dollar. Although some financial stability was restored, the damage to the banking system from the crisis contributed to a decline in real GDP of 11.5 percent during 2002.

13.5 The Quantity Theory of Money (pages 452-457)

Learning Objective 5   Explain the quantity theory of money and use it to explain how high rates of inflation occur.

The quantity of money in an economy plays a role in determining the inflation rate. One way of analyzing the relationship between money and prices is called the **quantity theory of money**, which can be illustrated using the quantity equation:

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

where *M* is the supply of money, *P* is the price level (GDP Deflator), and *Y* is real GDP. *V* is defined as the **velocity of money**, which measures the average number of times a dollar is used to purchase a final good or service, and is calculated as $V = PY/M$. From the quantity equation, it follows that:

Growth rate in *M* + Growth rate in *V* =
Growth rate in *P* (or the inflation rate) + Growth rate in *Y* (real GDP growth rate).

📖 Helpful Study Hint

The general rule is that the growth rate of two variables multiplied together equals the sum of the growth rates of each variable. So, for example, the growth rate of *M* x *V* = Growth rate of *M* + Growth rate of *V*.

Rearranging terms gives:

Inflation rate = (Growth rate in *M* – Growth rate in *Y*) + Growth rate in *V*.

The equation implies that if velocity is constant (which means that the growth rate in velocity = 0), then the economy will experience inflation if the growth rate in the money supply is greater than the growth rate in output. This equation suggests that in the long run, inflation results from growth in the money supply being greater than growth in output. Empirical studies show that velocity is not a constant.

Extra Solved Problem 13-5

Chapter 13 of the textbook includes two Solved Problems. Here is an extra Solved Problem to help you build your skills solving economic problems:

Calculating Velocity

Supports Learning Objective 5: Explain the quantity theory of money and use it to explain how high rates of inflation occur.

Because there are two measures of the money supply—M1 and M2—there are two measures of velocity, one based on each measure of the money supply. The table below has data on Money (M1 and M2), the

GDP deflator, and real GDP. (The values for real GDP, M1, and M2 are in billions.) Compute velocity measures using each money supply measure and also compute the growth rates in velocity with each money supply measure for each year from 2001 to 2006. Are the growth rates the same? (Remember that in the quantity equation, real GDP = Y and GDP deflator = P.)

Year	Real GDP	GDP Deflator	M1	M2
2000	$9,817	100.0	$1,087.6	$4,920.9
2001	9,891	102.4	1,182.1	5,430.3
2002	10,049	104.2	1,219.5	5,774.1
2003	10,301	106.4	1,305.5	6,062.0
2004	10,704	109.4	1,375.3	6,411.7
2005	11,049	112.7	1,373.2	6,669.4
2006	11,415	116.0	1,365.7	7,021.0

Step 1:   Review the chapter material.

This problem is about velocity, so you may want to review the section "The Quantity Theory of Money," which begins on page 452 of the textbook.

Step 2:   Calculate velocity.

Velocity is defined as $V = (P \times Y)/M$. (Note that in this calculation we need to divide the GDP deflator by 100.) The values of velocity are:

Year	Real GDP	GDP deflator	M1	M2	V(M1)	V(M2)
2000	$9,817	100.0	$1,087.6	$4,920.9	9.03	1.99
2001	9,891	102.4	1,182.1	5,430.3	8.57	1.87
2002	10,049	104.2	1,219.5	5,774.1	8.59	1.81
2003	10,301	106.4	1,305.5	6,062.0	8.40	1.81
2004	10,704	109.4	1,375.3	6,411.7	8.51	1.83
2005	11,049	112.7	1,373.2	6,669.4	9.07	1.87
2006	11,415	116.0	1,365.7	7,021.0	9.70	1.89

Step 3: **Calculate growth rates.**

Calculate the growth rate in velocity for the velocity values based upon the different measures of the money supply.

