CHAPTER 19 Money Supply, Money Demand, and the Banking System

Questions for Review

1. In a system of fractional-reserve banking, banks create money because they ordinarily keep only a fraction of their deposits in reserve. They use the rest of their deposits to make loans. The easiest way to see how this creates money is to consider the bank balance sheets shown in Figure 19–1.

Figure 19–1

A. Balance Sheet — Firstbank Money Supply = $1,000

Assets		Liabilities	
Reserves	$1,000	Deposits	$1,000

B. Balance Sheet — Firstbank Money Supply = $1,800

Assets		Liabilities	
Reserves	$200	Deposits	$1,000
Loans	$800		

C. Balance Sheet — Secondbank Money Supply = $2440

Assets		Liabilities	
Reserves	$160	Deposits	$800
Loans	$640		

Suppose that people deposit the economy's supply of currency of $1,000 into Firstbank, as in Figure 19–1(A). Although the money supply is still $1,000, it is now in the form of demand deposits rather than currency. If the bank holds 100 percent of these deposits in reserve, then the bank has no influence on the money supply. Yet under a system of fractional-reserve banking, the bank need not keep all of its deposits in reserve; it must have enough reserves on hand so that reserves are available whenever depositors want to make withdrawals, but it makes loans with the rest of its deposits. If Firstbank has a reserve–deposit ratio of 20 percent, then it keeps $200 of the $1,000 in reserve and lends out the remaining $800. Figure 19–1(B) shows the balance sheet of Firstbank after $800 in loans have been made. By making these loans, Firstbank increases the money supply by $800. There are still $1,000 in demand deposits, but now borrowers also hold an additional $800 in currency. The total money supply equals $1,800.

Money creation does not stop with Firstbank. If the borrowers deposit their $800 of currency in Secondbank, then Secondbank can use these deposits to make loans. If Secondbank also has a reserve–deposit ratio of 20 percent, then it keeps $160 of the

$800 in reserves and lends out the remaining $640. By lending out this money, Secondbank increases the money supply by $640, as in Figure 19–1(C). The total money supply is now $2,440.

This process of money creation continues with each deposit and subsequent loans made. The text demonstrated that each dollar of reserves generates ($1/*rr*) of money, where *rr* is the reserve–deposit ratio. In this example, $rr = 0.20$, so the $1,000 originally deposited in Firstbank generates $5,000 of money.

2. The Fed influences the money supply through open-market operations, reserve requirements, and the discount rate. *Open-market operations* are the purchases and sales of government bonds by the Fed. If the Fed buys government bonds, the dollars it pays for the bonds increase the monetary base and, therefore, the money supply. If the Fed sells government bonds, the dollars it receives for the bonds reduce the monetary base and therefore the money supply. *Reserve requirements* are regulations imposed by the Fed that require banks to maintain a minimum reserve–deposit ratio. A decrease in the reserve requirements lowers the reserve–deposit ratio, which allows banks to make more loans on a given amount of deposits and, therefore, increases the money multiplier and the money supply. The *discount rate* is the interest rate that the Fed charges banks to borrow money. Banks borrow from the Fed if their reserves fall below the reserve requirements. A decrease in the discount rate makes it less expensive for banks to borrow reserves. Therefore, banks will be likely to borrow more from the Fed; this increases the monetary base and therefore the money supply.

3. To understand why a banking crisis might lead to a decrease in the money supply, first consider what determines the money supply. The model of the money supply we developed shows that

$$M = m \times B.$$

The money supply M depends on the money multiplier m and the monetary base B. The money multiplier can also be expressed in terms of the reserve–deposit ratio rr and the currency–deposit ratio cr. This expression becomes

$$M = \left[\frac{(cr + 1)}{(cr + rr)}\right]B.$$

This equation shows that the money supply depends on the currency–deposit ratio, the reserve–deposit ratio, and the monetary base.

