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The Money Supply and the Federal Reserve System

Chapter objectives:

1. Identify the three functions of money. List the various types of money and the differences among them.
2. Identify two different measures of the U.S. money supply.
3. Determine which items are assets and which are liabilities on a bank's balance sheet. Distinguish among total, excess, and required reserves. Describe the process of deposit creation. Derive and explain the importance of the money multiplier.
4. Outline the functions of the Federal Reserve (the Fed). Identify the three monetary policy tools of the Fed and how they are adjusted to increase (decrease) the money supply.
5. Analyze the Fed's ability to expand or contract reserves and the money supply.

This chapter begins to build a model of the financial market that continues in Chapter 11 (26), where the factors that determine the demand for money holdings and the establishment of money market equilibrium are considered. This model will then be combined with the aggregate expenditure model in Chapter 12 (27). It is important that you develop a good understanding of financial markets at this point.

BRAIN TEASER: In 2000 the United States introduced its eighth dollar coin—the Sacagawea golden dollar. Over one billion of the coins were minted during 2000. About half remained in the vaults of Federal Reserve Banks and the U.S. Mint and the other half were in circulation. However, a large proportion of the “circulating” dollars were being hoarded. Are the Sacagawea dollars “money”? In practice, do they perform the functions of money?



OBJECTIVE 1:

Identify the three functions of money. List the various types of money and the differences among them.

Money fulfills three functions in the economy. The three functions of money are:

- (a) a medium of exchange (or means of payment)
- (b) a store of value
- (c) a unit of account (page 181 [493])

Before money, there was barter. But because trading goods for goods relies on a double coincidence of wants (where each trader must be willing to trade something that the other trader is willing to accept), barter was inefficient. *Commodity money* (a good that has some value over and above its value as money) was an intermediate stage between barter and the *fiat money* of the modern economy. Gold and cigarettes are examples of commodity money. Dollar bills (Federal Reserve notes) are fiat money—they derive their value from the willingness of individuals to accept them as payment. That willingness, in turn, derives from the government’s declaration that its notes are legal tender—an acceptable means of settling all debts, private and public. To ensure compliance, the government must protect its currency from being debased, either through forgery or by printing too much of it. (page 182 [494])

◆◆◆ **LEARNING TIP:** In this section, liberate yourself from equating “money” with dollar bills. Try a thought experiment: If dollars (and checks, etc.) disappeared overnight, how would the U.S. economy adapt? What might be used instead of dollars? Which features favor some commodities, such as gold, silver or tobacco, over others, such as fish, cows, or iron? Would credit cards (or debit cards) take over?◆

ECONOMICS IN PRACTICE: On page 183 [495], the textbook describes how dolphin’s teeth are used as money in the Solomon Islands. Is this commodity money or fiat money? How well does it fulfill the functions of money?

ANSWER: Dolphin’s teeth are a form of commodity money—they have some value (as jewelry) beyond their role as money. Clearly, this money is acceptable as a medium of exchange and, since it is durable, (unlike cows, for example, which can die), seems to perform well as a store of value.

ECONOMICS IN PRACTICE (CONTINUED): Douglas Adams, in his *Hitchhiker’s Guide to the Galaxy*, describes the efforts of the Golgafrinchams to devise their own money. They choose the leaf. The problem is that, because leaves are so available, inflation becomes rife, provoking a program of forest burn-down. The leaf is not a good choice as money. So what, in fact, are the characteristics of a “good” money? Compile a list of desirable qualities. How well do dolphin’s teeth (and dollar bills) meet your characteristics? And why are leaves such a poor choice?

ANSWER: To be a good candidate as “money,” an item must exhibit particular qualities including durability, portability, divisibility, comparability, and a limited supply. Dollars are fairly long-lived and portable. We can sub-divide a dollar into one hundred smaller units (cents) and one dollar is essentially the same as any other. Finally, it is illegal to forge dollars. Dolphin’s teeth similarly are portable and durable (although the article mentions the problem of decay) and are limited in supply (despite bat-tooth counterfeiters). Also, presumably, one tooth is quite similar to another. Leaves, in contrast, are not limited in supply, durable or comparable. A better choice for the Golgafrinchams would have been one particular type of leaf that is durable, difficult to substitute or counterfeit, and valuable in its own right—tobacco, for instance.

Practice

1. Money’s prime function is as
 - (a) the standard for credit transactions.
 - (b) the medium of exchange.
 - (c) a store of value.
 - (d) a unit of account.

ANSWER: (b) The main reason for having money is because it eases the process of exchange. Refer to p. 182 [494].

2. In a barter economy,
- (a) money functions only as a medium of exchange.
 - (b) multiple “exchange rates” are likely.
 - (c) money functions are a medium of exchange and as a store of value.
 - (d) saving can not occur.

ANSWER: (b) In a barter economy, there is no money, so Options (a) and (c) are incorrect. Saving can occur; saving, recall, is non-consumption. In a barter economy, there will be an exchange rate between apples and corn, another between corn and tobacco, another between tobacco and tomatoes, and so on.

Use the following information to answer the next two questions. At a flea market, Mary spots some valuable Depression glassware valued at the ridiculously low price of 25¢. She hands over the quarter to secure the item.

3. The price tag on the glassware used money in its role as a
- (a) medium of exchange.
 - (b) store of value.
 - (c) unit of account.
 - (d) means of payment.

ANSWER: (c) Money establishes a consistent way of quoting prices. Money is functioning well in this case—Mary can see that the glassware is undervalued.

