

### **ALTERNATIVE CLASSROOM EXAMPLE:**

Reserve ratio = 12.5%

Money multiplier =  $1 / 0.125 = 8$

in part by pointing out that credit cards actually lead to a bank's new business with money. Banks carry out their normal functions of accepting deposits and giving out loans. The Fed's policy of increasing the money supply is not a problem for the Fed.

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### **WHAT'S NEW IN THE SEVENTH EDITION:**

There is a new *In the News* box on “Why Gold?”

### **LEARNING OBJECTIVES:**

**By the end of this chapter, students should understand:**

- ☐ what money is and what functions money has in the economy.
- ☐ what the Federal Reserve System is.
- ☐ how the banking system helps determine the supply of money.
- ☐ what tools the Federal Reserve uses to alter the supply of money.

### **CONTEXT AND PURPOSE:**

Chapter 16 is the first chapter in a two-chapter sequence dealing

with money and prices in the long run. Chapter 16 describes what money is and develops how the Federal Reserve controls the quantity of money. Because the quantity of money influences the rate of inflation in the long run, the following chapter concentrates on the causes and costs of inflation.

The purpose of Chapter 16 is to help students develop an understanding of what money is, what forms money takes, how the banking system helps create money, and how the Federal Reserve controls the quantity of money. An understanding of money is important because the quantity of money affects inflation and interest rates in the long run, and production and employment in the short run.

### **KEY POINTS:**

- The term *money* refers to assets that people regularly use to buy goods and services.
- Money serves three functions. As a medium of exchange, it is the item used to make transactions. As a unit of account, it provides the way in which prices and other economic values are recorded. As a store of value, it offers a way to transfer purchasing power from the present to the future.
- Commodity money, such as gold, is money that has intrinsic value: It would be valued even if it were not used as money. Fiat money, such as paper dollars, is money without intrinsic value: It would be worthless if it were not used as money.
- In the U.S. economy, money takes the form of currency and various types of bank deposits, such as checking accounts.

- The Federal Reserve, the central bank of the United States, is responsible for regulating the U.S. monetary system. The Fed chairman is appointed by the president and confirmed by Congress every four years. The chairman is the lead member of the Federal Open Market Committee, which meets about every six weeks to consider changes in monetary policy.
- Bank depositors provide resources to banks by depositing their funds into bank accounts. These deposits are part of a bank's liabilities. Bank owners also provide resources (called bank capital) for the bank. Because of leverage (the use of borrowed funds for investment), a small change in the value of a bank's assets can lead to a large change in the value of the bank's capital. To protect depositors, bank regulators require banks to hold a certain minimum amount of capital.
- The Fed controls the money supply primarily through open-market operations. The purchase of government bonds increases the money supply, and the sale of government bonds decreases the money supply. The Fed also uses other tools to control the money supply. It can expand the money supply by decreasing the discount rate, increasing its lending to banks, lowering reserve requirements, or decreasing the interest rate on reserves. It can contract the money supply by increasing the discount rate, decreasing its lending to banks, raising reserve requirements or increasing the interest rate on reserves.
- When individuals deposit money in banks and banks loan out some of these deposits, the quantity of money in the economy increases. Because the banking system influences the money supply in this way, the Fed's control of the money

supply is imperfect.

- The Federal Reserve has in recent years set monetary policy by choosing a target for the federal funds rate, a short-term interest rate at which banks make loans to one another. As the Fed achieves its target, it adjusts the money supply.

## **CHAPTER OUTLINE:**



### I. The Meaning of Money



A. Definition of **money**: the set of assets in an economy that people regularly use to buy goods and services from other people.

### B. The Functions of Money

1. Money serves three functions in our economy.

a. Definition of **medium of exchange**: an item that buyers give to sellers when they want to purchase goods and services.

b. Definition of **unit of account**: the yardstick people use to post prices and record debts.

c. Definition of **store of value**: an item that people

**can use to transfer purchasing power from the present to the future.**

2. Definition of **liquidity**: **the ease with which an asset can be converted into the economy's medium of exchange.**

- a. Money is the most liquid asset available.
- b. Other assets (such as stocks, bonds, and real estate) vary in their liquidity.
- c. When people decide how to allocate their wealth, they must balance the liquidity of each possible asset against the asset's usefulness as a store of value.

