The circular flow diagrams of earlier chapters had a “financial system” in the upper-left corner. (Look back, for example, at Figure 1 of Chapter 9—on page 167.) Saving flowed into this system and investment flowed out. Something obviously goes on inside the financial system to channel the saving back into investment, and it is time we learned just what this something is.

There is another, equally important, reason for studying the financial system. The government exercises significant control over aggregate demand by manipulating monetary policy as well as fiscal policy. Indeed, most observers nowadays see monetary policy as the more important stabilization tool. To understand how monetary policy works (the subject of Chapters 13 and 14), we must first acquire some understanding of the banking and financial system. By the end of this chapter, you will have that understanding.
Money is so much a part of our daily existence that we take it for granted and fail to appreciate all that it accomplishes. But money is in no sense “natural.” Like the wheel, it had to be invented.

The most obvious way to trade commodities is not by using money, but by barter—a system in which people exchange one good directly for another. And the best way to appreciate what monetary exchange accomplishes is to imagine a world without it.

1 As will be explained in Chapter 18, the Argentine crisis had much to do with worries about the exchange rate between the Argentine peso and the U.S. dollar.
Barter versus Monetary Exchange

Under a system of direct barter, if Farmer Jones grows corn and has a craving for peanuts, he has to find a peanut farmer, say, Farmer Smith, with a taste for corn. If he finds such a person (a situation called the double coincidence of wants), the two farmers make the trade. If that sounds easy, try to imagine how busy Farmer Jones would be if he had to repeat the sequence for everything he consumed in a week. For the most part, the desired double coincidences of wants are more likely to turn out to be double wants of coincidence. (See the accompanying cartoon.) Jones gets no peanuts and Smith gets no corn. Worse yet, with so much time spent looking for trading partners, Jones would have far less time to grow corn. In brief:

Money greases the wheels of exchange, and thus makes the whole economy more productive.
Under a monetary system, Farmer Jones gives up his corn for money. He does so not because he wants the money per se, but because of what that money can buy. Now he need simply locate a peanut farmer who wants money. And what peanut farmer does not? For these reasons, monetary exchange replaced barter at a very early stage of human civilization, and only extreme circumstances, such as massive wars and runaway inflations, have been able to bring barter (temporarily) back.

**The Conceptual Definition of Money**

Under monetary exchange, people trade money for goods when they purchase something, and they trade goods for money when they sell something, but they do not trade goods directly for other goods. This practice defines money’s principal role as the **medium of exchange**. But once it has become accepted as the medium of exchange, whatever serves as money is bound to serve other functions as well. For one, it will inevitably become the **unit of account**—that is, the standard unit for quoting prices. Thus, if inhabitants of an idyllic tropical island use coconuts as money, they would be foolish to quote prices in terms of seashells.

Money also may come to be used as a **store of value**. If Farmer Jones’s corn sales bring in more value than he wants to spend right away, he may find it convenient to store the difference temporarily in the form of money. He knows that money can be “sold” easily for goods and services at a later date, whereas land, gold, and other stores of value might not be. Of course, if inflation is substantial, he may decide to forgo the convenience of money and store his wealth in some other form rather than see its purchasing power eroded. So money’s role as a store of value is far from inevitable.

Because money may not always serve as a store of value, and because other commodities may act as stores of value, we will not include the store-of-value function as part of our conceptual definition of money. Instead, we simply label as “money” whatever serves as the medium of exchange.

**What Serves as Money?**

Anthropologists and historians can testify that a bewildering variety of objects have served as money in different times and places. Cattle, stones, candy bars, cigarettes,
woodpecker scalps, porpoise teeth, and giraffe tails provide a few of the more colorful examples. (For another example, see the box “Dealing by Wheeling on Yap.”)

In primitive or less organized societies, the commodities that served as money generally held value in themselves. If not used as money, cattle could be slaughtered for food, cigarettes could be smoked, and so on. But such commodity money generally runs into several severe difficulties. To be useful as a medium of exchange, a commodity must be easily divisible—which makes cattle a poor choice. It must also be of uniform, or at least readily identifiable, quality so that inferior substitutes are easy to recognize. This shortcoming may be why woodpecker scalps never achieved great popularity. The medium of exchange must also be storable and durable, which presents a serious problem for candy-bar money. Finally, because people will carry and store commodity money, it is helpful if the item is compact—that is, if it has high value per unit of volume and weight.

All of these traits make it natural that gold and silver have circulated as money since the first coins were struck about 2,500 years ago. Because they have high value in nonmonetary uses, a lot of purchasing power can be carried without too much weight. Pieces of gold are also storable and durable, which presents a serious problem for candy-bar money. Finally, because people will carry and store commodity money, it is helpful if the item is compact—that is, if it has high value per unit of volume and weight.

The same characteristics suggest that paper would make an even better money. The Chinese invented paper money in the eleventh century, and Marco Polo brought the idea to Europe. Because we can print any number on it that we please, we can make paper money as divisible as we like. People can also carry a large value of paper money in a lightweight and compact form. Paper is easy to store and, with a little cleverness, we can make counterfeiting challenging, though never impossible. (See the box on America’s new $20 bills.)

Paper cannot, however, serve as commodity money because its value per square inch in alternative uses is so low. A paper currency that is repudiated by its issuer can, perhaps, be used as wallpaper or to wrap fish, but these uses will surely represent only a small fraction of the paper’s value as money.2 Contrary to the popular expression,

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2 The first paper money issued by the U.S. federal government, the Continental dollar, was essentially repudiated. (Actually, the new government of the United States redeemed the Continentals for 1 cent on the dollar in the 1790s.) This event gave rise to the derisive expression, “It’s not worth a Continental.”
such a currency literally is worth the paper it is printed on—which is to say that it is not worth much. Thus, paper money is always \textit{fiat money}.

