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CHAPTER 15

Money Creation

Learning Objectives

- LO15.1 Discuss why the U.S. banking system is called a “fractional reserve” system.
- LO15.2 Explain the basics of a bank's balance sheet and the distinction between a bank's actual reserves and its required reserves.
- LO15.3 Describe how a bank can create money.
- LO15.4 Describe the multiple expansion of loans and money by the entire banking system.
- LO15.5 Define the monetary multiplier, explain how to calculate it, and demonstrate its relevance.

We have seen that the $M1$ money supply consists of currency (coins and Federal Reserve Notes) and checkable deposits and that $M1$ is a base component of $M2$, a broader



measure of the money supply that also includes savings deposits, small-denominated time deposits, and balances in money market mutual funds. The U.S. Mint produces the coins and the U.S. Bureau of Engraving and Printing creates the Federal Reserve Notes. So who creates the checkable deposits? Surprisingly, it is loan officers! Although that may sound like something a congressional committee should investigate, the monetary authorities are well aware that banks and thrifts create checkable deposits. In fact, the Federal Reserve relies on these institutions to create this vital component of the nation's money supply.

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The Fractional Reserve System

LO15.1 Discuss why the U.S. banking system is called a fractional reserve system.

The United States, like most other countries today, has a **fractional reserve banking system** in which only a portion (fraction) of checkable deposits are backed up by reserves of currency in bank vaults or deposits at the central bank. Our goal is to explain this system and show how commercial banks can create checkable deposits by issuing loans. Our examples will involve commercial banks, but remember that thrift institutions also provide checkable deposits. So the analysis applies to banks and thrifts alike.

Illustrating the Idea: The Goldsmiths

Here is the history behind the idea of the fractional reserve system.

When early traders began to use gold in making transactions, they soon realized that it was both unsafe and inconvenient to carry gold and to have it weighed and assayed (judged for purity) every time they negotiated a transaction. So by the sixteenth century they had begun to deposit their gold with goldsmiths, who would store it in vaults for a fee. On receiving a gold deposit, the goldsmith would issue a receipt to the depositor. Soon people were paying for goods with goldsmiths' receipts, which served as one of the first types of paper money.

At this point the goldsmiths—embryonic bankers—used a 100 percent reserve system; they backed their circulating paper money receipts fully with the gold that they held “in reserve” in their vaults. But because of the public's acceptance of the goldsmiths' receipts as paper money, the goldsmiths soon realized that owners rarely redeemed the gold they had in storage. In fact, the goldsmiths observed that the amount of gold being deposited with them in any week or month was likely to exceed the amount that was being withdrawn.

Then some clever goldsmith hit on the idea that paper “receipts” could be issued in excess of the amount of gold held. Goldsmiths would put these receipts, which were redeemable in gold, into circulation by making interest-earning loans to merchants, producers, and consumers. A borrower might, for instance, borrow \$10,000 worth of gold receipts today with the promise to repay \$10,500 worth of gold receipts in one year (a 5 percent interest rate). Borrowers were willing to accept loans in the form of gold receipts because the receipts were accepted as a medium of exchange in the marketplace.

This was the beginning of the fractional reserve system of banking, in which reserves in bank vaults are a fraction of the total money supply. If, for example, the goldsmith issued \$1 million in receipts for actual gold in storage and another \$1 million in receipts as loans, then the total value of paper money in circulation would be \$2 million—twice the value of the gold. Gold reserves would be a fraction (one-half) of outstanding paper money.

Significant Characteristics of Fractional Reserve Banking

The goldsmith story highlights two significant characteristics of fractional reserve banking. First, banks can create money through lending. In fact, goldsmiths created money when they made loans by giving borrowers paper money that was not fully backed by gold reserves. The quantity of such money goldsmiths could create depended on the amount of reserves they deemed prudent to have available. The smaller the amount of reserves thought necessary, the larger the amount of paper money the goldsmiths could create. Today, gold is no longer used as bank reserves. Instead, currency itself serves as bank reserves so that the creation of checkable-deposit money by banks (via their lending) is limited by the amount of *currency reserves* that the banks feel obligated, or are required by law, to keep.