### C. The Kinds of Money

1. Definition of **commodity money**: **money that takes the form of a commodity with intrinsic value.**
2. Definition of **fiat money**: **money without intrinsic value that is used as money because of government decree.**

3. *In the News: Why Gold?*

- a. Historically, societies have used gold, rather than other commodities, for commodity money.
- b. This article from *NPR Morning Edition* describes why gold is the best choice for commodity money.

### D. Money in the U.S. Economy

1. The quantity of money circulating in the United States is sometimes called the *money stock*.
2. Included in the measure of the money supply are currency, demand deposits, and other monetary assets.
  - a. Definition of **currency**: **the paper bills and coins in the hands of the public**.
  - b. Definition of **demand deposits**: **balances in bank accounts that depositors can access on demand by writing a check**.
3. Figure 1 shows the monetary assets included in two important measures of the money supply, M1 and M2.



4. *FYI: Why Credit Cards Aren't Money*
  - a. Credit cards are not a form of money; when a person uses a credit card, he or she is simply deferring payment for the item.



- b. Because using a debit card is like writing a check, the account balances that lie behind debit cards are included in the measures of money.
5. *Case Study: Where Is All the Currency?*
- a. If we divide the amount of outstanding currency in the United States by the adult population, we find that the average adult should have approximately \$4,490 in currency.
  - b. Of course, most adults carry a much smaller amount.
  - c. One explanation is that a great deal of U.S. currency may be held in other countries.
  - d. Another explanation is that large amounts of currency may be held by criminals because transactions that use currency leave no paper trail.

## II. The Federal Reserve System

- A. Definition of **Federal Reserve (Fed)**: the central bank of the United States.
- B. Definition of **central bank**: An institution designed to oversee the banking system and regulate the quantity of money in the economy.

**Type:** In-class demonstration  
**Topics:** Money, Federal Reserve  
**Materials needed:** None  
**Time:** 5 minutes  
**Class limitations:** Works in any size class

#### PURPOSE

This activity introduces the role of the Federal Reserve in controlling the money supply.

#### INSTRUCTIONS

Ask the class to take a dollar bill from wallets (or a \$5, \$10, \$20, or \$100). Students without any currency can share with someone who does. Ask the class to read the bill.

After a minute, ask them what they have learned.

#### COMMON ANSWERS AND POINTS FOR DISCUSSION

Most students focus on the statement “This note is legal tender for all debts, public and private.” This statement is the only “backing” U.S. currency has—the note is not convertible into gold or silver. This can be used to introduce the difference between fiat money and commodity money.

Someone will usually point to the phrase printed at the top of the face of each bill: “Federal Reserve Note.” Explain the Fed functions as the United States' central bank—controlling the money supply and supplying currency to banks.

Information about the structure of the Federal Reserve can be found in the seal to the left of Washington's portrait. The writing around the seal says “Federal Reserve Bank of



If the class is big enough, all 12 Federal Reserve Banks will be represented: Boston, New York, Philadelphia, Richmond, Atlanta, Cleveland, Chicago, St. Louis, Minneapolis, Kansas City, Dallas, and San Francisco.

This is a good place to introduce the Federal Reserve Districts, and the Banks’ roles in those regions. These include check clearing, holding commercial bank reserves, supplying currency, lending to commercial banks, and collecting and analyzing regional economic data.

### C. The Fed’s Organization



1. The Fed was created in 1913 after a series of bank failures.
1. The Fed is run by a Board of Governors with 7 members who serve 14-year terms.
  - a. The Board of Governors has a chairman who is appointed for a four-year term.

- b. The current chairman is Ben Bernanke.
- 2. The Federal Reserve System is made up of 12 regional Federal Reserve Banks located in major cities around the country.



- 3. One job performed by the Fed is the regulation of banks to ensure the health of the nation's banking system.
  - a. The Fed monitors each bank's financial condition and facilitates bank transactions by clearing checks.
  - b. The Fed also makes loans to banks when they want to borrow.
- 4. The second job of the Fed is to control the quantity of money available in the economy.
  - a. Definition of **money supply**: the quantity of money available in the economy.
  - b. Definition of **monetary policy**: the setting of the money supply by policymakers in the central bank.