Money in the contemporary United States is almost entirely fiat money. Look at a dollar bill. Next to George Washington’s picture it states: “This note is legal tender for all debts, public and private.” Nowhere on the certificate is there a promise, stated or implied, that the U.S. government will exchange it for anything else. A dollar bill is convertible into, say, four quarters or 10 dimes—but not into gold, chocolate, or any other commodity.

Why do people hold these pieces of paper? Because they know that others are willing to accept them for things of intrinsic value—food, rent, shoes, and so on. If this confidence ever evaporated, dollar bills would cease serving as a medium of exchange and, given that they make ugly wallpaper, would become virtually worthless.

But don’t panic. This series of events is hardly likely to occur. Our current monetary system has evolved over hundreds of years, during which \textit{commodity money} was first replaced by \textit{full-bodied paper money}—paper certificates that were backed by gold or silver of equal value held in the issuer’s vaults. Then the full-bodied paper money was replaced by certificates that were only partially backed by gold and silver. Finally, we arrived at our present system, in which paper money has no “backing” whatsoever. Like a hesitant swimmer who first dips her toes, then her legs, then her whole body into a cold swimming pool, we have “tested the water” at each step of the way—and found it to our liking. It is unlikely that we will ever take a step back in the other direction.

\section*{HOW THE QUANTITY OF MONEY IS MEASURED}

Because the amount of money in circulation is important for the determination of national product and the price level, the government must know how much money there is. Thus we must devise some \textit{measure} of the money supply.

Our conceptual definition of money as the medium of exchange raises difficult questions about just which items to include and which items to exclude when we count up the money supply. Such questions have long made the statistical definition of money a subject of dispute. In fact, the U.S. government has several official definitions of the money supply, two of which we will meet shortly.

Some components are obvious. All of our coins and paper money—the small change of our economic system—clearly should count as money. But we cannot stop there if we want to include the main vehicle for making payments in our society, for the lion’s share of our nation’s payments are made neither in metal nor in paper money, but by check.

Checking deposits are actually no more than bookkeeping entries in bank ledgers. Many people think of checks as a convenient way to pass coins or dollar bills to someone else. But that is not so. For example, when you pay the grocer $50 by check, dollar bills rarely change hands. Instead, that check normally travels back to your bank, where $50 is deducted from the bookkeeping entry that records your account and $50 is added to the bookkeeping entry for your grocer’s account. (If you and the grocer hold accounts at different banks, more books get involved, but still no coins or bills will likely move.) The volume of money held in the form of checkable deposits far exceeds the volume of currency.

\section*{M1}

So it seems imperative to include checkable deposits in any useful definition of the money supply. Unfortunately, this is not an easy task nowadays, because of the wide variety of ways to transfer money by check. Traditional checking accounts in commercial banks are the most familiar vehicle. But many people can also write checks on their savings accounts, on their deposits at credit unions, on their mutual funds, on their accounts with stockbrokers, and so on.
One popular definition of the money supply draws the line early and includes only coins, paper money, traveler’s checks, conventional checking accounts, and certain other checkable deposits in banks and savings institutions. In the official U.S. statistics, this narrowly defined concept of money is called M1. The upper part of Figure 2 shows the composition of M1 as of February 2005.

- **M2**

But other types of accounts allow withdrawals by check, so they are also candidates for inclusion in the money supply. Most notably, money market deposit accounts allow their owners to write only a few checks per month but pay market-determined interest rates. Consumers have found these accounts attractive, and balances in them now exceed all the checkable deposits included in M1.

In addition, many mutual fund organizations and brokerage houses offer money market mutual funds. These funds sell shares and use the proceeds to purchase a variety of short-term securities. But the important point for our purposes is that owners of shares in money market mutual funds can withdraw their funds by writing checks. Thus, depositors can use their holdings of fund shares just like checking accounts.

Finally, although you cannot write a check on a savings account, modern banking procedures have blurred the distinction between checking balances and savings balances. For example, most banks these days offer convenient electronic transfers of funds from one account to another, either by telephone or by pushing a button on an automated teller. Consequently, savings balances can become checkable almost instantly. For this reason, savings accounts are included—along with money market deposit accounts and money market mutual fund shares—in the broader definition of the money supply known as M2.

The composition of M2 as of February 2005 is shown on the lower part of Figure 2. You can see that savings deposits predominate, dwarfing M1. Figure 2 illustrates that our money supply comes not only from banks, but also from savings institutions, brokerage houses, and mutual fund organizations. Even so, banks still play a predominant role.

- **Other Definitions of the Money Supply**

Some economists do not want to stop counting at M2; they prefer still broader definitions of money (M3, and so on), which include more types of bank deposits and other closely related assets. The inescapable problem, however, is that there is no obvious place to stop, no clear line of demarcation between those assets that are money and those that are merely close substitutes for money—so-called near moneys.

If we define an asset’s liquidity as the ease with which its holder can convert it into cash, there is a spectrum of assets of varying degrees of liquidity. Everything in M1 is completely liquid, the money market fund shares and passbook savings accounts included in M2 are a bit less so, and so on, until we encounter items such as short-term government bonds, which, while still quite liquid, would not normally be included in the money supply. Any number of different Ms can be defined—and have been—by drawing the line in different places.

