CHAPTER 11

MONEY CREATION

We have seen that the *M*1 money supply consists of currency in the hands of the public (Bank of Canada notes and coins) and demand deposits. The Bank of Canada has the responsibility for printing Bank of Canada notes and minting coins. So who creates the demand deposits that make up more than half the nation's *M*1 money supply? Surprisingly, it is loan officers! Although that may sound like something a Parliamentary committee should investigate, the monetary authorities are well aware that banks create demand deposits. In fact, the Bank of Canada relies on chartered banks to create this vital component of the nation's money supply.

IN THIS CHAPTER YOU WILL LEARN:

11.1 How a chartered bank can create (or destroy) money through loans to the public.

11.2 About the multiple-deposit expansion of the entire chartered banking system.

11.3 What the monetary multiplier is and how to calculate it.

11.1 Chartered Banks and the Creation of Money

Have you ever considered how money is created? You may believe that it is simply printed by the Bank of Canada. Although this is true, the creation of money is slightly more complex, and it is actually done with the help of Canada's chartered banks.

The Fractional Reserve System

fractional reserve
A reserve ratio that is less than 100 percent of the deposit liabilities of a chartered bank.

Canada, like most other countries today, has a **fractional reserve** banking system in which only a portion (fraction) of the total money supply is held in reserve as currency. Our goal is to explain this system and show how chartered banks can create demand deposits by issuing loans. Our examples will involve chartered banks, but remember that trust companies, credit unions, and *caisses populaires* also provide deposits on which cheques can be written, although these institutions use the chartered banking system to clear the cheques written on their account.

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 the first kind of paper money.

Because of the public's acceptance of the goldsmiths' receipt as paper money, the goldsmiths soon realized that owners rarely re-deemed the gold they had in storage.

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. 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, the creation of demand deposit money by banks (via their lending) is limited by the amount of *currency reserves* that the banks feel obligated 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, U.S., and Canadian 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 the reason why Canada has a system of deposit insurance.

A Single Chartered Bank

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

balance sheet
A statement of the assets, liabilities, and net worth of a firm or individual at a certain time.

The **balance sheet** of a chartered bank 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 non-owners 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.

For every $1 change in assets, there must be an offsetting $1 change in liabilities + net worth. For every $1 change in liabilities + net worth, there must be offsetting $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.

Formation of a Chartered Bank

To see how individual banks create money we must understand the items a bank carries on its balance sheet and how certain transactions affect the balance sheet. We begin with the organization of a local chartered bank.

TRANSACTION 1: CREATING A BANK

Suppose some citizens of Vancouver decide Canada in general, and their province in particular, needs a new chartered bank to provide the banking services for their growing city. Once they get the Parliament of Canada to pass an act granting a charter for their bank, they then sell, say, $250,000 worth of capital stock (equity shares) to buyers, both in and out of the province. The Bank of Vancouver now exists. What does the bank's balance statement look like at this stage?

vault cash
The currency a bank has in its vault and cash drawers.

The new owners of the bank have sold $250,000 worth of shares of stock in the bank—some to themselves and some to other people. As a result, the bank now has $250,000 in cash on hand and $250,000 worth of capital stock outstanding. The cash is an asset to the bank. Cash held by a bank is sometimes called **vault cash** or "till money." The bank's balance sheet reads:

CREATING A BANK

BALANCE SHEET 1: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Cash	$250,000	Capital stock	$250,000

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

TRANSACTION 2: ACQUIRING PROPERTY AND EQUIPMENT

The first step for the new bank will be to acquire property and equipment. The bank purchases buildings for $220,000 and buys $20,000 worth of office equipment. This 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 type to denote those accounts affected by each transaction, we find that the bank's balance sheet at the conclusion of Transaction 2 appears as follows:

ACQUIRING PROPERTY AND EQUIPMENT

BALANCE SHEET 2: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Cash	$10,000	Capital stock	$250,000
Property	240,000		