A banking crisis that involved a considerable number of bank failures might change the behavior of depositors and bankers and alter the currency–deposit ratio and the reserve–deposit ratio. Suppose that the number of bank failures reduced public confidence in the banking system. People would then prefer to hold their money in currency (and perhaps stuff it in their mattresses) rather than deposit it in banks. This change in the behavior of depositors would cause massive withdrawals of deposits and, therefore, increase the currency–deposit ratio. In addition, the banking crisis would change the behavior of banks. Fearing massive withdrawals of deposits, banks would become more cautious and increase the amount of money they held in reserves, thereby increasing the reserve–deposit ratio. As the preceding formula for the money multiplier indicates, increases in both the currency–deposit ratio and the reserve–deposit ratio result in a decrease in the money multiplier and, therefore, a fall in the money supply.

4. Portfolio theories of money demand emphasize the role of money as a store of value. These theories stress that people hold money in their portfolio because it offers a safe nominal return. Therefore, portfolio theories suggest that the demand for money depends on the risk and return of money as well as all the other assets that people hold in their portfolios. In addition, the demand for money depends on total wealth because wealth measures the overall size of the portfolio.

In contrast, transactions theories of money demand stress the role of money as a medium of exchange. These theories stress that people hold money in order to make purchases. The demand for money depends on the cost of holding money (the interest rate) and the benefit (the ease of making transactions). Money demand, therefore, depends negatively on the interest rate and positively on income.

5. The Baumol–Tobin model analyzes how people trade off the costs and benefits of holding money. The benefit of holding money is convenience: people hold money to avoid making a trip to the bank every time they wish to purchase something. The cost of this convenience is the forgone interest they would have received had they left the money deposited in a savings account. If i is the nominal interest rate, Y is annual income, and F is the cost per trip to the bank, then the optimal number of trips to the bank is

$$N^* = \sqrt{\frac{iY}{2F}}$$

This formula reveals the following: As i increases, the optimal number of trips to the bank increases because the cost of holding money becomes greater. As Y increases, the optimal number of trips to the bank increases because of the need to make more transactions. As F increases, the optimal number of trips to the bank decreases because each trip becomes more costly.

Examining the optimal number of trips to the bank provides insight into average money holdings—that is, money demand. More frequent trips to the bank decrease the amount of money people hold, and less frequent trips increase this amount. We know that average money holding is $Y/(2N^*)$. By plugging this into the preceding expression for N^*, we find

$$\textit{Average Money Holding} = \sqrt{\frac{YF}{2i}}$$

Thus, the Baumol–Tobin model tells us that money demand depends positively on expenditure and negatively on the interest rate.

6. "Near money" refers to nonmonetary assets that have acquired some of the liquidity of money. For example, it used to be that assets held primarily as a store of value, such as mutual funds, were inconvenient to buy and sell. Today, mutual funds allow depositors to hold stocks and bonds and make withdrawals simply by writing checks from their accounts. The existence of near money complicates monetary policy by making the demand for money unstable. As a result, velocity of money becomes unstable, and the quantity of money gives faulty signals about aggregate demand. The Federal Reserve has responded to this complication by setting a target for the federal funds rate and adjusting this rate in response to changing economic conditions.

Problems and Applications

1. The model of the money supply developed in Chapter 19 shows that

$$M = mB.$$

The money supply M depends on the money multiplier m and the monetary base B. The money multiplier can also be expressed in terms of the reserve–deposit ratio rr and the currency–deposit ratio cr. Rewriting the money supply equation:

$$M = \left[\frac{(cr + 1)}{(cr + rr)}\right] B.$$

This equation shows that the money supply depends on the currency–deposit ratio, the reserve–deposit ratio, and the monetary base.

To answer parts (a) through (c), we use the values for the money supply, the monetary base, the money multiplier, the reserve–deposit ratio, and the currency–deposit ratio from Table 19–1:

	August 1929	March 1933
Money supply	26.5	19.0
Monetary base	7.1	8.4
Money multiplier	3.7	2.3
Reserve–deposit ratio	0.14	0.21
Currency–deposit ratio	0.17	0.41

a. To determine what would happen to the money supply if the currency–deposit ratio had risen but the reserve–deposit ratio had remained the same, we need to recalculate the money multiplier and then plug this value into the money supply equation $M = mB$. To recalculate the money multiplier, use the 1933 value of the currency–deposit ratio and the 1929 value of the reserve–deposit ratio:

$$m = (cr_{1933} + 1)/(cr_{1933} + rr_{1929})$$
$$m = (0.41 + 1)/(0.41 + 0.14)$$
$$m = 2.56.$$