And yet more complexities arise. For example, credit cards clearly serve as a medium of exchange. Should they be included in the money supply? Of course, you

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1 This amount includes travelers’ checks and NOW (negotiable order of withdrawal) accounts.
say. But how much money does your credit card represent? Is it the amount you currently owe on the card, which may well be zero? Or is it your entire line of credit, even though you may never use it all? Neither choice seems sensible, which is one reason why economists have so far ignored credit cards in their definitions of money.

And soon Americans may start using electronic money instead of cash. Money will be transferred via computer hookups or by so-called smart cards with memory chips (see “Is There a Smart Card in Your Future?”).

We could mention further complexities, but an introductory course in economics is not the place to get bogged down in complex definitional issues. So we will simply adhere to the convention that:

“Money” consists only of coins, paper money, and checkable deposits.

THE BANKING SYSTEM

Now that we have defined money and seen how to measure it, we turn our attention to the principal creators of money—the banks. Banking is a complicated business—and getting more so. If you go further in your study of economics, you will probably learn more about the operations of banks. But for present purposes, a few simple principles will suffice. Let’s start at the beginning.

How Banking Began

When Adam and Eve left the Garden of Eden, they did not encounter an ATM. Banking had to be invented. With a little imagination, we can see how the first banks must have begun.

When money was made of gold or other metals, it was inconvenient for consumers and merchants to carry it around and weigh and assay its purity every time they made a transaction. So the practice developed of leaving gold in a goldsmith’s safe storage fa-
cilities and carrying in its place a receipt stating that John Doe did indeed own five ounces of gold. When people began trading goods and services for the goldsmiths’ receipts, rather than for the gold itself, the receipts became an early form of paper money.

At this stage, paper money was fully backed by gold. Gradually, however, the goldsmiths began to notice that the amount of gold they were actually required to pay out in a day was but a small fraction of the total gold they had stored in their warehouses. Then one day some enterprising goldsmith hit upon a momentous idea that must have made him fabulously wealthy.

His thinking probably ran something like this: “I have 2,000 ounces of gold stored away in my vault, for which I collect storage fees from my customers. But I am never called upon to pay out more than 100 ounces on a single day. What harm could it do if I lent out, say, half the gold I now have? I’ll still have more than enough to pay off any depositors who come in for withdrawals, so no one will ever know the difference. And I could earn 30 additional ounces of gold each year in interest on the loans I make (at 3 percent interest on 1,000 ounces). With this profit, I could lower my service charges to depositors and so attract still more deposits. I think I’ll do it.”

With this resolution, the modern system of fractional reserve banking was born.

This system has three features that are crucially important to this chapter.

**Bank Profitability** By getting deposits at zero interest and lending some of them out at positive interest rates, goldsmiths made profits. The history of banking as a profit-making industry was begun and has continued to this date. *Banks, like other enterprises, are in business to earn profits.*

**Bank Discretion over the Money Supply** When goldsmiths decided to keep only fractions of their total deposits on reserve and lend out the balance, they acquired the ability to create money. As long as they kept 100 percent reserves, each gold certificate represented exactly 1 ounce of gold. So whether people decided to carry their gold or leave it with their goldsmiths did not affect the money supply, which was set by the volume of gold.

With the advent of fractional reserve banking, however, new paper certificates appeared whenever goldsmiths lent out some of the gold they held on deposit. The loans, in effect, created new money. In this way, the total amount of money came to depend on the amount of gold that each goldsmith felt compelled to keep in his vault. For any given volume of gold on deposit, the lower the reserves the goldsmiths kept, the more loans they could make, and therefore the more money would circulate.

Although we no longer use gold to back our money, this principle remains true today. *Bankers’ decisions on how much to hold in reserves influence the supply of money.* A substantial part of the rationale for modern monetary policy is, as we have mentioned, that profit-seeking bankers might not create the amount of money that is best for society.

**Exposure to Runs** A goldsmith who kept 100 percent reserves never had to worry about a run on his vault. Even if all his depositors showed up at the door at once, he could always convert their paper receipts back into gold. But as soon as the first goldsmith decided to get by with only fractional reserves, the possibility of a run on the vault became a real concern. If that first goldsmith who lent out half his gold had found 51 percent of his customers at his door one unlucky day, he would have had a lot of explaining to do. Similar problems have worried bankers for centuries. *The danger of a run on the bank has induced bankers to keep prudent reserves and to lend out money carefully.* As we observed earlier, this danger is one of the main rationales for bank regulation.

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**Principles of Bank Management: Profits versus Safety**

Bankers have a reputation for conservatism in politics, dress, and business affairs. From what has been said so far, the economic rationale for this conservatism should be clear. Checking deposits are pure fiat money. Years ago, these deposits were
“backed” by nothing more than a particular bank’s promise to convert them into currency on demand. If people lost trust in a bank, it was doomed.

Thus, bankers have always relied on a reputation for prudence, which they achieved in two principal ways. First, they maintained a sufficiently generous level of reserves to minimize their vulnerability to runs. Second, they were cautious in making loans and investments, because any large losses on their loans would undermine their depositors’ confidence.

It is important to realize that banking under a system of fractional reserves is an inherently risky business that is rendered safe only by cautious and prudent management. America’s long history of bank failures (see Figure 1) bears sober testimony to the fact that many bankers were neither cautious nor prudent. Why not? Because caution is not the route to high profits. Bank profits are maximized by keeping reserves as low as possible, and by making at least some loans to borrowers with questionable credit standing who will pay higher interest rates.

The art of bank management is to strike the appropriate balance between the lure of profits and the need for safety. If a banker errs by being too stodgy, his bank will earn inadequate profits. If he errs by taking unwarranted risks, his bank may not survive at all.