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

TRANSACTION 3: ACCEPTING DEPOSITS

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

The bank receives cash, an asset to the bank. Suppose this money is placed in the bank as demand deposits (chequing accounts), rather than savings accounts or term deposits. These newly created *demand deposits* are claims that depositors have against the assets of the Bank of Vancouver, thus creating a new liability account. The bank's balance sheet now looks like this:

ACCEPTING DEPOSITS

BALANCE SHEET 3: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Cash	$110,000	Demand deposits	$100,000
Property	240,000	Capital stock	250,000

There has been no change in the economy's total supply of money, but a change has occurred in the composition of the money supply as a result of Transaction 3. Demand deposits have *increased* by $100,000 and currency in circulation has *decreased* by $100,000. Note that currency held by a bank is *not* part of the economy's money supply.

A withdrawal of cash will reduce the bank's demand-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.

DEPOSITS IN THE BANK OF CANADA

desired reserves
The amount of vault cash each chartered bank chooses to keep on hand for daily transactions, plus its deposits at the Bank of Canada.

desired reserve ratio
The specified percentage of deposit liabilities a chartered bank chooses to keep as vault cash.

The Bank of Vancouver has to have sufficient *cash reserves* to serve the daily cash needs of the chartered bank's customers. Some of these cash reserves are held at the Bank of Canada (see Table 10-2). Cash reserves are also called **desired reserves**. Generally, banks keep a minimum percentage of their holdings in cash reserves. We refer to the "specified percentage" of deposit liabilities the chartered bank chooses to keep as vault cash as the **desired reserve ratio**. Up to the mid 1990s the Bank of Canada actually required chartered banks to hold a specified percentage of demand, savings, and term deposits, and referred to this as *required reserves*. More will be said about this in Chapter 12. The desired reserve ratio is calculated as follows:

$$\text{Desired reserve ratio} = \frac{\text{chartered bank's desired reserves}}{\text{chartered bank's demand-deposit liabilities}}$$

If the desired reserve ratio is 20 percent, our bank, having accepted $100,000 in deposits from the public, would keep $20,000 as reserves to meet its daily cash needs.

There are two things to note about reserves:

excess reserves
The amount by which a chartered bank's actual reserves exceed its desired reserves.

actual reserves
The funds that a bank has as vault cash plus any deposit it may have with the Bank of Canada.

1. ***Excess Reserves*** A bank's **excess reserves** are found by subtracting desired reserves from its **actual reserves**.

   Excess reserves = actual reserves – desired reserves

   In this case,

Actual reserves	$110,000
Desired reserves	–20,000
Excess reserves	$ 90,000

   The only reliable way of computing excess reserves is to multiply the bank's demand-deposit liabilities by the reserve ratio to obtain desired reserves ($100,000 × 20 percent = $20,000) and then to subtract desired 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 3, assuming that the desired reserve ratio is (a) 5 percent, (b) 33.3 percent, and (c) 50 percent.

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

2. ***Influence*** Excess reserves are a means by which the Bank of Canada can influence the lending ability of chartered banks. The next chapter will explain in detail how the Bank of Canada can implement certain policies that either increase or decrease chartered bank reserves and affect the ability of banks to make loans. To the degree that these policies are successful in influencing the volume of chartered bank credit, the Bank of Canada can help the economy smooth out business fluctuations. ***(Key Question 2)***

TRANSACTION 4: CLEARING A CHEQUE DRAWN AGAINST THE BANK

Assume that Clem Bradshaw, a Vancouver lumberyard owner, deposited a substantial portion of the $100,000 in demand deposits that the Bank of Vancouver received in Transaction 3. Suppose Bradshaw buys $50,000 worth of lumber from the Ajax Forest Products Company of Chilliwack. Bradshaw pays for this lumber by writing a $50,000 cheque against his deposit in the Bank of Vancouver. Ajax deposits the cheque in its account with the Bank of Manitoba, which has a branch in Chilliwack.

Note that the balance statements of the two banks will balance. The Bank of Vancouver will reduce both its assets and its liabilities by $50,000. The Bank of Manitoba will have $50,000 more in cash and in deposits.