D. The Federal Open Market Committee

- 1. The Federal Open Market Committee (FOMC) consists of the 7 members of the Board of Governors and 5 of the 12 regional bank presidents.



2. The primary way in which the Fed increases or decreases the number of dollars in the economy is through open market operations (which involve the purchase or sale of U.S. government bonds).
  - a. If the Fed wants to increase the supply of money, it creates dollars and uses them to purchase government bonds from the public through the nation's bond markets.
  - b. If the Fed wants to lower the supply of money, it sells government bonds from its portfolio to the public. Money is then taken out of the hands of the public and the supply of money falls.

### III. Banks and the Money Supply



- A. The Simple Case of 100-Percent-Reserve Banking
  1. Example: Suppose that currency is the only form of money and the total amount of currency is \$100.
  2. A bank is created as a safe place to store currency; all deposits are kept in the vault until the depositor withdraws them.

- a. Definition of **reserves**: **deposits that banks have received but have not loaned out.**
- b. Under the example described above, we have 100-percent-reserve banking.



- 3. The financial position of the bank can be described with a T-account:

FIRST NATIONAL BANK			
Assets		Liabilities	
Reserves	\$100.00	Deposits	\$100.00



- 4. The money supply in this economy is unchanged by the creation of a bank.
  - a. Before the bank was created, the money supply consisted of \$100 worth of currency.
  - b. Now, with the bank, the money supply consists of \$100 worth of deposits.
- 5. This means that, if banks hold all deposits in reserve, banks do not influence the supply of money.

## B. Money Creation with Fractional-Reserve Banking

1. Definition of **fractional-reserve banking**: a banking system in which banks hold only a fraction of deposits as reserves.
2. Definition of **reserve ratio**: the fraction of deposits that banks hold as reserves.
3. Example: Same as before, but First National decides to set its reserve ratio equal to 10% and lend the remainder of the deposits.
4. The bank's T-account would look like this:

FIRST NATIONAL BANK			
Assets		Liabilities	
Reserves	\$10.00	Deposits	\$100.00
Loans	\$90.00		

5. When the bank makes these loans, the money supply changes.
  - a. Before the bank made any loans, the money supply was equal to the \$100 worth of deposits.
  - b. Now, after the loans, deposits are still equal to \$100, but borrowers now also hold \$90 worth of currency from the loans.
  - c. Therefore, when banks hold only a fraction of deposits in reserve, banks create money.
6. Note that, while new money has been created, so has debt. There is no new wealth created by this process.

## C. The Money Multiplier

1. The creation of money does not stop at this point.
2. Borrowers usually borrow money to purchase something and then the money likely becomes redeposited at a bank.
3. Suppose a person borrowed the \$90 to purchase something and the funds then get redeposited in Second National Bank. Here is this bank's T-account (assuming that it also sets its reserve ratio to 10%):

SECOND NATIONAL BANK			
Assets		Liabilities	
Reserves	\$9.00	Deposits	\$90.00
Loans	\$81.00		

4. If the \$81 in loans becomes redeposited in another bank, this process will go on and on.
5. Each time the money is deposited and a bank loan is created, more money is created.
6. Definition of **money multiplier**: the amount of money the banking system generates with each dollar of reserves.
7. In our example, the money supply increased from \$100 to \$1,000 after the establishment of fractional-reserve banking.



D. Bank Capital, Leverage, and the Financial Crisis of 2008–2009

1. In reality, banks also get funds from issuing debt and equity.

2. Definition of **bank capital**: the resources a bank's owners have put into the institution.

3. A more realistic balance sheet for a bank:

MORE REALISTIC NATIONAL BANK			
Assets		Liabilities and Owners' Equity	
Reserves	\$200.00	Deposits	\$800.00
Loans	\$700.00	Debt	\$150.00
Securities	\$100.00	Capital (owner's equity)	\$50.00

4. Definition of **leverage**: the use of borrowed money to supplement existing funds for purposes of investment.

5. Definition of **leverage ratio**: the ratio of assets to bank capital.

a. The leverage ratio is  $\$1,000/\$50 = 20$ .

b. A leverage ratio of 20 means that, for every

dollar of capital that has been contributed by the owners, the bank has \$20 of assets.

c. Because of leverage, a small change in assets can lead to a large change in owner's equity.