4. As Mary hands over the quarter, she is using money in its role as a
- (a) medium of exchange.
 - (b) store of value.
 - (c) unit of account.
 - (d) form of credit.

ANSWER: (a) The quarter, by being acceptable to the seller, permits the exchange to occur. Refer to p. 182 [494].

5. Jack is saving money to buy a new DVD. Money is functioning as a
- (a) medium of exchange.
 - (b) store of value.
 - (c) unit of account.
 - (d) standard of deferred payment.

ANSWER: (b) An asset that carries purchasing power from one time period to another is functioning as a store of value. Refer to p. 182 [494].

6. Each of the following is an example of commodity money EXCEPT
- (a) dollar bills.
 - (b) gold.
 - (c) cigarettes.
 - (d) salt.

ANSWER: (a) Dollar bills have value only as dollar bills—they are fiat money. The three commodities have all been used as money. Salt, in fact, is the source of the term “salary.” ■



OBJECTIVE 2:

Identify two different measures of the U.S. money supply.

At the heart of the various measures of the money supply is the concept of *liquidity*. The more easily and cheaply an asset can be converted into spending power, the more liquid it is. The most liquid assets are included in M1, the narrowest definition of money. M1, or transactions money, includes currency held outside banks, demand deposits and other checkable deposits, and the value of traveler’s checks. Other assets, such as savings accounts, are called *near monies*. M2 (broad money) includes everything in M1 and near monies such as savings accounts and money market accounts. (page 185 [497])

◆◆◆ LEARNING TIP: The definition of M1—currency held outside banks, demand deposits, the value of traveler’s checks, and various checkable accounts—prevents “double-counting.” When you deposit a dollar bill into your checking account, the money supply doesn’t change. “Demand deposits” increase by a dollar, but “currency held outside banks” decreases by a dollar, because the dollar bill is now held by the banking system, *not* by the public.

◆◆◆ LEARNING TIP: From this point on, when the textbook refers to “money,” it is referring to our M1 definition of money—transaction money. In fact, it’s being even more restrictive than that; from now on, for simplicity’s sake, “money” will mean “currency in circulation” and “deposits”.◆

Practice

7. Which of the following financial items is not included in M2?
- Money market accounts
 - Excess reserves
 - Demand deposits
 - Savings accounts

ANSWER: (b) Excess reserves are not found in any definition of the money supply. Note that demand deposits are included in M2 because they are included in M1. Refer to p. 185 [497].

8. Near monies are
- included in the M1.
 - liquid assets that are close substitutes for transactions money.
 - stocks, bonds, and collectible artwork.
 - Federal Reserve notes.

ANSWER: (b) Refer to p. 185 [497] for a discussion of near monies. ■



OBJECTIVE 3:

Determine which items are assets and which are liabilities on a bank’s balance sheet. Distinguish among total, excess, and required reserves. Describe the process of deposit creation. Derive and explain the importance of the money multiplier.

◆◆◆ LEARNING TIP: Balance sheets, often called T-accounts because the lines form a big “T,” are used extensively in this chapter. You may never have seen them before. A basic rule to memorize is that “assets go on the left and liabilities go on the right” in a balance sheet.◆

Bankers have discovered that, because they need keep only a fraction of their total reserves available for withdrawal by depositors (*required reserves*), the rest (*excess reserves*) can be loaned out at a profit. Banks create money through these lending activities. When loaned out, the funds advanced to the borrower increase her/his spending power and count as an addition to the money supply. Each bank, therefore, can expand the money supply by the value of its excess reserves. As a whole, the banking system, by recirculating deposits, can expand the money supply by a multiple (the *money multiplier*) of its total reserves, the multiple being determined by the fraction of funds that is held as required reserves. In practice, the Federal Reserve establishes a *required reserve ratio*, and that determines the maximum size of the money multiplier. The money multiplier is equal to $1/(\text{required reserve ratio})$. (page 187 [499])

◆◆◆ **LEARNING TIP:** The balance sheet is looked at from the viewpoint of the bank—not that of the customers or the Fed. Go through the process described in the text, but using different numbers. Explain each step to yourself as you go. The best way to practice the case of money “destruction,” which can effectively challenge your understanding, is by increasing the required reserve ratio. Initially, banks will have inadequate funds to meet their reserve requirements. They will have to reduce their lending activities and add to their reserves instead.◆

The following table will help to organize your thoughts on the money creation process. Suppose Alice deposits \$1,000 in her bank (Bank A). The required reserve ratio is 20%. Bank A’s reserves increase by \$1,000 (of which \$200 are required reserves, which can’t be loaned out) and \$800 are excess reserves (which can be loaned out). A loan to Peter is made and \$800 worth of spending power is released. Peter writes an \$800 check to Brenda, who deposits it in her bank (Bank B). Bank A’s excess reserves fall to zero when the check is cleared, but it still has the \$1,000 deposit, \$200 in required reserves, and \$800 in loans.

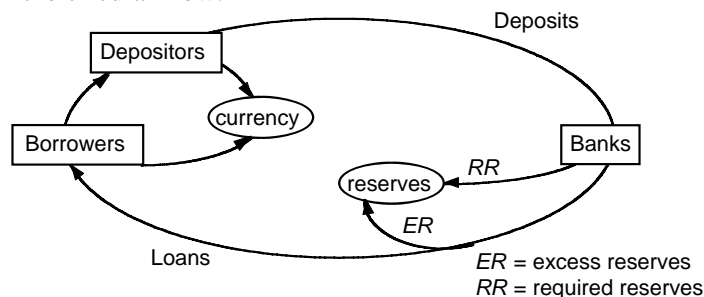
Bank B has \$800 in deposits, \$160 in required reserves, and \$640 in excess reserves. Now Bank B lends \$640 to Eric, who writes a check to Chris. Chris deposits the check in Bank C. When Eric’s check is cleared, Bank B’s excess reserves fall to zero, but it still has the \$800 deposit, \$160 in required reserves, and \$640 in loans. And so on.