A second reality is that banks operating on the basis of fractional reserves are vulnerable to “panics” or “runs.” A goldsmith who issued paper money equal to twice the value of his gold reserves would be unable to convert all that paper money into gold in the event that all the holders of that money appeared at his door at the same time demanding their gold. In fact, many European and U.S. banks were once ruined by this unfortunate circumstance. However, a bank panic is highly unlikely if the banker's reserve and lending policies are prudent. Indeed, one reason why banking systems are highly regulated industries is to prevent runs on banks.

This is also why the United States has the system of deposit insurance that we discussed in the last chapter. By guaranteeing deposits, deposit insurance helps to prevent the sort of bank runs that used to happen so often before deposit insurance was available. In those situations, rumors would spread that a bank was about to go bankrupt and that it only had a small amount of reserves left in its vaults. Bank runs are called “bank runs” because depositors would run to the bank trying to be one of the lucky few to withdraw their money while the bank had any reserves left. The rumors were usually totally unfounded. But, unfortunately, the bank would still go bankrupt even if it began the day with its normal amount of reserves. With so many customers withdrawing money simultaneously, it would run out of reserves and be forced to default on its obligations to its remaining depositors. By guaranteeing depositors that they

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will always get their money, deposit insurance removes the incentive to try to withdraw one's deposit before anyone else can. It thus stops most bank runs.

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A Single Commercial Bank

LO15.2 Explain the basics of a bank's balance sheet and the distinction between a bank's liquid reserves and its required reserves.

To illustrate the workings of the modern fractional reserve banking system, we need to examine a commercial bank's balance sheet.

The **balance sheet** of a commercial bank (or thrift) is a statement of assets—things owned by the bank or owed to the bank—and claims on those assets. A bank balance sheet summarizes the financial position of the bank at a certain time. Every balance sheet must balance; this means that the value of *assets* must equal the amount of claims against those assets. The claims shown on a balance sheet are divided into two groups: the claims of non-owners of the bank against the firm's assets, called *liabilities*, and the claims of the owners of the firm against the firm's assets, called *net worth*. Liabilities are things owed by the bank to depositors or others. A balance sheet is balanced because

$$\text{Assets} = \text{liabilities} + \text{net worth}$$

Every \$1 change in assets must be offset by a \$1 change in liabilities + net worth. Every \$1 change in liabilities + net worth must be offset by a \$1 change in assets.

Now let's work through a series of bank transactions involving balance sheets to establish how individual banks can create money.

Transaction 1: Creating a Bank

Suppose some far-sighted citizens of the town of Wahoo, Nebraska (yes, there is such a place), decide their town needs a new commercial bank to provide banking services for that growing community. Once they have secured a state or national charter for their bank, they turn to the task of selling, say, \$250,000 worth of stock (equity shares) to buyers, both in and out of the community. Their efforts meet with success and the Bank of Wahoo comes into existence—at least on paper. What does its balance sheet look like at this stage?

The founders of the bank have sold \$250,000 worth of shares of stock in the bank—some to themselves, some to other people. As a result, the bank now has \$250,000 in cash on hand and \$250,000 worth of stock shares outstanding. The cash is an asset to the bank. Cash held by a bank is sometimes called **vault cash** or till money. The shares of stock outstanding constitute an equal amount of claims that the owners have against the bank's assets. Those shares of stock constitute the net worth of the bank. The bank's balance sheet reads:

Creating a Bank			
Balance Sheet 1: Wahoo Bank			
Assets		Liabilities and net worth	
Cash	\$250,000	Stock shares	\$250,000

Each item listed in a balance sheet such as this is called an *account*.

Transaction 2: Acquiring Property and Equipment

The board of directors (who represent the bank's owners) must now get the new bank off the drawing board and make it a reality. First, property and equipment must be acquired. Suppose the directors, confident of the

success of their venture, purchase a building for \$220,000 and pay \$20,000 for office equipment. This simple transaction changes the composition of the bank's assets. The bank now has \$240,000 less in cash and \$240,000 of new property assets. Using blue to denote accounts affected by each transaction, we find that the bank's balance sheet at the end of transaction 2 appears as follows:

Acquiring Property and Equipment Balance Sheet 2: Wahoo Bank			
Assets		Liabilities and net worth	
Cash	\$ 10,000	Stock shares	\$250,000
Property	240,000		

Note that the balance sheet still balances, as it must.

Transaction 3: Accepting Deposits

Commercial banks have two basic functions: to accept deposits of money and to make loans. Now that the bank is operating, suppose that the citizens and businesses of Wahoo decide to deposit \$100,000 in the Wahoo bank. What happens to the bank's balance sheet?