6. Definition of **capital requirement**: a government regulation specifying a minimum amount of bank capital.

7. In 2008 and 2009, many banks realized they had incurred sizable losses on some of their assets.

#### IV. The Fed's Tools of Monetary Control

A. How the Fed Influences the Quantity of Reserves

1. Open-Market Operations

a. Definition of **open-market operations**: the purchase and sale of U.S. government bonds by the Fed.

b. If the Fed wants to increase the supply of money, it creates dollars and uses them to purchase government bonds from the public in the nation's bond markets.

c. If the Fed wants to lower the supply of money, it sells government bonds from its portfolio to the public in the nation's bond markets. Money is then taken out of the hands of the public and the supply of money falls.

d. If the sale or purchase of government bonds affects the amount of deposits in the banking system, the effect will be made larger by the money multiplier.





- e. Open market operations are easy for the Fed to conduct and are therefore the tool of monetary policy that the Fed uses most often.

## 2. Fed Lending to Banks

- a. The Fed can also lend reserves to banks.
- b. Definition of **discount rate**: the interest rate on the loans that the Fed makes to banks.
- c. A higher discount rate discourages banks from borrowing from the Fed and likely encourages banks to hold onto larger amounts of reserves. This in turn lowers the money supply.
- d. A lower discount rate encourages banks to lend their reserves (and borrow from the Fed). This will increase the money supply.
- e. In recent years, the Fed has set up new mechanisms for banks to borrow from the Fed.

## B. How the Fed Influences the Reserve Ratio

### 1. Reserve Requirements

- a. Definition of **reserve requirements**: regulations on the minimum amount of reserves that banks must hold against deposits.

b. This can affect the size of the money supply through changes in the money multiplier.

c. The Fed rarely uses this tool because of the disruptions in the banking industry that would be caused by frequent alterations of reserve requirements. (It is also not effective when banks hold a lot of excess reserves.)

## 2. Paying Interest on Reserves

a. In October of 2008, the Fed began paying banks interest on reserves.

b. The higher the interest rate, the more reserves a bank will want to hold. This will reduce the money multiplier and the money supply.

## C. Problems in Controlling the Money Supply

1. The Fed does not control the amount of money that consumers choose to deposit in banks.

a. The more money that households deposit, the more reserves the banks have, and the more money the banking system can create.

b. The less money that households deposit, the less reserves banks have, and the less money the banking system can create.

2. The Fed does not control the amount that bankers choose to lend.

- a. The amount of money created by the banking system depends on loans being made.
  - b. If banks choose to hold onto a greater level of reserves than required by the Fed (called excess reserves), the money supply will fall.
3. Therefore, in a system of fractional-reserve banking, the amount of money in the economy depends in part on the behavior of depositors and bankers.
  4. Because the Fed cannot control or perfectly predict this behavior, it cannot perfectly control the money supply.

D. *Case Study: Bank Runs and the Money Supply*

1. Bank runs create a large problem under fractional-reserve banking.
2. Because the bank only holds a fraction of its deposits in reserve, it will not have the funds to satisfy all of the withdrawal requests from its depositors.
3. Today, deposits are guaranteed through the Federal Depository Insurance Corporation (FDIC).

Activity 2—Money Creation

**Type:** In-class demonstration

**Topics:** The banking system and deposit expansion

**Materials needed:** two volunteers, a paper with  
“\$1,000” written on it

**Time:** 25 minutes

**Class limitations:** Works in any size class

**PURPOSE**

This activity demonstrates the role of the banking system in expanding the money supply.

**INSTRUCTIONS**

The two volunteers are bankers. Have each of them draw a balance sheet on the board.

<u>BankTwo</u>		<u>AmerBankCorp</u>	
Assets	Liabilities	Assets	Liabilities
0	0	0	0

The rest of the class is the public. They are all eager borrowers and depositors.