Whenever a cheque is drawn against one bank and deposited in another bank, collection of that cheque will reduce both reserves and demand deposits by the bank on which the cheque is drawn. In our example, the Bank of Vancouver loses $50,000 in both reserves and deposits to the Bank of Manitoba. 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 Bank of Vancouver's balance sheet looks like this at the end of Transaction 4:

CLEARING A CHEQUE

BALANCE SHEET 4: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Reserves	**$ 60,000**	**Demand deposits**	**$ 50,000**
Property	240,000	Capital stock	250,000

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

QUICK REVIEW

- 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.
- Chartered banks keep reserves (cash) equal to a desired percentage of their own deposit liabilities.
- The amount by which a bank's actual cash reserves exceeds its desired reserves is called excess reserves.
- A bank that has a cheque drawn and collected against it will lose to the recipient bank both cash and deposits equal to the value of the cheque.

Money-Creating Transactions of a Chartered Bank

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

CONSIDER THIS

Goldsmiths, Gold Reserves, and Deposit Insurance

Extending our previous story of the goldsmiths may help you better understand why the chartered banks' holdings of cash reserves to meet everyday customer transactions may be inadequate to stop bank runs and why deposit insurance is needed. Recall that goldsmiths created a fractional reserve system by issuing loans in the form of newly printed gold receipts—receipts that were not backed by gold held in storage. So the amount of gold receipts circulating in the economy was greater than the amount of gold "in reserve."

But even if the goldsmiths held, say, $1 of gold for every $10 of gold receipts in circulation, gold depositors would be subject to potential loss from a "run on the goldsmiths." If all the holders of gold receipts lost confidence in the goldsmiths and simultaneously demanded gold in exchange for their receipts, there would not be enough gold to go around. Anything less than 100 percent reserves ($1 of gold for $1 of gold receipts) would leave the goldsmiths short of gold.

So it is with the fractional reserve requirement in the modern Canadian banking system. The fact that chartered banks hold a percent of their total chequable (demand) deposits as currency reserves is inadequate to protect bank depositors from losses resulting from bank runs.

In the goldsmith economy, government could prevent panic retrieval of gold through deposit insurance that guaranteed gold payments (by government, if necessary) for gold receipts. The owners of the gold deposits therefore would view their receipts as "good as gold" and would be dissuaded from ever running *en masse* to exchange their receipts for gold.

The same logic applies to the modern economy. Because the Canada Deposit Insurance Corporation (CDIC) insures depositors' funds to a maximum of $60,000 per depositor, per institution, depositors view their demand deposits as "good as currency." So they have no incentive collectively to try to convert their chequable deposits to currency, even in circumstances in which chartered banks are experiencing financial difficulties. Note that financial institutions covered under the CDIC pay premiums for this insurance.

But deposit insurance has a downside: it makes depositors less diligent about investigating the lending practices of the chartered banks. If depositors know that the $60,000 deposit in a chartered bank will not be lost, even if its reckless lending practices lead it to bankruptcy, they will not take the time and effort to verify that the bank's lending practices are sound.

QUESTION: What would be the consequences if Canada's chartered banks decided to have fully backed reserves?

TRANSACTION 5: GRANTING A LOAN

Suppose the Grisley Meat Packing Company of Vancouver decides to expand. Suppose, too, that the company needs exactly $50,000—which just happens to be equal to the Bank of Vancouver's excess reserves—to finance this project.

Grisley requests a loan for this amount from the Bank of Vancouver. Convinced of Grisley's ability to repay, the bank grants the loan. Grisley hands a promissory note—a fancy IOU—to the bank. Grisley wants the convenience and safety of paying its obligations by cheque. So, instead of receiving cash from the bank, Grisley gets a $50,000 increase in its demand deposit account in the Bank of Vancouver.

The bank has acquired an interest-earning asset (the promissory note) and has created a deposit (a liability) to pay for this asset.

At the moment the loan is completed, the bank's position is shown by balance sheet 5A:

WHEN A LOAN IS NEGOTIATED

BALANCE SHEET 5A: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Reserves	$60,000	**Demand deposits**	**$100,000**
Loans	**50,000**	Capital stock	250,000
Property	240,000		

A close examination of the bank's balance statement will reveal a startling fact: *When a bank makes loans, it creates money.* The president of Grisley went to the bank with something that is not money—her IOU—and walked out with something that *is* money—a demand deposit.