Bank	New Demand Deposits =	Change in Reserves =	Change in Required Reserves +	Change in Excess Reserves	Change in Loans
A.	1,000.00	1,000.00	200.00	800.00 /0	800.00
B.	800.00	800.00	160.00	640.00 /0	640.00
C.	640.00	640.00	128.00	512.00 /0	512.00
D.	512.00	512.00	102.40	409.60 /0	409.60
etc.
Total	5,000.00	5,000.00	1,000.00	0	4,000.00

Points to note:

- The “change in excess reserves” column contains two steps, the first indicating how much excess reserves increase, the second assuming that all excess reserves have been loaned out and the borrower’s check has been honored.
- It becomes clear, using the table, that the expansion process will continue until all of the original injection of new reserves (\$1,000) has been converted into required reserves. At that point the process must stop.
- The \$5,000 expansion in demand deposit liabilities is balanced on the asset side of the balance sheet by \$1,000 of required reserves and \$4,000 of loans.

A Circular Flow Diagram: This “leakage” process is similar to that described for the expenditure multiplier in Practice Question 16 of Chapter 8 (23). To get an intuitive feel for the money expansion process, you can use a diagram similar to the one presented there. In this case, the “household” sector is split into two parts, borrowers and depositors, but otherwise the argument is similar. In the money creation situation, the leakage occurs when banks retain funds as required reserves. Over and above the leakage of reserves into required reserves, other “leakages,” such as holding funds as currency, (either by the borrower or other members of the public) or holdings of excess reserves by the banks, will diminish the strength of the circular flow.



◆◆◆ **LEARNING TIP:** The formula relating commercial bank reserves (RR) and deposits (D) via the required reserve ratio (g) is $D = RR/g$. Memorize it! ◆

A small point. Note that the money multiplier refers to the multiple change in *deposits* (which is not quite the same thing as the money supply). M1 is comprised of deposits and also of currency held outside banks. A 10% increase in reserves doesn't necessarily translate into a 10% increase in the money supply. If bank reserves increase because Alice deposits \$100 into her checking account, the decrease in currency will partly offset the multiple expansion in deposits.

Practice

9. The basic equation for a bank's balance sheet is
- Liabilities = Assets + Net Worth.
 - Net Worth = Liabilities + Assets.
 - Assets = Liabilities + Net Worth.
 - Assets = Liabilities – Net Worth.

ANSWER: (c) Refer to p. 187 [499].

10. Assets are things that are _____; on a balance sheet they are entered on the _____.
- owned; right
 - owned; left
 - owed; right
 - owed; left

ANSWER: (b) Refer to p. 187 [499].

Use the following balance sheet for First Union National Bank to answer the next three questions. First Union has a reserve ratio of 20%.

Assets		Liabilities	
Reserves	\$2,500,000	Checking deposits	6,000,000
Loans outstanding	5,500,000		
Other assets	1,000,000	Net Worth	3,000,000
Total	\$9,000,000	Total	\$9,000,000

11. First Union has \$2,500,000 in reserves, checking deposits of \$6,000,000, and a reserve ratio of 20%. First Union has _____ of required reserves and _____ of excess reserves.
- (a) \$500,000; \$2,000,000
 (b) \$500,000; \$5,500,000
 (c) \$1,200,000; \$1,300,000
 (d) \$1,200,000; \$4,800,000

ANSWER: (c) The required reserves are calculated relative to the bank's liabilities, therefore $\$6,000,000 \times 0.20$. Total reserves = required reserves + excess reserves.

12. Assuming prudent management, First Union can increase its loans by up to
- (a) \$1,300,000.
 (b) \$1,500,000.
 (c) \$2,000,000.
 (d) \$3,000,000.

ANSWER: (a) First Union can increase its loans by the extent of its excess reserves.

13. Assuming all banks have a reserve ratio of 20%, and that the other banks were loaned up initially, the nation's money supply could expand by
- (a) \$1,300,000.
 (b) \$6,500,000.
 (c) \$12,500,000.
 (d) \$10,000,000.

ANSWER: (b) The money supply can expand by the extent of the excess reserves (\$1,300,000) times the money multiplier, which is $1/0.20 = 5$.

Use the following balance sheet for First Federal Bank to answer the next two questions.

Assets		Liabilities	
Reserves	\$400,000	Checking deposits	\$1,000,000
Loans	\$600,000		
Total	\$1,000,000	Total	\$1,000,000

14. First Federal is fully loaned up. The reserve requirement is
- (a) 2.5%.
 (b) 40%.
 (c) 60%.
 (d) 250%.

ANSWER: (b) If all reserves are required reserves, the requirement is to hold 40% of deposit liabilities.

15. Assume that First Federal is the only bank in the economy and the banking system is closed to foreign banks. The reserve requirement is 40%. Now an additional \$100,000 is deposited. The bank can expand its loans up to the point where its total deposits are
- (a) \$1,100,000.

- (b) \$1,250,000.
- (c) \$1,400,000.
- (d) \$2,000,000.