### Bank Regulation

But governments in virtually every society have decided that profit-minded bankers will not necessarily strike the balance between profits and safety exactly where society wants it. So they have thrown up a web of regulations designed to ensure depositors’ safety and to control the money supply.

**Deposit Insurance** The principal innovation that guarantees the safety of bank deposits is deposit insurance. Today, most U.S. bank deposits are insured against loss by the Federal Deposit Insurance Corporation (FDIC)—an agency of the federal government. If your bank belongs to the FDIC, as almost all do, your account is insured for up to $100,000 regardless of what happens to the bank. Thus, while bank failures may spell disaster for the bank’s stockholders, they do not create concern for many depositors. Deposit insurance eliminates the motive for customers to rush to their bank just because they hear some bad news about the bank’s finances. Many observers give this innovation much of the credit for the pronounced decline in bank failures after the FDIC was established in 1933—which is apparent in Figure 1.

Despite this achievement, some critics of FDIC insurance worry that depositors who are freed from any risk of loss from a failing bank will not bother to shop around for safer banks. This problem is an example of what is called the moral hazard problem: the general idea that, when people are well-insured against a particular risk, they will put little effort into making sure that the risk does not occur. (Example: A business with good fire insurance may not install an expensive sprinkler system.) In this context, some of the FDIC’s critics argue that high levels of deposit insurance actually make the banking system less safe.

**Bank Supervision** Partly for this reason, the government takes several steps to see that banks do not get into financial trouble. For one thing, various regulatory authorities conduct periodic bank examinations to keep tabs on the financial conditions and business practices of the banks under their purview. After a rash of bank failures in the late 1980s and early 1990s (visible in Figure 1(b)), U.S. bank supervision was tightened by legislation that permits the authorities to intervene early in the affairs of financially troubled banks. Other laws and regulations limit the kinds and quantities of assets in which banks may invest. For example, banks are permitted to own only limited amounts of common stock. Both of these forms of regulation, and others, are clearly aimed at keeping banks safe.
Reserve Requirements  A final type of regulation also has some bearing on safety but is motivated primarily by the government’s desire to control the money supply. We have seen that the amount of money any bank will issue depends on the amount of reserves it elects to keep. For this reason, most banks are subject by law to minimum required reserves. Although banks may (and sometimes do) keep reserves in excess of these legal minimums, they may not keep less. This regulation places an upper limit on the money supply. The rest of this chapter is concerned with the details of this mechanism.

THE ORIGINS OF THE MONEY SUPPLY

Our objective is to understand how the money supply is determined. But before we can fully understand the process by which money is “created,” we must acquire at least a nodding acquaintance with the mechanics of modern banking.

How Bankers Keep Books

The first thing to know is how to distinguish assets from liabilities. An asset of a bank is something of value that the bank owns. This “thing” may be a physical object, such as the bank building or a computer, or it may be a piece of paper, such as an IOU from a customer to whom the bank has made a loan. A liability of a bank is something of value that the bank owes. Most bank liabilities take the form of bookkeeping entries. For example, if you have an account in the Main Street Bank, your bank balance is a liability of the bank. (It is, of course, an asset to you.)

There is an easy test for whether some piece of paper or bookkeeping entry is a bank’s asset or liability. Ask yourself a simple question: If this paper were converted into cash, would the bank receive the cash (if so, it is an asset) or pay it out (if so, it is a liability)? This test makes it clear that loans to customers are assets of the bank (when a loan is repaid, the bank collects), whereas customers’ deposits are bank liabilities (when a deposit is cashed in, the bank pays). Of course, things are just the opposite to the bank’s customers: The loans are liabilities and the deposits are assets.

When accountants draw up a complete list of all the bank’s assets and liabilities, the resulting document is called the bank’s balance sheet. Typically, the value of all the bank’s assets exceeds the value of all its liabilities. (On the rare occasions when this is not so, the bank is in serious trouble.) In what sense, then, do balance sheets “balance”? They balance because accountants have invented the concept of net worth to balance the books. Specifically, they define the net worth of a bank to be the difference between the value of all its assets and the value of all its liabilities. Thus, by definition, when accountants add net worth to liabilities, the sum they get must be equal to the value of the bank’s assets:

Assets = Liabilities + Net worth

Table 1 illustrates this point with the balance sheet of a fictitious bank, Bank-a-mythica, whose finances are extremely simple. On December 31, 2004, it had only two kinds of assets (listed on the left side of the balance sheet)—$1 million in cash reserves, and $4.5 million in outstanding loans to its customers, that is, in customers’ IOUs. And it had only one type of liability (listed on the right side)—

| TABLE 1 |
|-----------------|-----------------|
| Balance Sheet of Bank-a-mythica, December 31, 2004 |
| **Assets** | **Liabilities and Net Worth** |
| **Assets** | **Liabilities** |
| Reserves | Checking deposits | $5,000,000 |
| Loans outstanding | | $4,500,000 |
| Total | | **$5,500,000** |
| **Addendum: Bank Reserves** | | |
| Actual reserves | Stockholders’ equity | $500,000 |
| Required reserves | | $1,000,000 |
| Excess reserves | | **$5,500,000** |
| **Net Worth** | |
| | | |
$5 million in checking deposits. The difference between total assets ($5.5 million) and total liabilities ($5.0 million) was the bank’s net worth ($500,000), also shown on the right side of the balance sheet.

**BANKS AND MONEY CREATION**

Let us now turn to the process of deposit creation. Many bankers will deny that they have any ability to “create” money. The phrase itself has a suspiciously hocus-pocus sound to it. But the protesting bankers are not quite right. Although any individual bank’s ability to create money is severely limited, the banking system as a whole can achieve much more than the sum of its parts. Through the modern alchemy of deposit creation, it can turn one dollar into many dollars. But to understand this important process, we had better proceed step by step, beginning with the case of a single bank, our hypothetical Bank-a-mythica.