When banks lend, they create demand deposits (chequing accounts) that *are* money. By extending credit, the Bank of Vancouver has "monetized" an IOU. Grisley and the bank have created and then swapped claims. The claim created by the bank and given to the Grisley Company is money; cheques drawn against a deposit are acceptable as a medium of exchange. It is through the extension of credit by chartered banks that the bulk of the money used in our economy is created.

Assume that Grisley awards a $50,000 building contract to the Quickbuck Construction Company of Kamloops. Quickbuck completes the expansion job and is paid with a cheque for $50,000 drawn by Grisley against its demand deposit in the Bank of Vancouver. Quickbuck, with headquarters in Kamloops, does *not* deposit this cheque back in the Bank of Vancouver but instead deposits it in a Kamloops branch of the Bank of Manitoba. The Bank of Manitoba now has a $50,000 claim against the Bank of Vancouver. As a result, the Bank of Vancouver *loses* both reserves and deposits equal to the amount of the cheque; the Bank of Manitoba *acquires* $50,000 of reserves and deposits.

In summary, assuming a cheque is drawn by the borrower for the entire amount of the loan ($50,000) and given to a firm that deposits it in another bank, the Bank of Vancouver's balance sheet will read as follows after the cheque has been cleared against it:

AFTER A CHEQUE IS DRAWN ON THE LOAN

BALANCE SHEET 5B: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Reserves	**$10,000**	**Demand deposits**	**$50,000**
Loans	50,000	Capital stock	250,000
Property	240,000		

After the cheque has been collected, the Bank of Vancouver is just barely meeting its desired reserve ratio of 20 percent. The bank has no excess reserves; it is "fully loaned up." The money supply has

Worked Problem 11.1
Single Bank Accounting

not decreased due to the cheque drawn on the Bank of Vancouver, the money is simply showing up in the Bank of Manitoba. *(Key Questions 4 and 8)*

TRANSACTION 6: BUYING GOVERNMENT SECURITIES

When a chartered bank buys government bonds from the public, the effect is substantially the same as lending. New money is created.

Assume that the Bank of Vancouver's balance sheet initially stands as it did at the end of Transaction 4. Now suppose that instead of making a $50,000 loan, the bank buys $50,000 of government securities from a securities dealer. The bank receives the interest-bearing bonds, which appear on its balance statement as the asset "Securities" and give the dealer an increase in its deposit account. The bank's balance sheet appears as follows:

BUYING GOVERNMENT SECURITIES

BALANCE SHEET 6: BANK OF VANCOUVER

Assets		Liabilities and net worth	
Reserves	$60,000	**Demand deposits**	**$100,000**
Securities	**50,000**	Capital stock	250,000
Property	240,000		

Demand deposits, that is, the supply of money, have increased by $50,000, as in Transaction 5a. *Bond purchases from the public by chartered banks increase the supply of money in the same way as does lending to the public.*

Finally, the selling of government bonds to the public (including securities dealers) by a chartered bank—like the repayment of a loan—reduces the supply of money. The securities buyer pays by cheque and both "Securities" and "Demand deposits" (the latter being money) decline by the amount of the sale.

Profits, Liquidity, and the Overnight Lending Rate

The asset items on a chartered bank's balance sheet reflect the banker's pursuit of two conflicting goals:

1. ***Profit*** One goal is profit. Chartered banks, like any other business, seek profits, which is why the bank makes loans and buys securities—the two major earning assets of chartered banks.
2. ***Liquidity*** The other goal is safety. For a bank, safety lies in **liquidity**, specifically such liquid assets as cash and excess reserves. A bank must be on guard for depositors who want to transform their demand deposits into cash (see the Consider This box). Bankers thus seek a balance between prudence and profit. The compromise is between assets that earn high returns and highly liquid assets.

liquidity
The ease with which an asset can be converted into cash with little or no loss of purchasing power.