The bank receives cash, which is an asset to the bank. Suppose this money is deposited in the bank as checkable deposits (checking account entries), rather than as savings accounts or time deposits. These newly created *checkable deposits* constitute claims that the depositors have against

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the assets of the Wahoo bank and thus are a new liability account. The bank's balance sheet now looks like this:

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Accepting Deposits Balance Sheet 3: Wahoo Bank			
Assets		Liabilities and net worth	
Cash	\$110,000	Checkable deposits	\$100,000
Property	240,000	Stock shares	250,000

There has been no change in the economy's total supply of money as a result of transaction 3, but a change has occurred in the composition of the money supply. Bank money, or checkable deposits, has increased by \$100,000, and currency held by the public has decreased by \$100,000. As explained in the previous chapter, currency held in a bank is not part of the economy's money supply.

A withdrawal of cash will reduce the bank's checkable-deposit liabilities and its holdings of cash by the amount of the withdrawal. This, too, changes the composition, but not the total supply, of money in the economy.

Transaction 4: Depositing Reserves in a Federal Reserve Bank

All commercial banks and thrift institutions that provide checkable deposits must by law keep **required reserves**. Required reserves are an amount of funds equal to a specified percentage of the bank's own deposit liabilities. A bank must keep these reserves on deposit with the Federal Reserve Bank in its district or as cash in the bank's vault. To simplify, we suppose the Bank of Wahoo keeps its required reserves entirely as deposits in the Federal Reserve Bank of its district. But remember that vault cash is counted as reserves and real-world banks keep a significant portion of their own reserves in their vaults.

The “specified percentage” of checkable-deposit liabilities that a commercial bank must keep as reserves is known as the **reserve ratio**—the ratio of the required reserves the commercial bank must keep to the bank's own outstanding checkable-deposit liabilities:

$$\text{Reserve ratio} = \frac{\text{commercial bank's required reserves}}{\text{commercial bank's checkable-deposit liabilities}}$$

If the reserve ratio is $\frac{1}{10}$, or 10 percent, the Wahoo bank, having accepted \$100,000 in deposits from the public, would have to keep \$10,000 as reserves. If the ratio is $\frac{1}{5}$, or 20 percent, \$20,000 of reserves would be required. If $\frac{1}{2}$, or 50 percent, \$50,000 would be required.

TABLE 15.1 Reserve Requirements (Reserve Ratios) for Banks and Thrifts, 2013

Type of Deposit	Current Requirement	Statutory Limits
Checkable deposits:		
\$0–\$12.4 million	0%	3%
\$12.4–\$79.5 million	3	3
Over \$79.5 million	10	8–14
Noncheckable nonpersonal savings and time deposits	0	0–9

Source: Federal Reserve, Regulation D, www.federalreserve.gov.

The Fed has the authority to establish and vary the reserve ratio within limits legislated by Congress. The limits now prevailing are shown in Table 15.1. The first \$12.4 million of checkable deposits held by a commercial bank or thrift is exempt from reserve requirements. A 3 percent reserve is required on checkable deposits of between \$12.4 million and \$79.5 million. A 10 percent reserve is required on checkable deposits over \$79.5 million, although the Fed can vary that percentage between 8 and 14 percent. Currently, no reserves are required against noncheckable nonpersonal (business) savings or time deposits, although up to 9 percent can be required. Also, after consultation with appropriate congressional committees, the Fed for 180 days may impose reserve requirements outside the 8 to 14 percent range specified in Table 15.1. Beginning in late 2008, the Fed began paying banks interest on their required reserves and on their excess reserve balances held at Federal Reserve Banks.

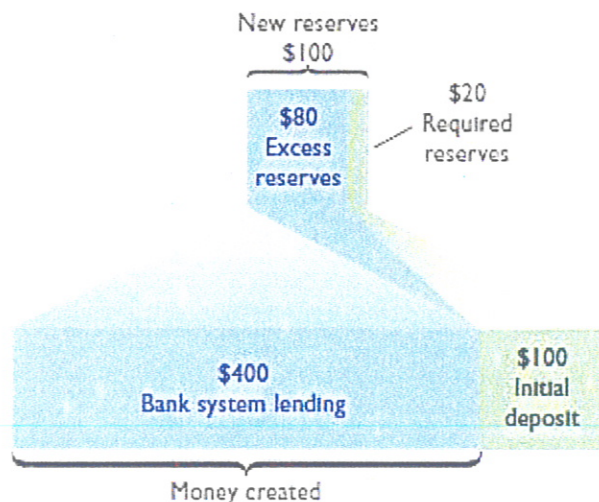
In order to simplify, we will suppose that the reserve ratio for checkable deposits in commercial banks is $\frac{1}{5}$, or 20 percent. Although 20 percent obviously is higher than the requirement really is, the figure is convenient for calculations. Because we are concerned only with checkable (spendable) deposits, we ignore reserves on noncheckable savings and time deposits. The main point is that reserve requirements are fractional, meaning that they are less than 100 percent. This point is critical in our analysis of the lending ability of the banking system.