### The Limits to Money Creation by a Single Bank

According to the balance sheet in Table 1, Bank-a-mythica holds cash reserves of $1 million, equal to 20 percent of its $5 million in deposits. Assume that this is the reserve ratio prescribed by law and that the bank strives to keep its reserves down to the legal minimum; that is, it strives to keep its excess reserves at zero.

Now let us suppose that on January 2, 2005, an eccentric widower comes into Bank-a-mythica and deposits $100,000 in cash in his checking account. The bank now has $100,000 more in cash reserves, and $100,000 more in checking deposits. But because deposits are up by $100,000, required reserves rise by only $20,000, leaving $80,000 in excess reserves. Table 2 illustrates the effects of this transaction on Bank-a-mythica’s balance sheet. Tables such as this one, which show changes in balance sheets rather than the balance sheets themselves, will help us follow the money-creation process.4

Bank-a-mythica is unlikely to be happy with the situation illustrated in Table 2, for it is holding $80,000 in excess reserves on which it earns no interest. So as soon as possible, it will lend out the extra $80,000—let us say to Hard-Pressed Construction Company. This loan leads to the balance sheet changes shown in Table 3: Bank-a-mythica’s loans rise by $80,000 while its holdings of cash reserves fall by $80,000.

By combining Tables 2 and 3, we arrive at Table 4, which summarizes the bank’s transactions for the week. Reserves are up $20,000, loans are up $80,000, and, now that the bank has had a chance to adjust to the inflow of deposits, it no longer holds excess reserves.

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**TABLE 2**

<table>
<thead>
<tr>
<th>Changes in Bank-a-mythica’s Balance Sheet, January 2, 2005</th>
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<tbody>
<tr>
<td><strong>Assets</strong></td>
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<tr>
<td>Reserves</td>
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<tr>
<td>+$100,000</td>
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</tbody>
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**Addendum: Changes in Reserves**

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<th>Actual reserves</th>
<th>Required reserves</th>
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<tbody>
<tr>
<td>+$100,000</td>
<td>+$20,000</td>
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<tr>
<td>Excess reserves</td>
<td>+$80,000</td>
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</tbody>
</table>

4 In all such tables, which are called _T accounts_, the two sides of the ledger must balance. This balance is required because changes in assets and changes in liabilities must be equal if the balance sheet is to balance both before and after the transaction.
Looking at Table 4 and keeping in mind our specific definition of money, it appears at first that the chairman of Bank-a-mythica is right when he claims not to have engaged in the nefarious practice of “money creation.” All that happened was that, in exchange for the $100,000 in cash it received, the bank issued the widower a checking balance of $100,000. This transaction does not change M1; it merely converts one form of money (currency) into another (checking deposits).

But wait. What happened to the $100,000 in cash that the eccentric man brought to the bank? The table shows that Bank-a-mythica retained $20,000 in its vault. Because this currency is no longer in circulation, it no longer counts in the official money supply, M1. (Notice that Figure 2 included only “currency outside banks.”) But the other $80,000, which the bank lent out, is still in circulation. It is held by Hard-Pressed Construction Company, which probably will redeposit it in some other bank. But even before this new deposit is made, the original $100,000 in cash has supported an increase in the money supply. There is now $100,000 in checking deposits and $80,000 of cash in circulation, making a total of $180,000—whereas prior to the original deposit there was only the $100,000 in cash. The money creation process has begun.

### Multiple Money Creation by a Series of Banks

Let us now trace the $80,000 in cash and see how the process of money creation gathers momentum. Suppose that Hard-Pressed Construction Company, which banks across town at the First National Bank, deposits the $80,000 into its bank account. First National’s reserves increase by $80,000. But because its deposits rise by $80,000, its required reserves increase by only 20 percent of this amount, or $16,000. If First National Bank behaves like Bank-a-mythica, it will lend out the $64,000 of excess reserves.

Table 5 shows the effects of these events on First National Bank’s balance sheet. (We do not show the preliminary steps corresponding to Tables 2 and 3 separately.) At this stage in the chain, the original $100,000 in cash has led to $180,000 in

<table>
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<th>TABLE 3</th>
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<td><strong>Changes in Bank-a-mythica’s Balance Sheet, January 3–6, 2005</strong></td>
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<tr>
<td><strong>Assets</strong></td>
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<tr>
<td>Loans outstanding</td>
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<tr>
<td>Reserves</td>
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<tr>
<td><strong>Addendum: Changes in Reserves</strong></td>
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<tr>
<td>Actual reserves</td>
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<tr>
<td>Required reserves</td>
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<td>Excess reserves</td>
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<table>
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<th>TABLE 4</th>
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<tr>
<td><strong>Changes in Bank-a-mythica’s Balance Sheet, January 2–6, 2005</strong></td>
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<tr>
<td><strong>Assets</strong></td>
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<td>Reserves</td>
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<tr>
<td>Loans outstanding</td>
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<td><strong>Addendum: Changes in Reserves</strong></td>
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<td>Excess reserves</td>
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</table>
deposits—$100,000 at Bank-a-mythica and $80,000 at First National Bank—and $64,000 in cash, which is still in circulation (in the hands of the recipient of First National’s loan—Al’s Auto Shop). Thus, instead of the original $100,000, a total of $244,000 worth of money ($180,000 in checking deposits plus $64,000 in cash) has been created.