An interesting way in which banks can partly reconcile the goals of profit and liquidity is to lend temporary excess reserves to other chartered banks. Normal day-to-day flows of funds to banks rarely leave all banks with their exact levels of desired reserves. Banks therefore lend these excess reserves to other banks on an overnight basis as a way to earn additional interest without sacrificing long-term liquidity. Banks that borrow in this market do so because they are temporarily short of the level of reserves they wish to hold. The interest rate paid on these overnight loans is called the **overnight lending rate**.

overnight lending rate
The interest rate banks charge to borrow and lend one-day funds to each other.

QUICK REVIEW

- Banks create money when they make loans; money vanishes when bank loans are repaid.
- New money is created when banks buy government bonds from the public; money disappears when banks sell government bonds to the public.
- Banks balance profitability and safety in determining their mix of earning assets and highly liquid assets.

11.2 The Banking System: Multiple-Deposit Expansion

Thus far we have seen that a single bank in a banking system can lend one dollar for each dollar of its excess reserves. The situation is different for all chartered banks as a group. We will find that the chartered banking system can lend—that is, can create money—by a multiple of its excess reserves. This multiple lending is accomplished even though each bank in the system can only lend "dollar for dollar" with its excess reserves.

How do these seemingly paradoxical results come about? To answer this question we must keep our analysis uncluttered and rely on three simplifying assumptions:

- The desired reserve ratio for all chartered banks is 20 percent.
- Initially all banks are meeting this 20 percent desired reserve ratio. No excess reserves exist; or in the parlance of banking they are "loaned up" (or "loaned out").
- If any bank can increase its loans as a result of acquiring excess reserves, an amount equal to those excess reserves will be lent to one borrower, who will write a cheque for the entire amount of the loan and give it to someone else, who will deposit the cheque in another bank. This third assumption means that the worst thing possible happens to every lending bank—a cheque for the entire amount of the loan is drawn and cleared against it in favour of another bank.

The Banking System's Lending Potential

Suppose a junkyard owner in Moncton finds a $100 bill while dismantling a car that has been on the lot for years. He deposits the $100 in bank A, which adds the $100 to its reserves. We will record only changes in the balance sheets of the various chartered banks. The deposit changes bank A's balance sheet as shown by entries (a_1):

MULTIPLE-DEPOSIT EXPANSION PROCESS

BALANCE SHEET: CHARTERED BANK A

Assets		Liabilities and net worth	
Reserves	$+100 ($a_1$)	Demand deposits	$+100 ($a_1$)
	− 80 (a_3)		+ 80 (a_2)
Loans	+ 80 (a_2)		− 80 (a_3)

Recall from Transaction 3 that this $100 deposit of currency does not alter the money supply. Although $100 of demand-deposit money comes into being, it is offset by the $100 of currency no longer in the hands of the public (the junkyard owner). What has happened is that bank A has acquired excess reserves of $80. Of the newly acquired $100 in reserves, 20 percent, or $20, is earmarked for the desired reserves on the new $100 deposit, and the remaining $80 becomes excess

reserves. Since a single chartered bank can lend only an amount equal to its excess reserves, we conclude that bank A can lend a maximum of $80. When a loan for this amount is made, bank A's loans increase by $80 and the borrower gets an $80 demand deposit. We add these figures—entries (a_2)—to bank A's balance sheet.

But now we make our third assumption: The borrower draws a cheque ($80) for the entire amount of the loan, and gives it to someone who deposits it in bank B, a different bank. As we saw in Transaction 6, bank A loses both reserves and deposits equal to the amount of the loan, as indicated in entries (a_3). The net result of these transactions is that bank A's reserves now stand at +$20 (= $100 – $80), loans at +$80, and demand deposits at +$100 (= $100 + $80 – $80). When the dust has settled, bank A is just meeting the 20 percent reserve ratio.