Year	Real GDP	GDP deflator	M1	M2	V(M1)	Growth rate in V(M1)	V(M2)	Growth rate in V(M2)
2000	$9,817	100.0	$1,087.6	$4,920.9	9.03		1.99	
2001	9,891	102.4	1,182.1	5,430.3	8.57	-5.09%	1.87	-6.03%
2002	10,049	104.2	1,219.5	5,774.1	8.59	0.23	1.81	-3.21
2003	10,301	106.4	1,305.5	6,062.0	8.40	-2.21	1.81	0.00
2004	10,704	109.4	1,375.3	6,411.7	8.51	1.31	1.83	1.10
2005	11,049	112.7	1,373.2	6,669.4	9.07	6.58	1.87	2.19
2006	11,415	116.0	1,365.7	7,021.0	9.70	6.95	1.89	1.07

While the growth rates of M1 velocity and M2 velocity are different in every year, they generally move in the same direction (with the exceptions of the 2003 value, where the growth rate in M1 velocity fell while the growth rate in M2 velocity increased, and the 2006 value, where the growth rate in M1 velocity increased while the growth rate in M2 velocity fell).

📖 Helpful Study Hint

Read *Making the Connection: The German Hyperinflation of the Early 1920s* to learn how the German central bank in the 1920s addressed hyperinflation. In order to finance World War I reparation payments to the Allies, the German government sold bonds to the central bank, which resulted in large increases in the money supply. The total number of marks—the German currency—in circulation rose from 115 million in January 1922 to 1.3 billion in January 1923 and then to 497 billion billion or 497,000,000,000,000,000,000 in December 1923. Just as the quantity theory predicts, the result was a staggeringly high rate of inflation. The German price index that stood at 100 in 1914 and 1,440 in January 1922 had risen to 126,160,000,000,000 in December 1923. The German mark became worthless. The German government ended the hyperinflation by (1) negotiating a new agreement with the Allies that reduced its reparations payments, (2) reducing other government expenditures and raising taxes to balance its budget, and (3) replacing the existing mark with a new mark. Each new mark was worth 1 trillion old marks. The German central bank was also limited to issuing a total of 3.2 billion new marks.

📖 Helpful Study Hint

Economics in YOUR Life! at the end of the chapter answers the question posed at the start of the chapter: Would you like to live in a country where the purchasing power of your money rose every year? What would be the advantages or disadvantages of living in such an economy? For

the purchasing power of money to be increasing, prices must be falling. If prices are falling, wages and income levels will also be falling. So, it is possible that the purchasing power of income will not be rising, even though the purchasing power of money is increasing. You are probably better off living in an economy experiencing mild inflation rather than one experiencing deflation.

Key Terms

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

Bank panic. Many banks experiencing runs at the same time.

Bank run. Many depositors simultaneously decide to withdraw money from a bank.

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

Discount loans. Loans the Federal Reserve makes to banks.

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

Excess reserves. Reserves that banks hold over and above the legal requirement.

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

Federal Reserve System. The central bank of the United States.

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

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

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

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

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

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

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

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

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

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

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

Simple deposit multiplier. The ratio of the amount of deposits created by banks to the amount of new reserves.

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

Self-Test

(Answers are provided at the end of the Self-Test.)

Multiple-Choice Questions

1. Assets that are generally accepted in exchange for goods and services or for payment of debts are specifically called
   a. wealth.
   b. net worth.
   c. money.
   d. capital.

2. A double coincidence of wants refers to
   a. the situation in which a good that is used as money also has value independent of its use as money.
   b. the fact that for a barter trade to take place between two people, each person must want what the other one has.
   c. the idea that a barter economy is more efficient than an economy that uses money.
   d. the situation where two parties are involved in a transaction where money is the medium of exchange.

3. By making exchange easier, money allows for
   a. a double coincidence of wants.
   b. the possible risk of inflation.
   c. specialization and higher productivity.
   d. all of the above

4. If prisoners of war use cigarettes as money, then cigarettes are
   a. token money.
   b. fiduciary money.
   c. fiat money.
   d. commodity money.

5. Money serves as a *unit of account* when
    a. sellers are willing to accept it in exchange for goods or services.
    b. it can be easily stored and used for transactions in the future.
    c. prices of goods and services are stated in the monetary unit.
    d. all of the above

6. Money serves as a standard of deferred payment when
    a. it can be easily stored today and used for transactions in the future.
    b. repayment of debts is made using money units.
    c. sellers are willing to accept it in exchange for goods or services.
    d. all of the above

7. Which of the following conditions make a good suitable for use as a medium of exchange?
    a. The good must be acceptable to (that is, usable by) most buyers and sellers.
    b. The good should be of standardized quality, so that any two units are identical.
    c. The good should be durable, valuable relative to its weight, and divisible.
    d. all of the above

8. Which of the following statements is correct?
    a. Today, most governments in the world issue paper currency that is backed by gold and can be redeemed for gold.
    b. Paper currency has no value unless it is used as money.
    c. Paper money is a commodity money.
    d. all of the above

9. What is fiat money?
    a. money that has value independent of its use as money
    b. an asset that has the ability to be easily converted into the medium of exchange
    c. money that is authorized by a central bank and that does not have to be exchanged for gold or some other commodity money
    d. money issued by financial intermediaries, such as banks and thrift institutions, not the central bank

10. To economists
    a. money is only those assets that serve as a medium of exchange.
    b. money is only currency, checking account deposits, or traveler's checks.
    c. money can be narrowly or broadly defined, depending on the types of assets included.
    d. None of the above. There is no official definition or measurement of the money supply today.