By depositing \$20,000 in the Federal Reserve Bank, the Wahoo bank will just be meeting the required 20 percent ratio between its reserves and its own deposit liabilities. We will use “reserves” to mean the funds commercial banks deposit in the Federal Reserve Banks, to distinguish those funds from the public's deposits in commercial banks.

But suppose the Wahoo bank anticipates that its holdings of checkable deposits will grow in the future. Then, instead of sending just the minimum amount, \$20,000, it sends an extra \$90,000, for a total of \$110,000. In so doing,

Figure 15.1 depicts the final outcome of our example of a multiple-deposit expansion of the money supply. The initial deposit of \$100 of currency into the bank (lower right-hand box) creates new reserves of an equal amount (upper box). With a 20 percent reserve ratio, however, only \$20 of reserves are needed to “back up” this \$100 checkable deposit. The excess reserves of \$80 permit the creation of \$400 of new checkable deposits via the making of loans, confirming a monetary multiplier of 5. The \$100 of new reserves supports a total supply of money of \$500, consisting of the \$100 initial checkable deposit plus \$400 of checkable deposits created through lending.

FIGURE 15.1 The outcome of the money expansion process. A deposit of \$100 of currency into a checking account creates an initial checkable deposit of \$100. If the reserve ratio is 20 percent, only \$20 of reserves is legally required to support the \$100 checkable deposit. The \$80 of excess reserves allows the banking system to create \$400 of checkable deposits through making loans. The \$100 of reserves supports a total of \$500 of money (\$100 + \$400).



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the bank will avoid the inconvenience of sending additional reserves to the Federal Reserve Bank each time its own checkable-deposit liabilities increase. And, as you will see, it is these extra reserves that enable banks to lend money and earn interest income.

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Actually, a real-world bank would not deposit *all* its cash in the Federal Reserve Bank. However, because (1) banks as a rule hold vault cash only in the amount of $1\frac{1}{2}$ or 2 percent of their total assets and (2) vault cash can be counted as reserves, we will assume for simplicity that all of Wahoo's cash is deposited in the Federal Reserve Bank and therefore constitutes the commercial bank's actual reserves. By making this simplifying assumption, we do not need to bother adding two assets—"cash" and "deposits in the Federal Reserve Bank"—to determine "reserves."

After the Wahoo bank deposits \$110,000 of reserves at the Fed, its balance sheet becomes:

Assets		Liabilities and net worth	
Cash	\$ 0	Checkable deposits	\$100,000
Reserves	110,000	Stock shares	250,000
Property	240,000		

There are three things to note about this latest transaction.

Excess Reserves A bank's **excess reserves** are found by subtracting its *required reserves* from its **actual reserves**:

$$\text{Excess reserves} = \text{actual reserves} - \text{required reserves}$$

In this case,

Actual reserves	\$110,000
Required reserves	<u>-20,000</u>
Excess reserves	\$ 90,000

The only reliable way of computing excess reserves is to multiply the bank's checkable-deposit liabilities by the reserve ratio to obtain required reserves ($\$100,000 \times 20 \text{ percent} = \$20,000$) and then to subtract the required reserves from the actual reserves listed on the asset side of the bank's balance sheet.

To test your understanding, compute the bank's excess reserves from balance sheet 4, assuming that the reserve ratio is (1) 10 percent, (2) $33\frac{1}{3}$ percent, and (3) 50 percent.

We will soon demonstrate that the ability of a commercial bank to make loans depends on the existence of excess reserves. Understanding this concept is crucial in seeing how the banking system creates money.

Control You might think the basic purpose of reserves is to enhance the liquidity of a bank and protect commercial bank depositors from losses. Reserves would constitute a ready source of funds from which commercial banks could meet large, unexpected cash withdrawals by depositors.