ANSWER: (b) Total (required) reserves will be \$500,000. The money multiplier is 2.5. ■



OBJECTIVE 4:

Outline the functions of the Federal Reserve (the Fed). Identify the three monetary policy tools of the Fed and how they are adjusted to increase (decrease) the money supply.

The main macroeconomic role of the Fed is to control the money supply and interest rates, but it also oversees the banking system and gives check-clearing and other services. As well as functioning as the bankers' bank, it is the government's bank, the lender of last resort to commercial banks, and a major player in international currency transactions. (page 192 [504])

The primary method used by the Federal Open Market Committee (FOMC) to control the money supply is the manipulation of commercial bank reserves. (Recall that the commercial banks can create deposits only if they have the excess reserves available to support such an expansion.)

The three major tools of monetary policy are:

- (a) the required reserve ratio
- (b) the discount rate (which largely have the effect of announcing policy changes)
- (c) open market operations, which are the most frequently used and the most precise (page 195 [507])

To expand the money supply, the Fed can buy government securities (which increases the reserves of the banking system), cut the reserve requirement (which results in the commercial banks having more excess reserves, and thus, greater lending capacity), or cut the discount rate (which reduces the "price" of borrowing funds from the Fed). In each case, the effect is to make more reserves available to the commercial banking system. When these reserves are loaned out, the money supply increases.

- ◆◆◆ LEARNING TIP: This section includes material crucial to the following chapters and will handsomely reward your study time. Take each of the policy tools (required reserve ratio, discount rate, and open market operations) in turn, and see how it would affect your ability to lend if you were a banker. If you become more able to lend, the money supply will increase.
- ◆◆◆ LEARNING TIP: In recent years, the Fed has been fairly active in attempting to manipulate the economy—stay alert to what's happening in the news. Often, Fed policy changes are signaled by a change in the "federal funds rate," which is the interest rate at which banks can borrow from each other and one which is closely linked to the discount rate.
- ◆◆◆ LEARNING TIP: The following "trick" will help you to sort out the operation of the monetary policy tools. The discount rate and reserve ratio move in the same direction (both down for an expansionary policy, for example) while, with open market operations, the Fed (**B**)uys securities to make the money supply (**B**)igger, and (**S**)ells them to make it (**S**)maller. ◀

Practice

16. Which of the following instruments is not used by the Fed to change the money supply?
- (a) Open market operations
 - (b) The discount rate
 - (c) The tax rate on interest earnings
 - (d) The required reserve ratio

ANSWER: (c) Changes in tax rates are undertaken by Congress as part of fiscal policy.

17. U.S. government securities owned by the Fed are a(n) _____ of the Fed; Federal Reserve notes are a(n) _____ of the Fed.
- (a) asset; asset
 - (b) asset; liability
 - (c) liability; asset
 - (d) liability; liability

ANSWER: (b) The securities are claims against the government and owned by the Fed. Federal Reserve notes are issued by the Fed and must be honored by it.

18. Which of the following is not a responsibility of the Fed?
- (a) Regulating the banking system
 - (b) Clearing interbank payments
 - (c) Managing exchange rates
 - (d) Issuing new bonds to finance the federal deficit

ANSWER: (d) New bonds to finance the deficit are issued by the Treasury.

19. The preferred instrument of monetary policy is
- (a) the discount rate.
 - (b) the required reserve ratio.
 - (c) open market operations.
 - (d) the exchange rate.

ANSWER: (c) Refer to p. 197 [509]. Open market operations seldom make headlines, but are the policy tool of choice because of convenience and precision.

20. *Ceteris paribus*, an open market sale of government securities to First Union National Bank will _____ First Union's assets and _____ First Union's liabilities.
- (a) increase; increase
 - (b) increase; not change
 - (c) not change; increase
 - (d) not change; not change

ANSWER: (d) The composition, but not the level, of First Union's assets will change.

21. The Fed decreases the required reserve ratio. The excess reserves of banks will _____ and the money supply will _____.
- (a) increase; increase
 - (b) increase; decrease
 - (c) remain constant; increase
 - (d) decrease; increase

ANSWER: (a) Lower reserve requirements mean that banks have more excess reserves available to lend.

22. First Union National Bank is fully loaned up. Ultimately, an open market sale of government securities to First Union will _____ First Union's reserves and _____ First Union's deposit liabilities.
- (a) increase; increase
 - (b) increase; decrease

- (c) decrease; increase
- (d) decrease; decrease

ANSWER: (d) To buy the securities, First Union must transfer some of its reserves to the Fed. Because reserves have fallen, First Union will be unable to support its original level of demand deposit liabilities. ■



OBJECTIVE 5:

Analyze the Fed's ability to expand or contract reserves and the money supply.

The Fed changes the required reserve ratio infrequently because it is a crude instrument of monetary control. When changes do occur, they tend to exert a powerful, if imprecise, impact on the private banks. (page 195 [507])

Discount rate adjustments help the Fed to “signal” changes in policy, but this policy tool also has some problems. First, the effect of a discount rate change is imprecise. Second, movements in other interest rates may counteract the hoped-for effect of the discount rate change. Moral suasion (threats!) may be used to discourage banks from borrowing heavily from the Fed and then re-lending the reserves. (page 196 [508])

Open market operations are a quick, precise, and flexible method of manipulating reserves. (page 197 [509])

The Fed, by its policy actions, clearly can influence the economy's money supply. Is the supply of money affected by the interest rate? At this point, Case, Fair and Oster assume that it is not—the money supply curve graphs as a vertical line. This simplifying assumption will be relaxed in Chapter 13 (28).