11. The sum of currency in circulation, checking account balances in banks, and holdings of traveler's checks equals
    a. M1.
    b. M2.
    c. M1 + M2.
    d. none of the above

12. Savings account balances, small-denomination time deposits, and noninstitutional money market fund shares are
    a. included only in M1.
    b. included only in M2.
    c. included in both M1 and M2.
    d. financial assets that are not included in the money supply.

13. Jill deposits $100 from her checking account into her savings account at the local bank. As a result of this transaction
    a. neither M1 nor M2 will change.
    b. M2 will increase by $100.
    c. M1 will decrease by $100.
    d. both b and c are correct

14. Which of the following statements is correct?
    a. Currency is used much more often to make payments than checking account balances.
    b. More than 80 percent of all goods and services are purchased with a check, rather than with currency.
    c. Most of the U.S. currency is held within the United States, but a small amount is actually outside the borders of the United States.
    d. all of the above

15. Which of the following statements is true?
    a. Today, U.S. law prohibits banks from paying interest on checking account deposits.
    b. Today, people are not allowed to write checks against their savings account balances.
    c. Today, the difference between checking accounts and savings accounts is greater than it was before the banking reform in 1980.
    d. all of the above

16. Which of the following are included in M2?
    a. M1
    b. savings account balances and small-denomination time deposits
    c. balances in money market deposit accounts in banks, and noninstitutional money market fund shares
    d. all of the above

17. In the definition of the money supply, where do credit cards belong?
    a. M1
    b. M2
    c. both M1 and M2
    d. Credit cards are not included in the definition of the money supply.

18. Bill Gates holds money and wealth. He also earns an annual income. Which of the three is largest?
    a. his money
    b. his income
    c. his wealth
    d. All three of the above mean the same thing and are the same size.

19. The key role that banks play in the economy is to
    a. provide a market for stocks and bonds.
    b. manage the money supply.
    c. accept deposits and make loans.
    d. serve as lenders of last resort.

20. Which of the following is an asset to a bank?
    a. reserves
    b. checking account deposits
    c. savings account deposits
    d. certificates of deposit

21. Which of the following is the largest asset of a typical bank?
    a. loans
    b. buildings
    c. vault cash
    d. checking account deposits

22. Which of the following refers to the minimum fraction of deposits banks are required by law to keep as reserves?
    a. the quantity equation
    b. the simple deposit multiplier
    c. the required reserve ratio
    d. the cash to deposit ratio

23. Which of the following is the largest liability of a typical bank?
    a. deposits
    b. loans
    c. reserves
    d. treasury bills

24. If the required reserve ratio is 10 percent, then using the simple deposit multiplier, what is the total increase in checking account deposits caused by an initial deposit of $1,000?
    a. $100
    b. $1,000
    c. $10,000
    d. $100,000

25. The simple deposit multiplier equals
    a. the inverse, or reciprocal, of the required reserve ratio.
    b. the ratio of the amount of deposits created by banks to the amount of new reserves.
    c. the formula used to calculate the total increase in checking account deposits from an increase in bank reserves.
    d. all of the above

26. A higher required reserve ratio _____ the value of the simple deposit multiplier.
    a. increases
    b. decreases
    c. leaves unchanged
    d. nullifies

27. An increase in the amount of excess reserves that banks keep _____ the value of the real-world deposit multiplier.
    a. increases
    b. decreases
    c. leaves unchanged
    d. nullifies

28. If Fenway Bank has $500 in deposits and $200 in reserves and the required reserve ratio is 10 percent, then Fenway Bank has
    a. $200 in excess reserves.
    b. $50 in required reserves.
    c. $50 in excess reserves.
    d. $200 in required reserves.