But this reasoning breaks down under scrutiny. Although historically reserves have been seen as a source of liquidity and therefore as protection for depositors, a bank's required reserves are not great enough to meet sudden, massive cash withdrawals. If the banker's nightmare should materialize—everyone with checkable deposits appearing at once to demand those deposits in cash—the actual reserves held as vault cash or at the

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Transaction 5: Clearing a Check Drawn against the Bank

Assume that Fred Bradshaw, a Wahoo farmer, deposited a substantial portion of the \$100,000 in checkable deposits that the Wahoo bank received in transaction 3. Now suppose that Fred buys \$50,000 of farm machinery from the Ajax Farm Implement Company of Surprise, Nebraska. Bradshaw pays for this machinery by writing a \$50,000 check against his deposit in the Wahoo bank. He gives the check to the Ajax Company. What are the results?

Ajax deposits the check in its account with the Surprise bank. The Surprise bank increases Ajax's checkable deposits by \$50,000 when Ajax deposits the check. Ajax is now paid in full. Bradshaw is pleased with his new machinery.

Now the Surprise bank has Bradshaw's check. This check is simply a claim against the assets of the Wahoo bank. The Surprise bank will collect this claim by sending the check (along with checks drawn on other banks) to the regional Federal Reserve Bank. Here a bank employee will clear, or collect, the check for the Surprise bank by increasing Surprise's reserve in the Federal Reserve Bank by \$50,000 and decreasing the Wahoo bank's reserve by that same amount. The check is "collected" merely by making bookkeeping notations to the effect that Wahoo's claim against the Federal Reserve Bank is reduced by \$50,000 and Surprise's claim is increased by \$50,000.

Finally, the Federal Reserve Bank sends the cleared check back to the Wahoo bank, and for the first time the Wahoo bank discovers that one of its depositors has drawn a check for \$50,000 against his checkable deposit. Accordingly, the Wahoo bank reduces Bradshaw's checkable deposit by \$50,000 and notes that the collection of this check has caused a \$50,000 decline in its reserves at the Federal Reserve Bank. All the balance sheets balance: The Wahoo bank has reduced both its assets (reserves) and its liabilities (checkable deposits) by \$50,000. The Surprise bank has \$50,000 more in both assets (reserves) and liabilities (checkable deposits). Ownership of reserves at the Federal Reserve Bank has changed—with Wahoo owning \$50,000 less and Surprise owning \$50,000 more—but total reserves stay the same.

Whenever a check is drawn against one bank and deposited in another bank, collection of that check will reduce both the reserves and the checkable deposits of the bank on which the check is drawn. Conversely, if a bank receives a check drawn on another bank, the bank receiving the check will, in the process of collecting it, have its reserves and deposits increased by the amount of the check. In our example, the Wahoo bank loses \$50,000 in both reserves and deposits to the Surprise bank. But there is no loss of reserves or deposits for the banking system as a whole. What one bank loses, another bank gains.

If we bring all the other assets and liabilities back into the picture, the Wahoo bank's balance sheet looks like this at the end of transaction 5:

Clearing a Check			
Balance Sheet 5: Wahoo Bank			
Assets		Liabilities and net worth	
Reserves	\$ 60,000	Checkable deposits	\$ 50,000
Property	240,000	Stock shares	250,000

Verify that with a 20 percent reserve requirement, the bank's excess reserves now stand at \$50,000.

QUICK REVIEW 15.1

- The United States has a fractional reserve banking system, in which the collective reserves of the banks usually are considerably less than 100 percent of their checkable deposit liabilities.
- When a bank accepts deposits of cash, the composition of the money supply is changed, but the total supply of money is not directly altered.
- Commercial banks and thrifts are obliged to keep required reserves equal to a specified percentage of their own checkable-deposit liabilities as cash or on deposit with the Federal Reserve Bank of their district.
- The amount by which a bank's actual reserves exceed its required reserves is called excess reserves.
- A bank that has a check drawn and collected against it will lose to the recipient bank both reserves and deposits equal to the value of the check.

Money-Creating Transactions of a Commercial Bank

LO15.3 Describe how a bank can create money.

The next two transactions are crucial because they explain (1) how a commercial bank can literally create money by making loans and (2) how banks create money by purchasing government bonds from the public.