Practice

23. Which of the following is false? Open market operations
- (a) are fast and flexible.
 - (b) are fairly predictable in their impact on the money supply.
 - (c) are an effective instrument of monetary policy because they are used infrequently.
 - (d) involve the purchase and sale of preexisting U.S. government securities.

ANSWER: (c) Open market operations are the most frequently used tool of monetary policy.

24. Although the required reserve ratio is a tool of monetary policy, it is used infrequently because
- (a) only banks that are members of the Federal Reserve System must comply with the requirement, and this discriminates in favor of the many banks that are not members of the Fed.
 - (b) when the Fed reduces the required reserve ratio, banks will have to “call” some of their loans.
 - (c) a change in the requirement will take two weeks to have an impact on banks due to lags in bank reporting.
 - (d) it may take a long time to get Congressional permission to proceed with a change in the ratio.

ANSWER: (c) Refer to p. 195 [507]. All depository institutions are members of the Fed. Congressional approval of Fed decisions is not required—the Fed is separate from Congress. *Raising* the ratio might result in called loans.

25. Each of the following is a problem associated with the use of the discount rate EXCEPT that

- (a) the discount rate cannot be adjusted quickly.
- (b) the impact of a change in the discount rate is imprecise.
- (c) the impact of a change in the discount rate can be offset by changes in other interest rates.
- (d) the effect of a change in the discount rate on banks' demand for reserves is uncertain.

ANSWER: (a) This rate is established, and can be changed at will, by the Fed. ■

BRAIN TEASER SOLUTION: Certainly, the unissued dollars are not money because, to be counted, currency must be held outside banks. However, what of the dollars held by the public? The prime role for currency is to serve as a medium of exchange and, in 2000 at least, many of the Sacagawea dollars that could have been used in this way were not being used. Presumably, the keepsake value of the coins exceeded one dollar and so they were hoarded—more a collectible than currency. Paper dollars were used in their stead. Certainly, though, the Sacagawea dollars fulfilled the store-of-value and unit-of-account functions of money.

PRACTICE TEST

I. MULTIPLE-CHOICE QUESTIONS

Select the option that provides the single best answer.

- _____ 1. Each of the following is included in M1 EXCEPT
 - (a) Federal Reserve notes.
 - (b) cash held by the public.
 - (c) demand deposit accounts.
 - (d) credit card balances.

- _____ 2. Which of the following is not a function of money?
 - (a) A form of speculation
 - (b) A medium of exchange
 - (c) A unit of account
 - (d) A store of value

- _____ 3. Robin Hood borrows \$100 in dollar bills from Friar Tuck and deposits it at Bank of America. The required reserve ratio is 25%. What is the maximum amount by which the banking system can expand checking accounts?
 - (a) \$500
 - (b) \$100
 - (c) \$300
 - (d) \$400

- _____ 4. Excess reserves equal
 - (a) demand deposits plus required reserves.
 - (b) actual reserves minus required reserves.
 - (c) total reserves minus actual reserves.
 - (d) demand deposits minus required reserves.

- _____ 5. It is assumed that the money supply curve is _____; it _____ affected by changes in the interest rate.
 - (a) horizontal; is
 - (b) vertical; is

- (c) vertical; is not
(d) horizontal; is not
- _____ 6. Checking account deposits at Centura Bank are Centura _____ ; money market accounts at Centura Bank are Centura _____ .
(a) assets; assets
(b) assets; liabilities
(c) liabilities; assets
(d) liabilities; liabilities
- _____ 7. In a T-account, liabilities go on the _____ side and net worth goes on the _____ side.
(a) left; left
(b) left; right
(c) right; left
(d) right; right
- _____ 8. An increase in the required reserve ratio will
(a) increase the demand for money balances.
(b) reduce the money supply.
(c) increase the value of the money multiplier.
(d) increase the amount of excess reserves.
- _____ 9. The required reserve ratio is 20%. \$200 is deposited into a demand deposit account in the banking system.
(a) Initially, the money supply has changed its composition but not its size.
(b) Eventually, the money supply will increase by \$1,000.
(c) Initially, the money supply will increase by \$200.
(d) Initially, the money supply will increase by \$40.
(Be careful on this one! There is only one correct answer.)

Use the following information to answer the next two questions.

The commercial banks are loaned up and have reserves of \$500 billion. Now the required reserve ratio is changed from 25% to 10%.

- _____ 10. Initially, excess reserves will
(a) increase by 15%.
(b) decrease by \$300 billion.
(c) increase by \$300 billion.
(d) increase by \$3,000 billion.
- _____ 11. Eventually, the money supply can
(a) increase by 15%.
(b) increase by a multiple of 10.
(c) increase by \$1,250 billion.
(d) increase by \$3,000 billion.
- _____ 12. The Board of Governors is responsible for all of the following EXCEPT
(a) setting the discount rate for lending to commercial banks.