29. Whenever banks gain reserves and make new loans, the money supply _____; and whenever banks lose reserves, they reduce their loans and the money supply _____.
    a. expands; expands
    b. expands; contracts
    c. contracts; contracts
    d. contracts; expands

30. A banking system in which banks keep less than 100 percent of deposits as reserves is called
    a. the Federal Reserve System.
    b. a fractional reserve banking system.
    c. a fully-funded reserve system.
    d. wildcat banking.

31. When many depositors decide simultaneously to withdraw their money from a bank, there is
    a. an increase in bank lending.
    b. usually a decline in discount lending by the Fed.
    c. a bank run.
    d. inflation.

32. A *bank panic* occurs when
    a. there is an increase in bank lending.
    b. the central bank carries out open market purchases.
    c. many banks experience runs at the same time.
    d. many banks fail to attract depositors so their reserves increase significantly.

33. The Federal Reserve System is
    a. the central bank of the United States.
    b. the institution that regulates all state banks.
    c. the institution solely responsible for regulating the stock and bond markets.
    d. the institution also known as the Treasury of the United States.

34. There are _____ members of the Board of Governors, who are appointed by the President of the United States to _____, non-renewable terms. One of the Board members is appointed Chairman for a _____, renewable term.
    a. nine; 7-year; eight-year
    b. twelve; 4-year; four-year
    c. seven; 14-year; four-year
    d. fourteen; 4-year; four-year

35. The actions the Federal Reserve takes to manage the money supply and interest rates to pursue economic objectives is called
    a. fiscal policy.
    b. open market operations.
    c. monetary policy.
    d. financial management.

36. The Fed uses three monetary policy tools. Which of the following is *not* one of those tools?
    a. open market operations
    b. discount policy
    c. reserve requirements
    d. federal funds rate setting

37. Which of the following people vote on monetary policy at the Federal Open Market Committee (FOMC) meetings?
    a. the seven members of the Federal Reserve's Board of Governors
    b. the president of the Federal Reserve Bank of New York
    c. four presidents from Federal Reserve banks other than the president of the Federal Reserve Bank of New York (rotating basis)
    d. all of the above

38. To increase the money supply, the FOMC directs the trading desk, located at the Federal Reserve Bank of New York to
    a. buy U.S. Treasury securities from the public.
    b. sell U.S. Treasury securities to the public.
    c. print U.S. Treasury securities and put them out in circulation.
    d. buy U.S. dollars in the foreign exchange market.

39. The Fed conducts monetary policy primarily through
    a. open market operations.
    b. discount policy.
    c. reserve requirements.
    d. none of the above

40. By raising the discount rate, the Fed encourages banks to make _____ loans to households and firms, which will _____ checking account deposits and the money supply.
    a. more; increase
    b. more; decrease
    c. fewer; increase
    d. fewer; decrease

41. The theory concerning the link between the money supply and the price level that assumes the velocity of money is constant is called
    a. the quantity equation.
    b. the quantity theory of money.
    c. the constant velocity theory of money.
    d. the purchasing power parity theory of money.

42. Velocity is defined as:
    a. $V = M/(P \times Y)$.
    b. $V = M \times P \times Y$.
    c. $V = M + P + Y$.
    d. $V = (P \times Y)/M$.

43. If Irving Fisher was correct in his prediction about the value of velocity, then the quantity equation can be written to solve for the inflation rate as follows:
    a. Inflation rate = Growth rate of the money supply + Growth rate of real output.
    b. Inflation rate = Growth rate of the money supply – Growth rate of real output.
    c. Inflation rate = Growth rate of the money supply – Growth rate of velocity.
    d. Inflation rate = Growth rate of the money supply + Growth rate of velocity.

44. Which of the following predictions can be made using the growth rates associated with the quantity equation?
    a. If the money supply grows at a faster rate than real GDP, there will be inflation.
    b. If the money supply grows at a slower rate than real GDP, there will be inflation.
    c. If the money supply grows at the same rate as real GDP, the price level will fall.
    d. none of the above

Short Answer Questions

1. Suzi deposited $100 in currency in her checking account. How will that deposit affect the values of M1 and M2? Would your answer change if Suzi had deposited the money in her savings account?

   _____

   _____

   _____

   _____

   _____

2. Below are the changes in the balance sheet for Andover Bank as a result of a $10,000 deposit of currency. Suppose the required reserve ratio is 10 percent. How much can the bank safely loan?