Recalling our previous discussion, we know that bank B acquires both the reserves and the deposits that bank A has lost. Bank B's balance sheet is changed as in entries (b_1):

MULTIPLE-DEPOSIT EXPANSION PROCESS

BALANCE SHEET: CHARTERED BANK B

Assets		Liabilities and net worth	
Reserves	$+80 ($b_1$)	Demand deposits	$+80 ($b_1$)
	−64 (b_3)		+64 (b_2)
Loans	+64 (b_2)		−64 (b_3)

When the borrower's cheque is drawn and cleared, bank A loses $80 in reserves and deposits and bank B gains $80 in reserves and deposits. But 20 percent, or $16, of bank B's new reserves are kept against the new $80 in demand deposits. This means that bank B has $64 (= $80 – $16) in excess reserves. It can therefore lend $64 [entries ($b_2$)]. When the new borrower draws a cheque for the entire amount and deposits it in bank C, the reserves and deposits of bank B both fall by $64 [entries ($b_3$)]. As a result of these transactions, bank B's reserves now stand at +$16 (= $80 – $64), loans at +$64, and demand deposits at +$80 (= $80 + $64 – $64). After all this, bank B is just meeting the 20 percent desired reserve ratio.

We are off and running again. Bank C acquires the $64 in reserves and deposits lost by bank B. Its balance sheet changes as in entries (c_1):

MULTIPLE-DEPOSIT EXPANSION PROCESS

BALANCE SHEET: CHARTERED BANK C

Assets		Liabilities and net worth	
Reserves	$+64.00 ($c_1$)	Demand deposits	$+64.00 ($c_1$)
	−51.20 (c_3)		+51.20 (c_2)
Loans	+51.20 (c_2)		−51.20 (c_3)

Exactly 20 percent, or $12.80, of these new reserves will be kept as reserves, the remaining $51.20 are excess reserves. Hence, bank C can safely lend a maximum of $51.20. Suppose it does [entries (c_2)]. And suppose the borrower draws a cheque for the entire amount and gives it to someone who deposits it in another bank [entries (c_3)].

We could go ahead with this procedure by bringing banks D, E, F, G, H, …, N into the picture. But we suggest that you work through the computations for banks D, E, F, and G to be sure you understand the procedure.

The entire analysis is summarized in Table 11-1. Data for banks D through N are supplied so that you can check your computations. Our conclusion is startling: On the basis of only $80 in excess reserves (acquired by the banking system when someone deposited $100 of currency in bank A), the entire chartered banking system is able to lend $400, the sum of the amounts in column 4. The

TABLE 11-1 Expansion of the Money Supply by the Chartered Banking System

Bank	(1) Acquired reserves and deposits	(2) Desired reserves (reserve ratio = 0.2)	(3) Excess reserves, (1) – (2)	(4) Amount bank can lend; new money created = (3)
Bank A	\$100.00 (a_1)	\$20.00	***\$80.00***	\$ 80.00 (a_2)
Bank B	80.00 (a_3, b_1)	16.00	64.00	64.00 (b_2)
Bank C	64.00 (b_3, c_1)	12.80	51.20	51.20 (c_2)
Bank D	51.20	10.24	40.96	40.96
Bank E	40.96	8.19	32.77	32.77
Bank F	32.77	6.55	26.22	26.22
Bank G	26.22	5.24	20.98	20.98
Bank H	20.98	4.20	16.78	16.78
Bank I	16.78	3.36	13.42	13.42
Bank J	13.42	2.68	10.74	10.74
Bank K	10.74	2.15	8.59	8.59
Bank L	8.59	1.72	6.87	6.87
Bank M	6.87	1.37	5.50	5.50
Bank N	5.50	1.10	4.40	4.40
Other banks	21.97	4.40	17.57	17.57
Total amount of money created (sum of the amounts in column 4)				***\$400.00***

banking system can lend excess reserves by a multiple of 5 when the reserve ratio is 20 percent. Yet each single bank in the banking system is lending only an amount equal to its own excess reserves. How do we explain this? How can the banking system lend by a multiple of its excess reserves, when each individual bank can only lend "dollar for dollar" with its excess reserves?

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.

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

11.3 The Monetary Multiplier

monetary multiplier
The multiple of its excess reserves by which the banking system can expand demand deposits and thus the money supply by making new loans.