Transaction 6: Granting a Loan

In addition to accepting deposits, commercial banks grant loans to borrowers. What effect does lending by a commercial bank have on its balance sheet?

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The answer is that reserves lost by a single bank are not lost to the banking system as a whole. The reserves lost by bank A are acquired by bank B. Those lost by B are gained by C. C loses to D, D to E, E to F, and so forth. Although reserves can be, and are, lost by individual banks in the banking system, there is no loss of reserves for the banking system as a whole.

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An individual bank can safely lend only an amount equal to its excess reserves, *but the commercial banking system can lend by a multiple of its collective excess reserves*. This contrast, incidentally, is an illustration of why it is imperative that we keep the fallacy of composition (Last Word, Chapter 1) firmly in mind. Commercial banks as a group can create money by lending in a manner much different from that of the individual banks in the group.

The Monetary Multiplier

LO15.5 Define the monetary multiplier, explain how to calculate it, and demonstrate its relevance.

The **monetary multiplier** (or, less commonly, the *checkable deposit multiplier*) defines the relationship between any new excess reserves in the banking system and the magnified creation of new checkable-deposit money by banks as a group. It is a separate idea from the spending-income multiplier of Chapter 10 but shares some mathematical similarities. The spending-income multiplier exists because the expenditures of one household become some other household's income; the multiplier magnifies a change in initial spending into a larger change in GDP. The spending-income multiplier is the reciprocal of the MPS (the leakage into saving that occurs at each round of spending).

Similarly, the monetary multiplier exists because the reserves and deposits lost by one bank become reserves of another bank. It magnifies excess reserves into a larger creation of checkable-deposit money. The monetary multiplier m is the reciprocal of the required reserve ratio R (the leakage into required reserves that occurs at each step in the lending process). In short,

$$\text{Monetary multiplier} = \frac{1}{\text{required reserve ratio}}$$

or, in symbols,

$$m = \frac{1}{R}$$

In this formula, m represents the maximum amount of new checkable-deposit money that can be created by a single dollar of excess reserves, given the value of R . By multiplying the excess reserves E by m , we can find the maximum amount of new checkable-deposit money, D , that can be created by the banking system. That is,

$$\begin{array}{l} \text{Maximum} \\ \text{checkable-deposit} \\ \text{creation} \end{array} = \begin{array}{l} \text{excess} \\ \text{reserves} \end{array} \times \begin{array}{l} \text{monetary} \\ \text{multiplier} \end{array}$$

or, more simply,

$$D = E \times m$$

In our example in Table 15.2, R is 0.20, so m is 5 ($= 1/0.20$). This implies that

$$D = \$80 \times 5 = \$400$$

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LAST WORD

Banking, Leverage, and Financial Instability

Leverage Boosts Banking Profits but Makes the Banking System Less Stable. Time to Reduce Leverage?

The term *leverage* is used in finance to describe how the use of borrowed money can magnify both profits and losses. To see how leverage works, first consider an investment opportunity that produces a 10 percent positive return if things go well but a 5 percent loss if things go poorly. Those rates of return imply that if a person invests \$100 of his own savings, he will end up with either \$110 if things go well or \$95 if things go badly. Put slightly differently, he will either gain \$10 or lose \$5 from where he started, with his own \$100 being used to fund the \$100 investment.

But now consider what happens to his potential returns if he uses borrowed money to provide “leverage.” In fact, let's have him use a lot of leverage. To make the \$100 investment, he uses \$10 of his own savings and \$90 of borrowed money (which, for simplicity, we will assume that he can borrow at zero percent interest). If things go well, the investment will return \$110. He then must repay the \$90 loan. That will leave him with \$20 (= \$110 of investment return if things go well minus \$90 to repay the loan). That means that he will end up with \$20 if things go well and he uses leverage. Notice that this implies that if he uses leverage, he will get a 100 percent (= \$20 divided by \$10) return on the \$10 of his own savings that he himself invested. That, of course, is much nicer than a 10 percent return. In fact, it is 10 times as large—hence the term *leverage*. The use of borrowed money has massively increased the percentage rate of return if things go well.



Unfortunately, however, nothing in life is free. Leverage also magnifies the investor's losses if things go wrong. To see this, note that if things go wrong in this example, the investor will end up turning \$100 into \$95. But then he has to pay back the \$90 that he borrowed. That will leave him with only \$5 (= \$95 investment return if things go badly minus \$90 to repay the loan). That implies that the investor will lose \$5 off of the \$10 of his own savings that he himself originally put into the investment. That is a 50 percent loss—ten times as much as the 5 percent loss that he would have sustained if he had used only his own money to make the \$100 investment. Thus, you can see that leverage increases both profits if things go well and losses if things go badly.