To determine the money supply under these conditions in 1933:

$$M_{1933} = mB_{1933}.$$

Plugging in the value for m just calculated and the 1933 value for B:

$$M_{1933} = 2.56 \times 8.4$$
$$M_{1933} = 21.504.$$

Therefore, under these circumstances, the money supply would have fallen from its 1929 level of 26.5 to 21.504 in 1933.

b. To determine what would have happened to the money supply if the reserve–deposit ratio had risen but the currency–deposit ratio had remained the same, we need to recalculate the money multiplier and then plug this value into the money supply equation $M = mB$. To recalculate the money multiplier, use the 1933 value of the reserve–deposit ratio and the 1929 value of the currency–deposit ratio:

$$m = (cr_{1929} + 1)/(cr_{1929} + rr_{1933})$$
$$m = (0.17 + 1)/(0.17 + 0.21)$$
$$m = 3.09.$$

To determine the money supply under these conditions in 1933:

$$M_{1933} = mB_{1933}.$$

Plugging in the value for m just calculated and the 1933 value for B:

$$M_{1933} = 3.09 \times 8.4$$
$$M_{1933} = 25.96.$$

Therefore, under these circumstances, the money supply would have fallen from its 1929 level of 26.5 to 25.96 in 1933.

c. From the calculations in parts (a) and (b), it is clear that the decline in the currency–deposit ratio was most responsible for the drop in the money multiplier and, therefore, the money supply.

2. a. The introduction of a tax on checks makes people more reluctant to use checking accounts as a means of exchange. Therefore, they hold more cash for transactions purposes, raising the currency–deposit ratio cr.

b. The money supply falls because the money multiplier, $\frac{cr + 1}{cr + rr}$, is decreasing in cr. Intuitively, the higher the currency–deposit ratio, the lower the proportion of the monetary base that is held by banks in the form of reserves and, hence, the less money banks can create.

c. The contraction of the money supply shifts the *LM* curve upward, raising interest rates and lowering output, as in Figure 19–2. This was not a very sensible action to take in 1932.

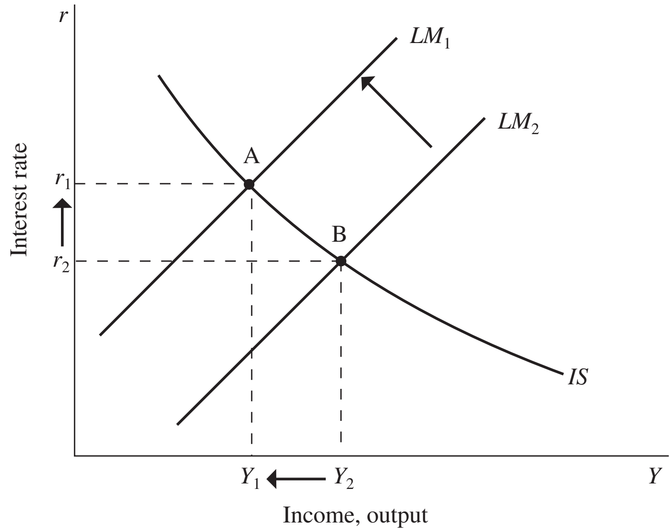

Figure 19–2

3. The leverage ratio is the ratio of a bank's total assets to its bank capital. If the leverage ratio is 10, this means that for each dollar of capital contributed by the bank owners, the bank has \$10 of assets, and therefore \$9 of deposits and debts. The balance sheet below has a leverage ratio of 10: total assets are \$1,200 and capital is \$120.

Assets		Liabilities and Owner's Equity	
Reserves	\$200	Deposits	\$800
Loans	\$600	Debt	\$280
Securities	\$400	Capital (Owner's Equity)	\$120

If the value of the bank's assets rises by 5 percent and deposits and debt do not change, then owner's equity will also rise by 5 percent. Since the sum of the entries on each side of the balance sheet must be the same, a 5-percent rise in the asset value must be balanced by a 5-percent rise in the right-hand-side value. To reduce the bank's capital to zero, assets must decline in value by \$120, which is 10 percent of the current asset value.