The banking system magnifies any original excess reserves into a larger amount of newly created demand-deposit money. The *demand-deposit multiplier*, or **monetary multiplier** exists because the reserves and deposits lost by one bank are received by another bank. It magnifies excess reserves into a larger creation of demand-deposit money. The monetary multiplier m is the reciprocal of the desired reserve ratio R (the leakage into cash reserves that occurs at each step in the lending process). In short,

Monetary multiplier = 1/desired reserve ratio

or, in symbols,

$$m = 1/R$$

In this formula, m represents the maximum amount of new demand-deposit 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 demand-deposit money, D, that can be created by the banking system. That is,

Math 11.1
The Monetary Multiplier

Maximum demand-deposit creation = excess reserves × monetary multiplier

or, more simply,

$$D = E \times m$$

In our example in Table 11-1, R is 0.20 so m is 5 (= 1/0.20). Then

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

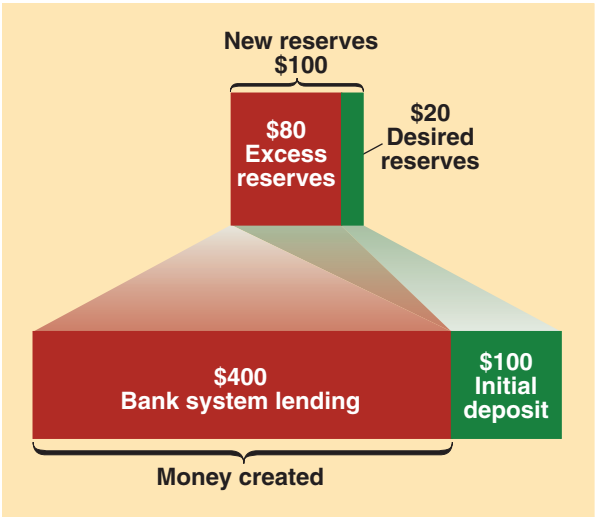
Worked Problem 11.2
Money Creation

Figure 11-1 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 currency reserves is needed to "back up" this $100 chequable (demand) deposit. The excess reserves of $80 permit the creation of $400 of new demand 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 demand deposit plus $400 of demand deposits created through lending.

Higher reserve ratios mean lower monetary multipliers and therefore less creation of new demand-deposit money via loans; smaller reserve ratios mean higher monetary multipliers and thus more creation of new demand-deposit money via loans. With a high reserve ratio, say, 50 per-

FIGURE 11-1 The Outcome of the Money Expansion Process

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



cent, the monetary multiplier would be 2 (= 1/0.5), and in our example the banking system could create only $100 (= $50 of excess reserves ? 2) of new demand deposits. With a low reserve ratio, say, 5 percent, the monetary multiplier would be 20 (= 1/0.05), and the banking system could create $1900 (= $95 of excess reserves ? 20) of new demand deposits.

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

- Re-work the analysis in Table 11-1 (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!)
- 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 demand-deposit account forces one bank to draw down its reserves by $100. ***(Key Question 13)***

Reversibility: The Multiple Destruction of Money

The process we have described is reversible. Just as demand deposit money is created when banks make loans, demand 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, demand 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, demand 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, demand deposits will contract and the money supply will decline.

QUICK REVIEW

- 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 desired 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 payback of loans as well as the money creation from the making of loans.

The LAST WORD

Money in the Early History of Canada[1]

The story of the Canadian dollar begins in the currency chaos of the early French and British colonial period in North America. Through the seventeenth century and until well into the nineteenth, various coins from many countries circulated freely in the colonies. These included not only English and French coins, but also coins from Portugal, Spain, and the Spanish colonies in Latin America—notably Mexico, Peru, and Colombia. The hazards of sea travel and persistent trade imbalances with the home country left the colonies chronically short of coins.

The chronic coin shortage also encouraged the introduction of paper money. The most famous issue is undoubtedly the card money of New France. Introduced in 1685, card money initially consisted of playing cards cut to different sizes according to denomination and signed by colonial officials. Despite the protests of authorities in Paris, who objected to the loss of budgetary control, there were several issues of card money before it was withdrawn from circulation in 1719. Card money reappeared in 1729, however, and remained readily accepted until rising inflation, associated with the financing of the Seven Years' War during the 1750s, undermined confidence in its value.