Assets		Liabilities	
Reserves	+$10,000	Deposits	+$10,000

   Suppose the bank makes a loan for the amount you have just calculated; use the T-account below to show the changes in the bank's balance sheet after the bank grants the loan.

Assets	Liabilities

Use the T-account below to show the change in the bank's balance sheet after the check is cashed and the bank loses reserves.

Assets	Liabilities

_____

_____

_____

_____

_____

3. If Alice deposits $100 of currency in her bank, what will this do to the level of deposits in her bank and to the supply of money in the United States assuming the required reserve ratio is 10 percent? How would your answer change if the required reserve ratio were 20 percent?

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_____

_____

_____

4. When the FOMC buys Treasury bills from the public as part of open market operations, the level of reserves and the level of deposits will increase. If the Fed buys $2 million of securities from the public, reserves and deposits in the banking system will both increase by $2 million. This is reflected in the T-account below:

Assets		Liabilities	
Reserves	+$2 million	Deposits	+2 million

Assuming a 10 percent required reserve ratio, determine the potential change in deposits and change in the money supply as a result of this open market purchase by the Fed. If the Fed wished to increase the money supply by $5 million, how many dollars of securities would the Fed need to buy?

_____

_____

_____

_____

_____

5. During 2006, the growth rate in output (real GDP) was 2.9%, and the growth rate in the money supply (M2) was 5.3%. If velocity was constant, what should the inflation rate have been? Suppose that we discover that the inflation rate during 2006 was 3.2%. What does that tell us about velocity in 2006?

_____

_____

_____

_____

6. Suppose that the required reserve ratio is 10 percent. By what amount must reserves grow for the level of deposits to rise by $500?

_____

_____

_____

True/False Questions

T F 1. Economies that trade goods and services for other goods and services are barter economies.
T F 2. Money that has value independent of its use as money is called fiat money.
T F 3. Goods and services in the U.S. are priced in dollars. This is an example of the store of value function of money.
T F 4. The U.S. government backs Federal Reserves Notes with an equal amount of gold.
T F 5. The M1 measure of money counts the currency in banks, called vault cash.
T F 6. M2 includes savings accounts but not checking accounts.
T F 7. A household checking account is an asset to the household and a liability to its bank.
T F 8. As households deposit paychecks in their banks, M1 will immediately increase.
T F 9. Excess reserves are actual reserves plus required reserves.
T F 10. If the First Bank of Boston has no excess reserves, $RR = 0.10$, and a household deposits $5,000 in currency, then that bank can now lend $4,500.
T F 11. A bank with $1,000 of excess reserves cannot safely lend more than $1,000.
T F 12. The simple deposit multiplier is $1/(1 - RR)$.
T F 13. Open market decisions are made by the FOMC.
T F 14. To expand the money supply, the Fed will buy securities from the public.
T F 15. According to the quantity theory of money, an economy will experience inflation if the money supply grows more than 2 percent per year.

Answers to the Self-Test

Multiple-Choice Questions

Question	Answer	Comment
1	c	The economic definition of money is any asset that is generally accepted in exchange for goods and services or for payment of debts.
2	b	Economies that do not use money, but instead trade goods and services directly for other goods and services, are called barter economies. For a barter trade to take place between two people, each person must want what the other one has. Economists refer to this requirement as a double coincidence of wants.
3	c	Most people in modern economies are highly specialized. The high income levels in modern economies are based on the specialization that money makes possible. By making exchange easier, money allows for specialization and higher productivity.
4	d	The usual inefficiencies of barter led the prisoners to begin using cigarettes as money. Cigarettes have a value independent of their use as money, so they are commodity money.
5	c	Instead of having to quote the price of a single good in terms of many other goods, each good has a single price quoted in terms of the medium of exchange. This function of money gives buyers and sellers a unit of account, a way of measuring value in the economy in terms of money. When the U.S. economy uses dollars as money, then each good has a price in terms of dollars.
6	b	Money is useful because of its ability to serve as a standard of deferred payment in borrowing and lending. Money can facilitate exchange at a *given point in time* by providing a medium of exchange and unit of account. It can facilitate exchange *over time* by providing a store of value and a standard of deferred payment.
7	d	What makes a good suitable to use as a medium of exchange? There are five criteria: 1) The good must be acceptable to (that is, usable by) most traders; 2) It should be of standardized quality, so that any two units are identical; 3) It should be durable, so that value is not lost by spoilage; 4) It should be valuable relative to its weight, so that amounts large enough to be useful in trade can be easily transported; and 5) Because different goods are valued differently, the medium of exchange should be divisible.
8	b	In modern economies, paper currency is generally issued by a central bank, which is a special governmental or quasi-governmental institution in the financial system (like the Federal Reserve in the United States) that regulates the money supply. Today, no government in the world issues paper currency that can be redeemed for gold. Paper currency has no value unless it is used as money and is therefore not commodity money.
9	c	Fiat money: Money, such as paper currency, that is authorized by a central bank or governmental body and that does not have to be exchanged by the central bank for gold or some other commodity money.