- (b) establishing and changing the required reserve ratio of the commercial banks.
 - (c) clearing interbank payments.
 - (d) deciding whether to buy or to sell U.S. government securities.
- _____ 13. Which one of the following pairs of policy actions would definitely *not* increase the money supply?
- (a) Open market sales of securities, increasing the discount rate
 - (b) Open market sales of securities, reducing the discount rate
 - (c) Open market purchases of securities, increasing the discount rate
 - (d) Open market purchases of securities, reducing the discount rate
- _____ 14. The required reserve ratio is 25%. First Union National Bank makes an additional loan of \$500,000 to the public. If the banking system holds no excess reserves (it is fully loaned up), then the eventual increase in the money supply will be
- (a) zero.
 - (b) \$500,000.
 - (c) \$1,500,000.
 - (d) \$2,000,000.
- _____ 15. If Kristin deposits \$5,000 cash into her savings account, then
- (a) M1 goes down and M2 goes up.
 - (b) M1 goes up and M2 goes down.
 - (c) M1 goes down and M2 stays the same.
 - (d) M1 stays the same and M2 goes down.
- _____ 16. The value of the money multiplier will be reduced when
- (a) recipients of bank loans redeposit the proceeds of their loans into another bank.
 - (b) each bank holds zero excess reserves.
 - (c) recipients of bank loans do not keep any of the loan as cash.
 - (d) the required reserves of the banking system are less than its total reserves.
- _____ 17. The pressure exerted by the Fed on bankers to discourage them from borrowing from the Fed is called
- (a) open market operations.
 - (b) closed market operations.
 - (c) closing the discount window.
 - (d) moral suasion.
- _____ 18. The discount rate is the interest rate paid by
- (a) the Fed to banks who deposit funds with it.
 - (b) banks when they borrow from the Fed.
 - (c) banks when they borrow from each other.
 - (d) the Fed to the Treasury to buy U.S. government securities.
- _____ 19. Most of the Fed's liabilities are
- (a) Federal Reserve notes.
 - (b) loans made to the private banks.
 - (c) U.S. government securities.
 - (d) bank reserves deposited by depository institutions.

- _____ 20. The required reserve ratio is 25% and all banks, whose total reserves are valued at \$200 million, are fully loaned up. If the Fed reduces the required reserve ratio to 20%, the banking system could support an additional
- (a) \$100 million in deposits.
 - (b) \$200 million in deposits.
 - (c) \$400 million in deposits.
 - (d) \$500 million in deposits.

II. APPLICATION QUESTIONS

1. In the nation of Arboc, the required reserve ratio is 20%. 30% of cash assets end up in foreign accounts. Arbobank (the central bank) buys 500 million opeks of government securities. Calculate how much the money supply will increase. How does the movement of funds to foreign accounts affect the size of the money multiplier?
2. The required reserve ratio is 20%. All banks are “loaned up.” Assume that banks lend their excess reserves.
 - (a) Now First Union discovers an additional \$1,000 in excess reserves. Make the final entries on the T-account of each of the following banks after deposits have been received, loans made, spending undertaken, and checks cleared. Assume that a borrower from First Union deposits at Second Union, and so on.

First Union			
Assets		Liabilities	
Reserves	_____	Deposits	_____
Loans	_____		

Second Union			
Assets		Liabilities	
Reserves	_____	Deposits	_____
Loans	_____		

Third Union			
Assets		Liabilities	
Reserves	_____	Deposits	_____
Loans	_____		

Fourth Union

Assets	Liabilities
Reserves _____	Deposits _____
Loans _____	

- (b) Calculate the extent of overall expansion in the money supply once this process is complete.
3. ArbeFed (the central bank of Arbez) has assets of 1,000 bandu (in the form of government securities). ArbeFed's liabilities are 800 bandu of currency and 200 bandu of deposits by banks in the central bank. All banks are "loaned up" and all currency is held by the public. Assume that no leakages from the banking system occur.
- (a) Draw a T-account showing ArbeFed's financial position.
- (b) The required reserve ratio is 20%. Determine the size of the Arbezani money supply, M1 (currency plus demand deposits).
- (c) ArbeFed wishes to increase the money supply to 2,000 bandu by adjusting the reserve requirement.
- (i) Would the reserve requirement have to increase or decrease?
- (ii) What should the new reserve requirement be?
- (d) ArbeFed decides to reduce the money supply by 300, opting for an open market operation.
- (i) Should ArbeFed buy bonds or sell bonds on the open market?
- (ii) How big should this transaction be if ArbeFed sells to the banking system?
- (iii) How big should this transaction be if ArbeFed sells to the public, which pays by check?
4. How would each of the following, *ceteris paribus*, affect the M1 and M2 measures of the money supply?
- (a) Households move \$10 billion of their liquid wealth from demand deposits to money market accounts.
- (b) Households buy \$10 billion worth of traveler's checks and pay with checks drawn on their checking accounts.
- (c) Households cash in \$10 billion in savings accounts and keep the proceeds as cash.
5. List the following assets in terms of their liquidity—i.e., ease and cheapness of conversion into spending power. Put the most liquid first, the least liquid last.
A house; a dollar bill; a car; some IBM stock; a passbook savings account; an individual retirement account.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
6. Use the following information to calculate the total value of M1 (transactions money) and M2 (broad money) as defined in the text.

Credit cards	403
Stock market holdings	1,009
Demand deposits	140
Federal reserve notes held by public	146
Other near monies	196
Treasury bills	708
Traveler's checks	20
Other checkable deposits	80
Savings accounts	300
Treasury bonds	513
Currency held outside banks	10
Gold	73

- (a) M1 _____
 (b) M2 _____

7. The following table gives several possible required reserve ratios.

Required Reserve Ratio	Money Multiplier	Max. Expansion (Single Bank)	Max. Expansion (Banking System)
10%	_____	_____	_____
12.5%	_____	_____	_____
20%	_____	_____	_____
25%	_____	_____	_____

- (a) Calculate the money multipliers and enter the values in the table.
 (b) Suppose a “loaned up” bank receives a deposit of \$100. Given the required reserve ratio, calculate the maximum amount by which the bank could expand its *loans*.
 (c) In each case, calculate the maximum amount by which the banking system will be able to expand its *deposits*.