4. The epidemic of street crimes causes average cash holdings to fall and the number of trips to the bank to rise. In the Baumol–Tobin model, agents balance two costs: the fixed cost of a trip to the bank versus the cost of forgone interest from holding cash. The wave of street crime gives rise to a second cost of holding cash: it might be stolen. In particular, the higher one's average holdings of cash (i.e., the less frequently one goes to the bank) the greater the amount of money that is liable to be stolen. Bringing this new cost into the minimization problem provides an additional incentive to go to the bank more often and hold less cash.

5. a. Suppose you spend \$1,500 per year in cash. $Y = \$1{,}500$.
   b. Suppose a trip to the bank takes 0.5 hour, and you earn \$10 per hour. Then each trip to the bank costs you $(0.5 \times \$10) = \$5$. $F = \$5$.
   c. Assume that the interest rate on your checking account is 6 percent. $i = 0.06$.

d. According to the Baumol–Tobin model, the optimal number of times to go to the bank is

$$N^* = \sqrt{\frac{iY}{2F}}.$$

Plugging in the values of i, Y, and F that we established in parts (a), (b), and (c), we find

$$N^* = \sqrt{\frac{(0.06 \times \$1,500)}{(2 \times \$5)}}.$$
$$= 3.$$

According to the Baumol–Tobin model, you should go to the bank three times per year. You should withdraw Y/N^* each time you go to the bank, or \$500.

e. In practice, many people go to the bank about once a week and withdraw the amount they expect to spend that week.

f. Most people find that they go to the bank more frequently and hold less money on average than the Baumol–Tobin model predicts. One possible explanation is that people fear they will be robbed. The threat of theft increases the opportunity cost of holding money and therefore leads people to go to the bank more often and hold less money. Modifying the Baumol–Tobin model to incorporate this additional cost of holding money might lead to more accurate predictions.

6. a. To write velocity as a function of trips to the bank, note that for simplicity, the presentation of the Baumol–Tobin model in the text ignored prices (implicitly holding them fixed). But conceptually, the model relates *nominal* expenditure PY to nominal money holdings.

From the quantity equation:

$$MV = PY.$$

Rewriting this equation in terms of velocity:

$$V = (PY)/M.$$

The Baumol–Tobin model tells us that average nominal money holdings is:

$$M = PY/2N.$$

We know that real average money holdings is:

$$M/P = Y/2N.$$

Substituting this expression into the velocity equation, we obtain:

$$V = PY/(PY/2N).$$
$$V = 2N.$$

This equation tells us that velocity increases as the number of trips to the bank increase. More trips to the bank means that fewer dollars are held on hand to finance the same amount of expenditure. Therefore, dollars must change hands more quickly. In other words, velocity increases.

b. To express velocity as a function of Y, i, and F, begin with the velocity expression from part (a), $V = 2N$. The formula for the optimal number of trips to the bank tells us that

$$N^* = \sqrt{\frac{iY}{2F}}.$$

Plugging N^* into the velocity expression, we obtain:

$$V = 2\sqrt{\frac{iY}{2F}}.$$

Velocity is now expressed as a function of Y, i, and F.

c. As the expression for velocity derived in part (b) indicates, an increase in the interest rate leads to an increase in velocity. Because the opportunity cost of holding money increases, people make more trips to the bank, and on average hold less money. The increase in velocity reflects the fact that fewer dollars are held to finance the same expenditure. Dollars must therefore change hands more quickly.

d. As the expression for velocity derived in part (b) indicates, nothing happens to velocity when the price level rises. An increase in the price level not only increases desired (nominal) expenditure but also increases desired money holdings by the same amount.

e. To see what happens to velocity as the economy grows, first note that Y and F appear in ratio to one another in the velocity expression derived in part (b). As the economy grows, Y increases, reflecting greater expenditure on goods and services. Yet, the wage will also rise, making the cost of going to the bank F higher. (In the Solow growth model, for example, the real wage grows at the same rate as real expenditure per person.) Therefore, in a growing economy, the ratio Y/F is likely to remain fixed, implying that there will be no trend in velocity.

f. From the velocity expression we derived in part (a), we can see that if N is fixed, then velocity is also fixed.