But, to coin a phrase, the bucks do not stop here. Al’s Auto Shop will presumably deposit the proceeds from its loan into its own account at Second National Bank, leading to the balance sheet adjustments shown in Table 6 when Second National makes an additional loan of $51,200 rather than hold on to excess reserves. You can see how the money creation process continues.

Figure 3 summarizes the balance sheet changes of the first five banks in the chain (from Bank-a-mythica through the Fourth National Bank) graphically, based on the assumptions that (1) each bank holds exactly the 20 percent required reserves, and (2) each loan recipient redeposits the proceeds in the next bank. But the chain does not end there. The Main Street Movie Theatre, which received the $32,768 loan from the Fourth National Bank, deposits these funds into the Fifth National Bank. Fifth National has to keep only 20 percent of this deposit, or $6,553.60, on reserve and will lend out the balance. And so the chain continues.

Where does it all end? The running sums on the right side of Figure 3 show what eventually happens to the entire banking system. The initial deposit of $100,000 in cash is ultimately absorbed in bank reserves, Column (1), leading to a total of $500,000 in new deposits, Column (2), and $400,000 in new loans, Column (3). The money supply rises by $400,000 because the nonbank public eventually holds $100,000 less in currency and $500,000 more in checking deposits.

As we see, there really is some hocus-pocus. Somehow, an initial deposit of $100,000 leads to $500,000 in new bank deposits—a multiple expansion of $5 for every original dollar—and a net increase of $400,000 in the money supply. We need to understand why this is so. But first let us verify that the calculations in Figure 3 are correct.

If you look carefully at the numbers, you will see that each column forms a geometric progression; specifically, each entry is equal to exactly 80 percent of the entry before it. Recall that in our discussion of the multiplier in Chapter 8 we learned how to sum

---

**TABLE 5**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>+$16,000</td>
</tr>
<tr>
<td>Loans outstanding</td>
<td>+$64,000</td>
</tr>
</tbody>
</table>

**Addendum: Changes in Reserves**

| Actual reserves | +$16,000 | Required reserves | +$16,000 | Excess reserves | No change |

**TABLE 6**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>+$12,800</td>
</tr>
<tr>
<td>Loans outstanding</td>
<td>+$51,200</td>
</tr>
</tbody>
</table>

**Addendum: Changes in Reserves**

| Actual reserves | +$12,800 | Required reserves | +$12,800 | Excess reserves | No change |
an infinite geometric progression, which is just what each of these chains is. In particular, if the common ratio is $R$, the sum of an infinite geometric progression is:

$$1 + R + R^2 + R^3 + \ldots = \frac{1}{1 - R}$$

By applying this formula to the chain of checking deposits in Figure 3, we get:

$$\begin{align*}
\$100,000 & \times (1 + 0.80 + 0.64 + 0.512 + \ldots ) \\
= \$100,000 & \times \frac{1}{1 - 0.80} = \$100,000 \times \frac{0.20}{0.20} = \$100,000 \\
\end{align*}$$

Proceeding similarly, we can verify that the new loans sum to $400,000 and that the new required reserves sum to $100,000. (Check these figures as exercises.) Thus the numbers in Figure 3 are correct. Let us, therefore, think through the logic behind them.

The chain of deposit creation ends only when there are no more excess reserves to be loaned out—that is, when the entire $100,000 in cash is tied up in required reserves. That explains why the last entry in Column (1) of Figure 3 must be $100,000. But, with a reserve ratio of 20 percent, excess reserves disappear only when checking deposits expand by $500,000—which is the last entry in Column (2). Finally, because balance sheets must balance, the sum of all newly created assets (reserves plus loans) must equal the sum of all newly created liabilities ($500,000 in deposits). That leaves $400,000 for new loans—which is the last entry in Column (3).
More generally, if the reserve ratio is some number \( m \) (rather than the one-fifth in our example), each dollar of deposits requires only a fraction \( m \) of a dollar in reserves. The common ratio in the preceding formula is, therefore, \( R = 1 - m \), and deposits must expand by \( 1/m \) for each dollar of new reserves that are injected into the system. This suggests the general formula for multiple money creation when the required reserve ratio is some number \( m \):

**OVERSIMPLIFIED MONEY MULTIPLIER FORMULA**

If the required reserve ratio is some fraction, \( m \), the banking system as a whole can convert each $1 of reserves into $1/m in new money. That is, the so-called money multiplier is given by:

\[
\text{Change in money supply} = \frac{1}{m} \times \text{Change in reserves}
\]

Although this formula correctly describes what happens in our example, it leaves out an important detail. The initial deposit of $100,000 in cash at Bank-a-mythica constitutes $100,000 in new reserves (see Table 2 on page 626). Applying a multiplier of \( 1/m = 1/0.20 = 5 \) to this $100,000, we conclude that bank deposits will rise by $500,000—which is just what happens. But remember that the process started when the eccentric widower took $100,000 in cash and deposited it in his bank account. Thus the public’s holdings of money—which includes both checking deposits and cash—increase by only $400,000 in this case: There is $500,000 more in deposits, but $100,000 less in cash.

### The Process in Reverse: Multiple Contractions of the Money Supply

Let us now briefly consider how this deposit creation mechanism operates in reverse—as a system of deposit destruction. In particular, suppose that our eccentric widower returned to Bank-a-mythica to withdraw $100,000 from his checking account and return it to his mattress, where it rightfully belongs. Bank-a-mythica’s required reserves would fall by $20,000 as a result of this transaction (20 percent of $100,000), but its actual reserves would fall by $100,000. The bank would be $80,000 short, as indicated in Table 7(a).