A modern bank uses a lot of leverage. In fact, only about 5 percent of the money that it invests comes from its shareholders and the money they paid to purchase ownership shares in the bank. The other 95 percent comes from borrowing, either by issuing bonds (about 25 percent) or by taking in checking and savings deposits (about 70 percent). It surprises many people, but checking and savings deposits are technically a type of loan made by depositors to their banks. So banks get 70 percent of their leverage and funding from money borrowed from depositors.

The problem with that much leverage is that it takes only very small losses to drive the bank into insolvency and a situation in which it cannot repay all of the money that it has borrowed because the value of the bank's assets has fallen below the value of the bank's liabilities. Consider what would happen if for every \$100 invested by the bank, only \$94 returned. That by itself is a 6 percent rate of loss. But because the bank is borrowing \$95 of every \$100 that it invests, it will be driven into insolvency by that six percent loss because it is getting back less than the amount that it borrowed to fund the investment. With the investment returning only \$94, there won't be enough money to pay off the \$95 that the bank borrowed!

So why do banks use this much leverage? Because it is very profitable for the bankers who run the banks. If things are going well, the leverage massively increases the banks' profit rates—and bankers get paid bonuses based on those profit rates. On the other hand, if things go badly, bankers have come to expect bailouts in which the government uses taxpayer money to ensure that all of a bank's liabilities are repaid. So from the perspective of the bankers, it's “heads I win, tails you lose.”

One solution to these problems would be to require banks to use much less leverage. For every \$100 that a bank wants to invest, the bank could be required to raise \$30 from its shareholder owners so that it would only be borrowing the other \$70 through issuing bonds or by taking in checking and savings deposits. That would make the entire banking system much more stable because it would be very unlikely that for any \$100 invested into projects by the bank, less than \$70 would come back. Even if only \$71 came back, there would still be enough money to pay back the \$70 of borrowed money—and thus no need for the bank to go bankrupt or require a government bailout via the deposit insurance system.

Unfortunately, however, bankers have lobbied strongly and successfully against any legal attempts to require lower leverage levels. So the current regulatory system relies instead on bank supervisors who attempt to prevent the banks from making bad loans. That system was unable to prevent the 2007–2008 financial crisis and a number of economists argue that until leverage is reduced, no amount of bank supervision will be sufficient to prevent another financial crisis because with massive leverage, even a small loss can destroy a bank.



Higher reserve ratios mean lower monetary multipliers and therefore less creation of new checkable-deposit money via loans; smaller reserve ratios mean higher monetary multipliers and thus more creation of new checkable-deposit money via loans. With a high reserve ratio, say, 50 percent, the monetary multiplier would be 2 ($= 1/0.5$), and in our example the banking system could create only \$100 ($= \50 of excess reserves $\times 2$) of new checkable deposits. With a low reserve ratio, say, 5 percent, the monetary multiplier would be 20 ($= 1/0.05$), and the banking system could create \$1,900 ($= \95 of excess reserves $\times 20$) of new checkable deposits.

You might experiment with the following two brainteasers to test your understanding of multiple credit expansion by the banking system:

- Rework the analysis in Table 15.2 (at least three or four steps of it) assuming the reserve ratio is 10 percent. What is the maximum amount of money the banking system can create upon acquiring \$100 in new reserves and deposits? (The answer is not \$800!)

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Suppose the banking system is loaned up and faces a 20 percent reserve ratio. Explain how it might have to reduce its outstanding loans by \$400 when a \$100 cash withdrawal from a checkable-deposit account forces one bank to draw down its reserves by \$100.

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Reversibility: The Multiple Destruction of Money

The process we have described is reversible. Just as checkable-deposit money is created when banks make loans, checkable-deposit money is destroyed when loans are paid off. Loan repayment, in effect, sets off a process of multiple destruction of money the opposite of the multiple creation process. Because loans are both made and paid off in any period, the direction of the loans, checkable deposits, and money supply in a given period will depend on the net effect of the two processes. If the dollar amount of loans made in some period exceeds the dollar amount of loans paid off, checkable deposits will expand and the money supply will increase. But if the dollar amount of loans is less than the dollar amount of loans paid off, checkable deposits will contract and the money supply will decline.