10	c	Economists have developed several different definitions of the money supply. Each definition includes a different group of assets. The definitions range from narrow to broad. The narrowest definition of money includes cash, checkable deposits and traveler's checks. Broader definitions include other assets that can be easily converted to cash—savings account deposits or certificates of deposit, for example.
11	a	M1 is the narrowest definition of the money supply: the sum of currency in circulation, checking account balances in banks, and holdings of traveler's checks. (Technically, M1 includes all checkable deposits, funds in commercial banks, S&Ls and credit unions that can be transferred using a check-like instrument. If the account is in an S&L, the instrument is called a negotiated order of withdrawal or NOW. If the account is in a credit union, the instrument is called a share draft.)
12	b	M2 includes M1, savings account balances, small-denomination time deposits, money market deposit accounts, and noninstitutional money market fund shares.
13	c	The reduction of checking will reduce M1 by $100, but the transfer to savings will not change M2. Only the composition of M2 changes.
14	b	Although currency and checking account balances are roughly equal in value, checking account balances are used much more often to make payments than currency. More than 80 percent of all goods and services are purchased with checks rather than with currency.
15	b	Before 1980, U.S. law prohibited banks from paying interest on checking account deposits. In 1980, the law was changed to allow banks to pay interest on certain types of checking accounts. This change reduced the difference between checking accounts and savings accounts, although people are still not allowed to write checks against their savings account balances. (But some people have checking accounts that will automatically transfer funds from their savings account if their checking account balance is not large enough to cover a specific check. However, the bank usually charges a fee for this service, meaning the savings account balance is still not as liquid as the checking account balance.)
16	d	M2 includes M1 plus savings account balances, small-denomination time deposits, balances in money market deposit accounts in banks, and noninstitutional money market fund shares.
17	d	Many people buy goods and services with credit cards, yet credit cards are not included in definitions of the money supply. The reason is that when you buy something with a credit card, you are in effect taking out a loan from the bank that issued the credit card. Only when you pay your credit card bill at the end of the month—usually with a check—is the transaction complete.
18	c	Bill Gates's wealth of $46.5 billion made him the richest person in the world in 2005. He also has a very large income, but how much money does he have? A person's *wealth* is equal to the value of his assets minus the value of any debts he has. A person's income is equal to his earnings during the year. Bill Gates's earnings as chairman of Microsoft and from his investments are very large. But his money is just equal to what he has in currency and in checking accounts.
19	c	The key role that banks play in the economy is to accept deposits and make loans. By doing this, they create checking account deposits.
20	a	The key assets on a bank's balance sheet are its reserves, its loans, and its holdings of securities, such as U.S. Treasury bills.