8. Suppose that Ace deposits \$1,000 into his bank (Bank A), which is fully loaned up. Complete the following table, showing the maximum amount by which deposits, reserves, and loans can increase. Assume that the required reserve ratio is 12.5%.

Bank	New Demand Deposits =	Change in Reserves =	Change in Required Reserves +	Change in Excess Reserves =	Change in Loans
A	_____	_____	_____	_____	_____
B	_____	_____	_____	_____	_____
C	_____	_____	_____	_____	_____
D	_____	_____	_____	_____	_____
etc.	_____	_____	_____	_____	_____
Total	_____	_____	_____	_____	_____

9. A commercial bank has deposits of \$100,000 and total reserves amounting to \$31,000. The required reserve ratio is 15%. All other banks are loaned up.

- (a) What is the largest loan that this bank can make? _____
 (b) What is the value of the money multiplier? _____

- (c) If the initial loan is made, what is the maximum expansion that can occur in the money supply if other banks also lend as much as possible? _____
10. Arboc's central bank (Arbobank) holds 2,000 opeks in government securities. The commercial banks have deposited 200 opeks with Arbobank and hold 100 in vault cash. 700 opeks are held as currency by the public. The required reserve ratio is 20%; banks are loaned up.
- (a) The money multiplier value is _____.
- (b) Calculate Arboc's money supply. _____
- It is felt that the money supply should be increased by 900 opeks. Either an open market operation or a change in the reserve ratio is possible.
- (c) If the reserve ratio is changed, what should be the new ratio? _____
- (d) If an open market operation is undertaken, it should be a: purchase/sale of _____ opeks.

PRACTICE TEST SOLUTIONS

I. Solutions to Multiple-Choice Questions

1. (d) Federal Reserve notes are the official name for dollar bills. Refer to p. 184 [496]. From the economist's point of view, credit cards are a means of obtaining a loan, not a means of payment. Payment comes later, when you send a check to Visa or Mastercard.
2. (a) Refer to p. 182 [494] for a discussion of the functions of money.
3. (d) The money multiplier is 4 ($1/\text{required reserve ratio}$). Checking accounts (demand deposits) will increase by 400 (100×4). Refer to p. 191 [503].
4. (b) Refer to p. 189 [501]. Typically, some of a bank's actual reserves will be excess reserves.
5. (c) Refer to p. 200 [512] for a discussion of the slope of the money supply curve.
6. (d) Centura owes depositors the value of their checking accounts; Centura also owes depositors the value of their money market accounts. Both are liabilities.
7. (d) Assets to the left; liabilities to the right. Net worth is the value of the firm (the difference between assets and liabilities).
8. (b) Given the reserves of the banking system, if more reserves are required to be held back, the money multiplier ($1/\text{required reserve ratio}$) will decrease and the money supply will decrease. $\text{Excess reserves} = \text{total reserves} - \text{required reserves}$. As required reserves increase, excess reserves decrease.
9. (a) On its own, the deposit has no effect on the money supply. The "currency held outside banks" category decreases by \$200; the "demand deposits" category increases by \$200. Refer to p. 185 [497]. Eventually, because the money multiplier is 5, deposits will increase by \$1,000, but currency held outside banks has decreased by \$200. The net change in the money supply is \$800.
10. (c) When the banking system is loaned up, all reserves are required reserves. Excess reserves are zero. If the required reserve ratio is 25%, the banking system's reserves must be supporting \$2,000 billion ($\$500 \text{ billion} \times 4$) in deposits. If the reserve requirement

decreases to 10%, only \$200 billion will be required, liberating \$300 billion as excess reserves.

11. (d) If the required reserve ratio is 10%, the banking system's reserves can support \$5,000 billion ($\$500 \text{ billion} \times 10$) in deposits—an increase of \$3,000 billion.
12. (c) The Board of Governors is in charge of monetary policy actions. Clearing checks is not a part of monetary policy. Refer to p. 192 [504].
13. (a) An open market sale of securities draws reserves away from the private banking system, reducing the money supply. Increasing the discount rate discourages borrowing. Options (b) and (c) each contain two conflicting policies—if the expansionary element is stronger (open market purchase, discount rate decrease), the money supply would increase.
14. (d) The money multiplier is 4. Each dollar loaned out will be multiplied four times by the banking system as a whole.
15. (c) M2 includes all components of M1, so the transfer has no effect on the total value of M2. M1 is reduced because savings accounts are not included in M1.
16. (d) When the required reserves of the banking system are less than its total reserves, some excess reserves exist. Excess reserves represent a leakage from the money creation process.
17. (d) Refer to p. 197 [509] for a reference to moral suasion.
18. (b) Refer to p. 196 [508]. For your information, the rate charged when banks borrow from each other is the federal funds rate.
19. (a) Refer to p. 194 [506].
20. (b) If the banking system is fully loaned up, all reserves are required reserves. With a required reserve ratio of 25%, total deposits must be \$800 million ($\$200 \text{ million} \times 4$). If the Fed reduces the required reserve ratio to 20%, the money multiplier will increase to 5, and the banking system will be able to support \$1,000 million of deposits ($\$200 \text{ million} \times 5$)—an increase of \$200 million.