QUICK REVIEW 15.3

- A single bank in a multibank system can safely lend (create money) by an amount equal to its excess reserves; the banking system can lend (create money) by a multiple of its excess reserves.
- The monetary multiplier is the reciprocal of the required reserve ratio; it is the multiple by which the banking system can expand the money supply for each dollar of excess reserves.
- The monetary multiplier works in both directions; it applies to money destruction from the payoff of loans as well as the money creation from the making of loans.

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SUMMARY

LO15.1 Discuss why the U.S. banking system is called a “fractional reserve” system.

Modern banking systems are fractional reserve systems: Only a fraction of checkable deposits is backed by currency.

LO15.2 Explain the basics of a bank's balance sheet and the distinction between a bank's actual reserves and its required reserves.

The operation of a commercial bank can be understood through its balance sheet, where assets equal liabilities plus net worth.

Commercial banks keep required reserves on deposit in a Federal Reserve Bank or as vault cash. These required reserves are equal to a specified percentage of the commercial bank's checkable-deposit liabilities. Excess reserves are equal to actual reserves minus required reserves.

Banks lose both reserves and checkable deposits when checks are drawn against them.

LO15.3 Describe how a bank can create money.

Commercial banks create money—checkable deposits, or checkable-deposit money—when they make loans. They convert IOUs, which are *not* money, into checkable-deposits, which *are* money. Money is destroyed when lenders repay bank loans.

The ability of a single commercial bank to create money by lending depends on the size of its excess reserves. Generally speaking, a commercial bank can lend only an amount equal to its excess reserves. Money creation is thus limited because, in all likelihood, checks drawn by borrowers will be deposited in other banks, causing a loss of reserves and deposits to the lending bank equal to the amount of money that it has lent.

Rather than making loans, banks may decide to use excess reserves to buy bonds from the public. In doing so, banks merely credit the checkable-deposit accounts of the bond sellers, thus creating checkable-deposit money. Money vanishes when banks sell bonds to the public because bond buyers must draw down their checkable-deposit balances to pay for the bonds.

Banks earn interest by making loans and by purchasing bonds; they maintain liquidity by holding cash and excess reserves. The Fed pays interest on excess reserves. Nevertheless, banks often can obtain higher interest rates by lending out excess reserves on an overnight basis to banks that are short of required reserves. These loans are made in the federal funds market, and the interest paid on the loans is called the federal funds rate.

LO15.4 Describe the multiple expansion of loans and money by the entire banking system.

The commercial banking system as a whole can lend by a multiple of its excess reserves because the system as a whole cannot lose reserves. Individual banks, however, can lose reserves to other banks in the system.

LO15.5 Define the monetary multiplier, explain how to calculate it, and demonstrate its relevance.

The multiple by which the banking system can lend on the basis of each dollar of excess reserves is the reciprocal of the reserve ratio. This multiple credit expansion process is reversible.

TERMS AND CONCEPTS

fractional reserve banking system

balance sheet

vault cash
required reserves
reserve ratio
excess reserves
actual reserves
federal funds rate
monetary multiplier

The following and additional problems can be found in 

DISCUSSION QUESTIONS

1. Explain why merchants accepted gold receipts as a means of payment even though the receipts were issued by goldsmiths, not the government. What risk did goldsmiths introduce into the payments system by issuing loans in the form of gold receipts? **LO15.1**
2. Why is the banking system in the United States referred to as a fractional reserve bank system? What is the role of deposit insurance in a fractional reserve system? **LO15.1**
3. What is the difference between an asset and a liability on a bank's balance sheet? How does net worth relate to each? Why must a balance sheet always balance? What are the major assets and claims on a commercial bank's balance sheet? **LO15.2**
4. Why does the Federal Reserve require commercial banks to have reserves? Explain why reserves are an asset to commercial banks but a liability to the Federal Reserve Banks. What are excess reserves? How do you calculate the amount of excess reserves held by a bank? What is the significance of excess reserves? **LO15.2**
5. “Whenever currency is deposited in a commercial bank, cash goes out of circulation and, as a result, the supply of money is reduced.” Do you agree? Explain why or why not. **LO15.2**
6. “When a commercial bank makes loans, it creates money; when loans are repaid, money is destroyed.” Explain. **LO15.3**