21	a	Loans are the largest asset of a typical bank.
22	c	Banks are required by law to keep 10 percent of their checking account deposits above a certain level as reserves. These reserves are called required reserves. The minimum fraction of deposits that banks are required to keep as reserves (currently 10 percent) is called the required reserve ratio. Any reserves banks hold over and above the legal requirement are called excess reserves.
23	a	Deposits include checking accounts, savings accounts, and certificates of deposit.
24	c	The change in deposits equals $1,000 x (1/0.1) = $10,000.
25	d	The simple deposit multiplier is the ratio of the amount of deposits created by banks to the amount of new reserves. It is the formula used to calculate the total increase in checking account deposits from an increase in bank reserves. It is also the inverse of the required reserve ratio.
26	b	The simple deposit multiplier formula $(1/RR)$ makes it clear that the higher the required reserve ratio, the smaller the multiplier.
27	b	The more excess reserves banks keep, the smaller the real-world deposit multiplier.
28	b	With $500 in deposits and a 10 percent required reserve ratio, required reserves are $50 = 0.10 x $500. Excess reserves are actual reserves ($200) minus required reserves ($50) or $150 = $200 − $50.
29	b	The most important part of the money supply is checking account balances. When banks make loans, they increase checking account balances, expanding the money supply. Banks make new loans whenever they gain reserves. The whole process can also work in reverse. If banks lose reserves, they reduce their outstanding loans and deposits, and the money supply contracts.
30	b	The United States, like nearly all other countries, has a fractional reserve banking system. In a fractional reserve banking system, banks keep less than 100 percent of deposits as reserves.
31	c	Sometimes depositors lose confidence in a bank when they question the value of the bank's underlying assets, particularly its loans. Often, the reason for a loss of confidence is bad news, whether true or false. When many depositors decide simultaneously to withdraw their money from a bank, there is a bank run.
32	c	When many depositors decide simultaneously to withdraw their money from a bank, there is a bank run. If many banks experience runs at the same time, the result is a bank panic. It is possible for one bank to handle a run by borrowing from other banks, but if many banks simultaneously experience runs, the banking system may be in trouble. In that case, the central bank should act as lender of last resort.
33	a	With the intention of putting an end to banking panics, Congress in 1913 passed the Federal Reserve Act, setting up the Federal Reserve System. The system began operation in 1914. The Federal Reserve—usually referred to as the "Fed"—is the central bank of the United States. The Fed's main job is controlling the money supply. The Fed also acts as a lender of last resort to banks and as a bankers' bank, providing services such as check clearing to banks.

34	c	There are seven members of the Board of Governors, who are appointed by the President of the United States to 14-year, non-renewable terms. Board members come from banking, business, and academic backgrounds. One of the seven Board members is appointed Chairman for a four-year, renewable term. No more than one Board member can be selected from any Federal Reserve district.
35	c	Monetary policy refers to the actions the Federal Reserve takes to manage the money supply and interest rates to pursue economic objectives.
36	d	Setting a target for the federal funds rate is not a tool of monetary policy. To manage the money supply, the Fed uses three monetary policy tools: 1) Open market operations, 2) Discount policy, and 3) Reserve requirements. Remember that the most important component of the money supply is checking account balances. (The federal funds rate is, however, the main operating target of U.S. monetary policy.)
37	d	The Federal Open Market Committee is responsible for open market operations and managing the money supply. The FOMC has 12 members: the seven members of the Federal Reserve's Board of Governors, the president of the Federal Reserve Bank of New York, and four presidents from the other 11 Federal Reserve banks. These four presidents serve one-year rotating terms.
38	a	To increase the money supply, the FOMC directs the trading desk, located at the Federal Reserve Bank of New York, to buy U.S. Treasury securities—most frequently bills, but sometimes notes or bonds—from the public. When the sellers of the Treasury securities deposit the funds in their banks, the reserves of banks will rise. This increase in reserves will start the process of increasing loans and checking account deposits, increasing the money supply.
39	a	The Fed conducts monetary policy principally through open market operations for three reasons. First, because the Fed initiates open market operations, it completely controls their volume. Second, the Fed can make both large and small open market operations. Third, the Fed can implement its open market operations quickly, with no administrative delay or required changes in regulations. Many other central banks, including the European Central Bank and the Bank of Japan, use open market operations in conducting monetary policy.
40	d	By lowering the discount rate, the Fed can encourage banks to increase the volume of their borrowing from the Fed. When banks borrow from the Fed, they are borrowing reserves. With more reserves, banks will make more loans to households and firms, which will increase checking account deposits and the money supply. Raising the discount rate will have the opposite effect.
41	d	Irving Fisher turned the quantity equation into the quantity theory of money, by asserting that velocity was constant. He asserted that the average number of times a dollar is spent depends on how often people get paid, how often they do their grocery shopping, how often businesses mail bills, and other factors that do not change very often. Because this assertion may be true or false, the quantity theory of money is, in fact, a theory.
42	b	M x $V = P$ x Y, so $V = (P$ x $Y)/M$.
43	b	If Irving Fisher was correct that velocity is constant, then the growth rate of velocity will be zero. That is, if velocity is, say, always 8.6, then its percentage change from one year to the next will always be zero. This allows us to rewrite the equation as: Inflation rate = Growth rate of the money supply – Growth rate of real output.

44   a   The growth rate version of the quantity equation leads to the following predictions (recall that deflation is a decline in the price level): 1) If the money supply grows at a faster rate than real GDP, there will be inflation; 2) If the money supply grows at a slower rate than real GDP, there will be deflation, and 3) If the money supply grows at the same rate as real GDP, the price level will be stable. There will be neither inflation nor deflation.