II. *Solutions to Application Questions*

1. Although it should be clear that the leakage of currency to foreign accounts reduces the money multiplier, the exact calculation is more complex than for the case in which there is no such leakage. The individuals who sold the 500 million opeks worth of securities to the government deposit 30% of their receipts abroad, so only 70% (350 million opeks) are deposited in Arbocali accounts. Of the 350 million opeks deposited, 70 million opeks (20%) are retained by private banks as reserves and 280 million opeks are loaned out. Of the 280 million opeks, 30% (84 million) are held in foreign accounts and 70% (196 million) are redeposited domestically. At each stage in the money multiplier process, 20% of each opek is held as reserves and a further 24% (0.8×0.3) leaks to foreign accounts, a total of 44%. The money multiplier, then, is $1/0.44$, or 2.2727. The total increase in the money supply is $350 \text{ million} \times 2.2727$, or 795.4545 million opeks.
2. (a) Refer to the following T-accounts.

Assets		Liabilities	
Reserves	-1,000	Deposits	_____
Loans	+1,000		

Second Union			
Assets		Liabilities	
Reserves	+200	Deposits	+1,000
Loans	+800		

Third Union			
Assets		Liabilities	
Reserves	+160	Deposits	+800
Loans	+640		

Fourth Union			
Assets		Liabilities	
Reserves	+128	Deposits	+640
Loans	+512		

- (b) The money supply can expand by \$5,000.
3. (a) Refer to the following T-account.

ArbeFed			
Assets		Liabilities	
Securities	1,000	Currency	800
		Deposits of Banks	200

- (b) Currency = 800. Because the banking system is fully loaned up and the money multiplier is 5.00, demand deposits are 200×5 , or 1,000. M1 is 1,800 bandu.
- (c) (i) The reserve requirement must be decreased to 16.67%.
(ii) The money multiplier is $1/0.1667$, or 6. Bank reserves are 200, therefore demand deposits will be 1,200 bandu. Currency remains at 800 bandu.
- (d) (i) ArbeFed should sell bonds.
(ii) If the central bank sells bonds worth 60 bandu to the banking system and the money multiplier is 5, the money supply will decrease by 300 bandu.
(iii) If the central bank sells bonds worth 60 bandu to the public and the public uses demand deposits from the banking system, banking system reserves will fall by 60. The banking system's reserves are 48 bandu too low (i.e., 60×0.80). Deposits will shrink by an additional 240 bandu (i.e., 48×5). Total decrease is 300 bandu.
4. (a) Moving funds from demand deposits to money market deposits: M1, which includes demand deposits but not money market deposits, would decrease by \$10 billion; M2 would remain unchanged.
(b) Moving funds from demand deposits to traveler's checks: M1 and M2 both include both demand deposits and traveler's checks, so each would remain unchanged.

- (c) Moving funds from savings accounts to cash: M1, which includes cash held outside banks but not savings accounts, would increase by \$10 billion. M2 wouldn't change.
5. A dollar bill; a passbook savings account; some IBM stock; an individual retirement account; a car; a house.
6. (a) M1 is 396—that is, the total of coins (10) and Federal Reserve Notes (146) held outside banks, traveler's checks (20), demand deposits (140), and other checkable deposits (80).
(b) M2 is 942—that is, M1 (396) plus savings accounts (300), money market accounts (50), and other near monies (196).
7. (a) Refer to the following table.

Required Reserve Ratio	Money Multiplier	Max. Expansion (Single Bank)	Max. Expansion (Banking System)
10%	10	\$90.00	\$1,000
12.5%	8	\$87.50	\$800
20%	5	\$80.00	\$500
25%	4	\$75.00	\$400

- (b) Refer to the preceding table.
(c) Refer to the preceding table.
8. Refer to the following table. "Change in Excess Reserves for Bank A" is \$875.00 initially, but will eventually be decreased to zero as Bank A continues to lend.

Bank	New Demand Deposits =	Change in Reserves =	Change in Required Reserves +	Change in Excess Reserves =	Change in Loans
A	\$1,000.00	\$1,000.00	\$125.00	\$875.00/0	\$875.00
B	\$875.00	\$875.00	\$109.38	\$765.62/0	\$765.62
C	\$765.62	\$765.62	\$95.70	\$669.92/0	\$669.92
D	\$669.92	\$669.38	\$83.74	\$586.18/0	\$586.18
etc.	<u>\$4,689.46</u>	<u>\$4,689.46</u>	<u>\$586.18</u>	<u>\$4,103.28/0</u>	<u>\$4,103.28</u>
Total	\$8,000.00	\$8,000.00	\$1,000.00	\$7,000.00/0	\$7,000.00

9. (a) Required reserves are \$15,000 and excess reserves are \$16,000. The bank can lend out all of its excess reserves—that is, \$16,000.
(b) The money multiplier = $1/\text{required reserve ratio} = 1/0.15 = 6.667$.
(c) $\$16,000 \times 6.667 = \$106,666.67$
10. (a) The money multiplier = $1/\text{required reserve ratio} = 1/0.20 = 5$.
(b) Bank reserves are vault cash (100) and deposits at the central bank (200). If the banks are loaned up and the money multiplier is 5, demand deposits must be 1,500 (300×5). The money supply includes currency (700) and demand deposits (1,500) = 2,200 opeks.
(c) To support a money supply of 3,100, with 2,400 opeks of demand deposits ($1,500 + 900$), using the same quantity of reserves (300), the money multiplier must be 8 ($2,400/300$). To get a money multiplier of 8, the required reserve ratio must be 12.5%.
(d) If the money multiplier is 5, a purchase of 180 opeks will increase the money supply by 900.