How would the bank react to this discrepancy? As some of its outstanding loans are routinely paid off, it will cease granting new ones until it has accumulated the necessary $80,000 in required reserves. The data for Bank-a-mythica’s contraction are shown in Table 7(b), assuming that borrowers pay off their loans in cash.\(^5\)

---

**TABLE 7**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>−$100,000</td>
<td>Checking deposits</td>
<td>−$100,000</td>
</tr>
<tr>
<td>Addendum: Changes in Reserves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual reserves</td>
<td>−$100,000</td>
<td>Required reserves</td>
<td>−$20,000</td>
</tr>
<tr>
<td>Excess reserves</td>
<td>−$80,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>+$80,000</td>
</tr>
<tr>
<td>Loans outstanding</td>
<td>−$80,000</td>
</tr>
</tbody>
</table>

**Addendum: Changes in Reserves**

| Actual reserves | +$80,000 |
| Reserves required | No change |
| Excess reserves | +$80,000 |

---

\(^5\) In reality, the borrowers would probably pay with checks drawn on other banks. Bank-a-mythica would then cash these checks to acquire the reserves.
But where did the borrowers get this money? Probably by making withdrawals from other banks. In this case, assume that the funds all came from First National Bank, which loses $80,000 in deposits and $80,000 in reserves. It finds itself short some $64,000 in reserves, as shown in Table 8(a), and therefore must reduce its loan commitments by $64,000, as in Table 8(b). This reaction, of course, causes some other bank to suffer a loss of reserves and deposits of $64,000, and the whole process repeats just as it did in the case of deposit expansion.

After the entire banking system had become involved, the picture would be just as shown in Figure 3, except that all the numbers would have minus signs in front of them. Deposits would shrink by $500,000, loans would fall by $400,000, bank reserves would be reduced by $100,000, and the M1 money supply would fall by $400,000. As suggested by our money multiplier formula with \( m = 0.20 \), the decline in the bank deposit component of the money supply is \( 1/0.20 = 5 \) times as large as the decline in reserves.

One of the authors of this book was a student in Cambridge, Massachusetts, during the height of the radical student movement of the late 1960s. One day a pamphlet appeared urging citizens to withdraw all funds from their checking accounts on a prescribed date, hold them in cash for a week, and then redeposit them. This act, the circular argued, would wreak havoc upon the capitalist system. Obviously, some of these radicals were well schooled in modern money mechanics, for the argument was basically correct. The tremendous multiple contraction of the banking system and subsequent multiple expansion that a successful campaign of this sort could have caused might have seriously disrupted the local financial system. But history records that the appeal met with little success. Checking-account withdrawals are not the stuff of which revolutions are made.

### WHY THE MONEY CREATION FORMULA IS OVERSIMPLIFIED

So far, our discussion of the process of money creation has seemed rather mechanical. If everything proceeds according to formula, each $1 in new reserves injected into the banking system leads to a $1/m increase in new deposits. But, in reality, things are not this simple. Just as in the case of the expenditure multiplier, the oversimplified money multiplier is accurate only under very particular circumstances. These circumstances require that:

1. Every recipient of cash must redeposit the cash into another bank rather than hold it.
2. Every bank must hold reserves no larger than the legal minimum.

<table>
<thead>
<tr>
<th>TABLE 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changes in the Balance Sheet of First National Bank</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>Reserves</td>
<td>$-80,000</td>
</tr>
<tr>
<td>Addendum: Changes in Reserves</td>
<td></td>
</tr>
<tr>
<td>Actual reserves</td>
<td>$-80,000</td>
</tr>
<tr>
<td>Required reserves</td>
<td>$-16,000</td>
</tr>
<tr>
<td>Excess reserves</td>
<td>$-64,000</td>
</tr>
</tbody>
</table>

Loans outstanding: $-64,000
The “chain” diagram in Figure 3 can teach us what happens if either of these assumptions is violated.

Suppose first that the business firms and individuals who receive bank loans decide to redeposit only a fraction of the proceeds into their bank accounts, holding the rest in cash. Then, for example, the first $80,000 loan would lead to a deposit of less than $80,000—and similarly down the chain. The whole chain of deposit creation would therefore be reduced. Thus:

If individuals and business firms decide to hold more cash, the multiple expansion of bank deposits will be curtailed because fewer dollars of cash will be available for use as reserves to support checking deposits. Consequently, the money supply will be smaller.

The basic idea here is simple. Each $1 of cash held inside a bank can support several dollars (specifically, $1/m) of money. But each $1 of cash held outside the banking system is exactly $1 of money; it supports no deposits. Hence, any time cash moves from inside the banking system into the hands of a household or a business, the money supply will decline. And any time cash enters the banking system, the money supply will rise.

Next, suppose bank managers become more conservative or that the outlook for loan repayments worsens because of a recession. In such an environment, banks might decide to keep more reserves than the legal requirement and lend out less than the amounts assumed in Figure 3. If this happens, banks further down the chain receive smaller deposits and, once again, the chain of deposit creation is curtailed. Thus:

If banks wish to keep excess reserves, the multiple expansion of bank deposits will be restricted. A given amount of cash will support a smaller supply of money than would be the case if banks held no excess reserves.

The latter problem has afflicted Japan for several years. Because they have so many bad loans on their books, Japanese bankers have become super-cautious about lending money to any but their most creditworthy borrowers. So even though bank reserves have soared, the money supply has not.