Short Answer Responses

1. Because M1 includes both currency and checking accounts, the deposit of $100 currency in her checking account will change the composition of M1 (less currency and more checking deposits), not the level of M1. Because M2 includes M1 plus savings accounts, then the deposits of $100 in her checking account will also not change M2. If she had deposited the $100 currency in her savings account, then M1 would decrease by $100 (less currency) and M2 would not change (less currency and more savings accounts).

2. As a result of the currency deposit, Andover Bank's required reserves will increase by $1,000 (10 percent of the increase in deposits, or 0.10 x $10,000). The bank can now create a loan for $9,000, the amount of excess reserves ($10,000 – $1,000). After that loan the balance sheet will be:

	Assets		Liabilities
Reserves	+$10,000	Deposits	+$10,000
Loans	+$9,000		+$9,000

When the person that receives the loan uses it to write checks, the level of deposits at the bank will fall, and the bank will lose reserves to other banks. The bank balance sheet will then look like:

	Assets		Liabilities
Reserves	+$1,000	Deposits	+$10,000
Loans	+$9,000		

3. If Alice deposits $100 in her checking account, the supply of money will not change, but the level of bank deposits and the level of excess reserves in the bank will change. This is shown in the T-account below:

	Assets	Liabilities and Net Worth	
Reserves	+$100	Deposits	+$100

With $RR = 0.10$ (or 10%), Alice's bank has $90 of excess reserves that it can use to make a new loan, which will create $90 of new deposits and $90 of new money. The banking system can create deposits according to the formula:

$$\Delta D = \frac{1}{RR}\Delta Reserves = \frac{1}{0.1}\$100 = \$1,000$$

The level of deposits will increase by $1,000 and the money supply will increase by $900. If $RR = 0.20$ (or 20%), then the same $100 deposit by Alice will increase the level of deposits by $500 (1/0.20) x $100) and the money supply will increase $400.

4. If the Fed buys $2 million of securities from the public as part of open market operations, the level of bank reserves will increase by $2 million. Assuming a 10 percent required reserve ratio, the new level of deposits is determined with the formula:

$$\Delta D = \frac{1}{RR} \Delta \text{Reserves} = \frac{1}{0.1} \$2 \text{ million} = \$20 \text{ million.}$$

In this case, since the deposit did not start with a deposit of currency by the public, the supply of money will also increase $20 million.

If the Fed wanted to increase the money supply by $5 million, then using the formula:

$$\Delta D = \frac{1}{RR} \Delta \text{Reserves} \quad \text{or} \quad \$5 \text{ million} = \frac{1}{0.1} \Delta \text{Reserves}, \quad \text{or} \quad \Delta \text{Reserves} = \$0.5 \text{ million.}$$

Because the simple deposit = 10, a $0.5 million security purchase will result in a $5 million deposit and money supply change.

5. If velocity was constant (which means the growth rate in velocity is zero) then using the equation:

Inflation rate = (Growth rate in *M* – Growth rate in *Y*) + Growth rate in *V*

we would predict an inflation rate of 2.4% (5.3% – 2.9% = 2.4%). However, if we observe that inflation was 3.2%, then that would imply from the equation that the velocity growth rate was 0.8%, meaning velocity increased in 2006.

6. The simple deposit expansion formula is:

$$\Delta \text{Deposits} = \frac{1}{RR} \Delta \text{Reserves} = \frac{1}{.1} \Delta \text{Reserves} = 10 \Delta \text{Reserves.}$$

So if we want deposits to increase by $500, then reserves must grow by $50 ($500 = 10 x ΔReserves, or ΔReserves = $50).

True/False Answers

1.	T	
2.	F	Money that has value other than as money is called a commodity money.
3.	F	This is the unit of the account function of money.
4.	F	Federal Reserve Notes are not backed by any commodity. They are an example of fiat money.
5.	F	M1 only counts currency outside banks or the government.
6.	F	M2 includes both savings accounts and checking accounts.
7.	T	
8.	F	When the household's checking account increases from the deposit, the firm's checking account decreases the same amount so that M1 will not change.
9.	F	Excess reserves are actual reserves minus required reserves.
10.	T	
11.	T	

12. F   The simple deposit multiplier is $1/RR$.
13. T
14. T
15. F   According to the quantity theory, an economy will experience inflation if money growth exceeds output growth.