The 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 cash 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that the amount of gold being deposited with them in any week or month was likely to exceed the amount that was being withdrawn.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 these 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 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.

A Single Commercial Bank

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 and claims on assets that 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 nonowners against the firm's assets, called *liabilities*, and the claims of the owners of the firm against the firm's assets, called *net worth*. A balance sheet is balanced because

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

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. Currency held by a bank, you will recall, 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.

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 32.1. The first $9.3 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 $9.3 million and $43.9 million. A 10 percent reserve is required on checkable deposits over $43.9 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 8–14 percent range specified in Table 32.1.

TABLE 32.1 Reserve Requirements (Reserve Ratios) for Banks and Thrifts, 2008

Type of Deposit	Current Requirement	Statutory Limits
Checkable deposits:		
$0–$9.3 million	0%	3%
$9.3–$43.9 million	3	3
Over $43.9 million	10	8–14
Noncheckable nonpersonal savings and time deposits	0	0–9

Source: Federal Reserve, Regulation D, **www.federalreserve.gov.** Data are for 2008.

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, 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.

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:

Depositing Reserves at the Fed
Balance Sheet 4: Wahoo Bank

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:**

Excess reserves = actual reserves − required reserves

In this case,

Actual reserves	$110,000
Required reserves	−20,000
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 × 20 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 Federal Reserve Bank would be insufficient. The banker simply could not meet this "bank panic." Because reserves are fractional, checkable deposits may be much greater than a bank's required reserves.

So commercial bank deposits must be protected by other means. Periodic bank examinations are one way of promoting prudent commercial banking practices. Furthermore, insurance funds administered by the Federal Deposit Insurance Corporation (FDIC) and the National Credit Union Administration (NCUA) insure individual deposits in banks and thrifts up to $100,000.

If it is not the purpose of reserves to provide for commercial bank liquidity, then what is their function? *Control* is the answer. Required reserves help the Fed control the lending ability of commercial banks. The Fed can take certain actions that either increase or decrease commercial bank reserves and affect the ability of banks to grant credit. The objective is to prevent banks from overextending or underextending bank credit. To the degree that these policies successfully influence the volume of commercial bank credit, the Fed can help the economy avoid business fluctuations. Another function of reserves is to facilitate the collection or "clearing" of checks. **(Key Question 2)**

Asset and Liability Transaction 4 brings up another matter. Specifically, the reserves created in transaction 4 are an asset to the depositing commercial bank because they are a claim this bank has against the assets of another institution—the Federal Reserve Bank. The checkable deposit you get by depositing money in a commercial bank is an asset to you and a liability to the bank (since the bank is liable for repaying you whenever you choose to withdraw your deposit). In the same way, the reserves that a commercial bank establishes by depositing money in a bankers' bank are an asset to the commercial bank and a liability to the Federal Reserve Bank.

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?