The instructor is the Federal Reserve. The Federal Reserve sets the reserve requirement at 20% of deposits.

The Federal Reserve also conducts open-market operations. Use the \$1,000 paper to buy a baseball cap from a student. (Explain that the Fed actually buys government bonds from the public because the market for used baseball caps is small.)

The capless student now has \$1,000 to spend with any other member of the class. This student receives \$1,000 and puts it in the bank of his or her choice.

The bank now has \$1,000 in deposits (a liability) and \$1,000 in cash (an asset). The bank needs to keep \$200 in

reserve (20%) but can loan the other \$800. Have the banker tear off 20% of the bill and give the rest to another student.

Revise the banks' balance sheets.

~~Now the borrower spends the \$800 and the recipient~~  
deposits it in a bank. This bank now has \$800 in deposits and \$800 in cash. Of that, \$160 needs to be kept in reserve and \$640 can be lent. Have the banker save 20% of the paper and give the rest to another eager borrower.

Revise the banks' balance sheets.

Continue this process for a few more iterations.

At the end, ask everyone who has money in the bank to stand. The total deposits in the bank will far exceed the initial \$1,000 that the Fed put into the economy.

Show the final balance sheet for each bank.

#### POINTS FOR DISCUSSION

Banks are important to the process of money creation. The banking system, as a whole, literally expands the money supply.

If the process is carried on far enough, you can derive the money multiplier.  
The Federal Funds Rate

1. Definition of **federal funds rate: the short-term interest rate that banks charge one another for loans.**
2. When the federal funds rate rises or falls, other interest rates often move in the same direction.

3. In recent years, the Fed has set a target for the federal funds rate.

F. *In the News: Bernanke on the Fed's Toolbox*

1. During the financial crisis of 2008 and 2009, the Fed expanded reserves to help struggling banks.

2. This is an article written by Fed chairman, Ben Bernanke, discussing the Fed's options for reversing this policy once the economy recovers from this deep recession.

**SOLUTIONS TO TEXT PROBLEMS:**

**Quick Quizzes**

1. The three functions of money are: (1) medium of exchange; (2) unit of account; and (3) store of value.  
Money is a medium of exchange because money is the item people use to purchase goods and services. Money is a unit of account because it is the yardstick people use to post prices and record debts. Money is a store of value because people use it to transfer purchasing power from the present to the future.
2. The primary responsibilities of the Federal Reserve are to regulate banks, to ensure the health of the banking system, and to control the quantity of money that is made available in the economy. If the Fed wants to increase the supply of money, it usually does so by creating dollars and using them to purchase government bonds from the public in the nation's bond markets.

3. Banks create money when they hold a fraction of their deposits in reserve and lend out the remainder. If the Fed wanted to use all of its tools to decrease the money supply, it would: (1) sell government bonds from its portfolio in the open market to reduce the number of dollars in circulation; (2) increase reserve requirements to reduce the money created by banks; (3) increase the interest rate it pays on reserves to increase the reserves banks will choose to hold; and (4) increase the discount rate to discourage banks from borrowing reserves from the Fed.

### **Questions for Review**

1. Money is different from other assets in the economy because it is the most liquid asset available. Other assets vary widely in their liquidity.
2. Commodity money is money with intrinsic value, like gold, which can be used for purposes other than as a medium of exchange. Fiat money is money without intrinsic value; it has no value other than its use as a medium of exchange. Our economy uses fiat money.
3. Demand deposits are balances in bank accounts that depositors can access on demand simply by writing a check or using a debit card. They should be included in the supply of money because they can be used as a medium of exchange.
4. The Federal Open Market Committee (FOMC) is

responsible for setting monetary policy in the United States. The FOMC consists of the 7 members of the Federal Reserve Board of Governors and 5 of the 12 presidents of Federal Reserve Banks. Members of the Board of Governors are appointed by the president of the United States and confirmed by the U.S. Senate. The presidents of the Federal Reserve Banks are chosen by each bank's board of directors.