The NEED FOR MONETARY POLICY

If we pursue these two points a bit farther, we will see why the government must regulate the money supply in an effort to maintain economic stability. We have just suggested that banks prefer to keep excess reserves when they do not foresee profitable and secure opportunities to make loans. This scenario is most likely to arise when business conditions are depressed. At such times, the propensity of banks to hold excess reserves can turn the deposit creation process into one of deposit destruction, as happened recently in both Japan and Argentina. In addition, if depositors become nervous, they may decide to hold on to more cash. Thus:

During a recession, profit-oriented banks would be prone to reduce the money supply by increasing their excess reserves and declining to lend to less creditworthy applicants—if the government did not intervene. As we will learn in subsequent chapters, the money supply is an important influence on aggregate demand, so such a contraction of the money supply would aggravate the recession.

This is precisely what happened—with a vengeance—during the Great Depression of the 1930s. Although total bank reserves grew, the money supply contracted violently because banks preferred to hold excess reserves rather than make loans that might not be repaid. And something similar has been happening in Japan for years: The supply of reserves has expanded much more rapidly than the money supply because nervous bankers have been holding on to their excess reserves.

By contrast, banks want to squeeze the maximum money supply possible out of any given amount of cash reserves by keeping their reserves at the bare minimum when
the demand for bank loans is buoyant, profits are high, and secure investment opportunities abound. This reduced incentive to hold excess reserves in prosperous times means that:

During an economic boom, profit-oriented banks will likely make the money supply expand, adding undesirable momentum to the booming economy and paving the way for inflation. The authorities must intervene to prevent this rapid money growth.

Regulation of the money supply, then, is necessary because profit-oriented bankers might otherwise provide the economy with a money supply that dances to and amplifies the tune of the business cycle. Precisely how the authorities control the money supply is the subject of the next chapter.

SUMMARY

1. It is more efficient to exchange goods and services by using money as a medium of exchange than by bartering them directly.
2. In addition to being the medium of exchange, whatever serves as money is likely to become the standard unit of account and a popular store of value.
3. Throughout history, all sorts of items have served as money. Commodity money gave way to full-bodied paper money (certificates backed 100 percent by some commodity, such as gold), which in turn gave way to partially backed paper money. Nowadays, our paper money has no commodity backing whatsoever; it is pure fiat money.
4. One popular definition of the U.S. money supply is M1, which includes coins, paper money, and several types of checking deposits. Most economists actually prefer the M2 definition, which adds to M1 other types of checkable accounts and most savings deposits. Much of M2 is held outside of banks by investment houses, credit unions, and other financial institutions.
5. Under our modern system of fractional reserve banking, banks keep cash reserves equal to only a fraction of their total deposit liabilities. This practice is the key to their profitability, because the remaining funds can be loaned out at interest. But it also leaves banks potentially vulnerable to runs.
6. Because of this vulnerability, bank managers are generally conservative in their investment strategies. They also keep a prudent level of reserves. Even so, the government keeps a watchful eye over banking practices.
7. Before 1933, bank failures were common in the United States. They declined sharply when deposit insurance was instituted.
8. Because it holds only fractional reserves, the banking system as a whole can create several dollars of deposits for each dollar of reserves it receives. Under certain assumptions, the ratio of new bank deposits to new reserves will be $1/m, where m is the required reserve ratio.
9. The same process works in reverse, as a system of money destruction, when cash is withdrawn from the banking system.
10. Because banks and individuals may want to hold more cash when the economy is shaky, the money supply would probably contract under such circumstances if the government did not intervene. Similarly, the money supply would probably expand rapidly in boom times if it were unregulated.
Chapter 12  MONEY AND THE BANKING SYSTEM

TEST YOURSELF

1. Suppose banks keep no excess reserves and no individuals or firms hold on to cash. If someone suddenly discovers $12 million in buried treasure, explain what will happen to the money supply if the required reserve ratio is 10 percent.

2. How would your answer to Test Yourself Question 1 differ if the reserve ratio were 25 percent? If the reserve ratio were 100 percent?

3. Use tables such as Tables 2 and 3 to illustrate what happens to bank balance sheets when each of the following transactions occurs:
   a. You withdraw $100 from your checking account to buy concert tickets.
   b. Sam finds a $100 bill on the sidewalk and deposits it into his checking account.
   c. Mary Q. Contrary withdraws $500 in cash from her account at Hometown Bank, carries it to the city, and deposits it into her account at Big City Bank.

4. For each of the transactions listed in Test Yourself Question 3, what will be the ultimate effect on the money supply if the required reserve ratio is one-eighth (12.5 percent)? Assume that the oversimplified money multiplier formula applies.

DISCUSSION QUESTIONS

1. If ours were a barter economy, how would you pay your tuition bill? What if your college did not want the goods or services you offered in payment?

2. How is “money” defined, both conceptually and in practice? Does the U.S. money supply consist of commodity money, full-bodied paper money, or fiat money?

3. What is fractional reserve banking, and why is it the key to bank profits? (Hint: What opportunities to make profits would banks lose if reserve requirements were 100 percent?) Why does fractional reserve banking give bankers discretion over how large the money supply will be? Why does it make banks potentially vulnerable to runs?

4. During the 1980s and early 1990s, a rash of bank failures occurred in the United States. Explain why these failures did not lead to runs on banks.

5. Each year during Christmas shopping season, consumers and stores increase their holdings of cash. Explain how this development could lead to a multiple contraction of the money supply. (As a matter of fact, the authorities prevent this contraction from occurring by methods explained in the next chapter.)

6. Excess reserves make a bank less vulnerable to runs. Why, then, don’t bankers like to hold excess reserves? What circumstances might persuade them that it would be advisable to hold excess reserves?

7. If the government takes over a failed bank with liabilities (mostly deposits) of $2 billion, pays off the depositors, and sells the assets for $1.5 billion, where does the missing $500 million come from? Why?