5. If the Fed wants to increase the supply of money with open-market operations, it purchases U.S. government bonds from the public on the open market. The purchase increases the number of dollars in the hands of the public, thus raising the money supply.
6. Banks do not hold 100% reserves because it is more profitable to use the reserves to make loans, which earn interest, instead of leaving the money as reserves. The amount of reserves banks hold is related to the amount of money the banking system creates through the money multiplier. The smaller the fraction of reserves banks hold, the larger the money multiplier, because each dollar of reserves is used to create more money.
7. Bank B will show a larger change in bank capital. The decrease in assets will render Bank B insolvent because its assets will fall below its liabilities, a decrease in bank capital of 140%. Bank A will suffer a large decline in bank capital (70%) but will remain solvent.
8. The discount rate is the interest rate on loans that the Federal Reserve makes to banks. If the Fed raises the discount rate, fewer banks will borrow from the Fed, so both banks' reserves and the money supply will be lower.



9. Reserve requirements are regulations on the minimum amount of reserves that banks must hold against deposits. An increase in reserve requirements raises the reserve ratio, lowers the money multiplier, and decreases the money supply.
10. The Fed cannot control the money supply perfectly because: (1) the Fed does not control the amount of money that households choose to hold as deposits in banks; and (2) the Fed does not control the amount that bankers choose to lend. The actions of households and banks affect the money supply in ways the Fed cannot perfectly control or predict.

### **Quick Check Multiple Choice**

1. c
2. c
3. d
4. a
5. c
6. a

### **Problems and Applications**

1. a. A U.S. penny is considered money in the U.S. economy because it is used as a medium of exchange to buy goods or services, it serves as a unit of account because prices in stores are listed in terms of dollars and cents, and it serves as a store of value for anyone

who holds it over time.

- b. A Mexican peso is not considered money in the U.S. economy, because it is not used as a medium of exchange, and prices are not given in terms of pesos, so it is not a unit of account. It could serve as a store of value, though.
  - c. A Picasso painting is not considered money, because you cannot exchange it for goods or services, and prices are not given in terms of Picasso paintings. It does, however, serve as a store of value.
  - d. A plastic credit card is similar to money, but represents deferred payment rather than immediate payment. So credit cards do not fully represent the medium of exchange function of money, nor are they stores of value, because they represent short-term loans rather than being an asset like currency.
2. When your uncle repays a \$100 loan from Tenth National Bank (TNB) by writing a check from his TNB checking account, the result is a change in the assets and liabilities of both your uncle and TNB, as shown in these T-accounts:

Your Uncle			
Assets		Liabilities	
<b>Before:</b>			
Checking Account	\$100	Loans	\$100
<b>After:</b>			
Checking Account	\$0	Loans	\$0

Tenth National Bank	

Assets		Liabilities	
<b>Before:</b>			
Loans	\$100	Deposits	\$100
<b>After:</b>			
Loans	\$0	Deposits	\$0

By paying off the loan, your uncle simply eliminated the outstanding loan using the assets in his checking account. Your uncle's wealth has not changed; he simply has fewer assets and fewer liabilities.

3. a. Here is BSB's T-account:

Beleaguered State Bank			
Assets		Liabilities	
Reserves	\$25 million	Deposits	\$250 million
Loans	\$225 million		

- b. When BSB's largest depositor withdraws \$10 million in cash and BSB reduces its loans outstanding to maintain the same reserve ratio, its T-account is now:

Beleaguered State Bank			
Assets		Liabilities	
Reserves	\$24 million	Deposits	\$240 million
Loans	\$216 million		

- c. Because BSB is cutting back on its loans, other banks will find themselves short of reserves and they may also cut back on their loans as well.
- d. BSB may find it difficult to cut back on its loans immediately, because it cannot force people to pay off loans. Instead, it can stop making new loans. But for a time it might find itself with more loans than it wants.

It could try to attract additional deposits to get additional reserves, or borrow from another bank or from the Fed.

4. If you take \$100 that you held as currency and put it into the banking system, then the total amount of deposits in the banking system increases by \$1,000, because a reserve ratio of 10% means the money multiplier is  $1/0.10 = 10$ . Thus, the money supply increases by \$900, because deposits increase by \$1,000 but currency declines by \$100.

5. a.

Happy Bank			
Assets		Liabilities	
Reserves	\$100	Deposits	\$800
Loans	\$900	Bank Capital	\$200

b. The leverage ratio =  $\$1,000/\$200 = 5$ .

c.

Happy Bank			
Assets		Liabilities	
Reserves	\$100	Deposits	\$800
Loans	\$810	Bank Capital	\$110

- d. Assets decline by 9%. The bank's capital declines by 45%. The reduction in bank capital is larger than the reduction in assets because all of the defaulted loans are covered by bank capital.

6. With a required reserve ratio of 10%, the money

multiplier could be as high as  $1/0.10 = 10$ , if banks hold no excess reserves and people do not keep some additional currency. So the maximum increase in the money supply from a \$10 million open-market purchase is \$100 million. The smallest possible increase is \$10 million if all of the money is held by banks as excess reserves.

7. The money supply will expand more if the Fed buys \$2,000 worth of bonds. Both deposits will lead to monetary expansion, but the Fed's deposit is new money. With a 5% reserve requirement, the multiplier is 20 ( $1/0.05$ ). The \$2,000 from the Fed will increase the money supply by \$40,000 ( $\$2,000 \times 20$ ). The \$2,000 from the cookie jar is already part of the money supply as currency. When it is deposited the money supply increases by \$38,000. Deposits increase by \$40,000 ( $\$2,000 \times 20$ ) but currency decreases by \$2,000.
8.
  - a. With a required reserve ratio of 10% and no excess reserves, the money multiplier is  $1/0.10 = 10$ . If the Fed sells \$1 million of government bonds, reserves will decline by \$1 million and the money supply will contract by  $10 \times \$1 \text{ million} = \$10 \text{ million}$ .
  - b. Banks might wish to hold excess reserves if they need to hold the reserves for their day-to-day operations, such as paying other banks for customers' transactions, making change, cashing paychecks, and so on. If banks increase excess reserves such that there is no overall change in the total reserve ratio, then the money multiplier does not change and there is no effect on the money supply.

9. a. With banks holding only required reserves of 10%, the money multiplier is  $1/0.10 = 10$ . Because reserves are \$100 billion, the money supply is  $10 \times \$100 \text{ billion} = \$1,000 \text{ billion}$  or \$1 trillion.
- b. If the required reserve ratio is raised to 20%, the money multiplier declines to  $1/0.20 = 5$ . With reserves of \$100 billion, the money supply would decline to \$500 billion, a decline of \$500 billion. Reserves would be unchanged.
10. a. To expand the money supply, the Fed should buy bonds.
- b. With a reserve requirement of 20%, the money multiplier is  $1/0.20 = 5$ . Therefore to expand the money supply by \$40 million, the Fed should buy  $\$40 \text{ million} / 5 = \$8 \text{ million}$  worth of bonds.
11. a. If people hold all money as currency, the quantity of money is \$2,000.
- b. If people hold all money as demand deposits at banks with 100% reserves, the quantity of money is \$2,000.
- c. If people have \$1,000 in currency and \$1,000 in demand deposits, the quantity of money is \$2,000.
- d. If banks have a reserve ratio of 10%, the money multiplier is  $1/0.10 = 10$ . So if people hold all money as demand deposits, the quantity of money is  $10 \times \$2,000 = \$20,000$ .

- e. If people hold equal amounts of currency ( $C$ ) and demand deposits ( $D$ ) and the money multiplier for reserves is 10, then two equations must be satisfied: (1)  $C = D$ , so that people have equal amounts of currency and demand deposits; and (2)  $10 \times (\$2,000 - C) = D$ , so that the money multiplier (10) times the number of dollar bills that are not being held by people ( $\$2,000 - C$ ) equals the amount of demand deposits ( $D$ ). Using the first equation in the second gives  $10 \times (\$2,000 - D) = D$ , or  $\$20,000 - 10D = D$ , or  $\$20,000 = 11D$ , so  $D = \$1,818.18$ . Then  $C = \$1,818.18$ . The quantity of money is  $C + D = \$3,636.36$ .