The first bank notes in Canada, issued by the Montreal Bank following its establishment in 1817, were also denominated in dollars. These notes could be redeemed in (gold) coin, upon demand. As new banks were incorporated in Upper and Lower Canada during the 1830s and 1840s, their bank notes were typically denominated in both dollars and pounds. These notes circulated freely through both Canadas and in the United States. Dollar-denominated bank notes issued by U.S. banks also circulated widely in Upper Canada during the early 1800s. This two-way movement of notes across the Canada–U.S. border strongly favoured the continued use of dollars and cents in Canada over pounds, shillings, and pence.

In contrast, bank notes circulating in New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland, before Confederation, were typically denominated in pounds, shillings, and pence. This reflected both the stronger ties these provinces had with Great Britain and their weaker commercial links with the United States.

Confederation on July 1, 1867 brought sweeping changes to banking and currency legislation in the provinces of Canada, Nova Scotia, and New Brunswick. Under the British North America Act, the government of the new Dominion was given jurisdiction over currency and banking. The Dominion Notes Act came into effect the following year. Under this legislation, the Dominion took over the various provincial note issues. Provincial notes issued in the Province of Canada were renamed "dominion notes" and were made redeemable in Halifax and Saint John in addition to Montreal and Toronto. The Dominion Notes Act was subsequently extended to cover Prince Edward Island, Manitoba, and British Columbia in 1876 and the Northwest Territories in 1886.

[1] From Powell, James, *A History of the Canadian Dollar*, http://www.bankofcanada.ca/en/dollar_book/index.htm.

QUESTION: The first bank notes were issues by the Bank of Montreal in 1817. What backed up these notes? If it was a banking system with fully backed reserves, how could new money be created?

CHAPTER SUMMARY

11.1 CHARTERED BANKS AND THE CREATION OF MONEY

- Modern banking systems are fractional reserve systems: only a fraction of deposits are backed by currency.
- The operation of a chartered bank can be understood through its balance sheet, where assets equal liabilities plus net worth.
- Chartered banks keep reserves as vault cash and a small amount in the Bank of Canada for cheque-clearing purposes. This reserve is equal to a desired percentage of the chartered bank's deposit liabilities. Excess reserves are equal to actual reserves minus desired reserves.
- Banks lose both reserves and deposits when cheques are drawn against them.

- Chartered banks create money—create demand deposits, or deposit money—when they make loans. The creation of demand deposits by bank lending is the most important source of money in the Canadian economy. Money is destroyed when bank loans are repaid.
- The ability of a single chartered bank to create money by lending depends on the size of its *excess* reserves. Generally speaking, a chartered bank lends only an amount equal to the amount of its excess reserves.
- Rather than making loans, chartered banks may decide to use excess reserves to buy bonds from the public. In doing so, banks merely credit the demand-deposit accounts of the bond sellers, thus creating demand-deposit money. Money vanishes when banks sell bonds to the public because bond buyers must draw down their demand-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. Banks having temporary excess reserves often lend them overnight to banks that are short of desired cash reserves. The interest rate paid on loans in this market is called the overnight lending rate.

11.2 THE BANKING SYSTEM: MULTIPLE DEPOSIT EXPANSION

- The chartered banking system as a whole can lend by a multiple of its excess reserves because the banking system cannot lose reserves, although individual banks can lose reserves to other banks in the system.

11.3 THE MONETARY MULTIPLIER

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

TERMS AND CONCEPTS

fractional reserve, p. 264
balance sheet, p. 265
vault cash, p. 265
desired reserves, p. 266
desired reserve ratio, p. 266
excess reserves, p. 267
actual reserves, p. 267
liquidity, p. 270
overnight lending rate, p. 270
monetary multiplier, p. 273

STUDY QUESTIONS

1. Why must a balance sheet always balance? What are the major assets and claims on a chartered bank's balance sheet?
2. **KEY QUESTION** Why do chartered banks hold reserves? Explain why reserves are an asset to chartered banks but a liability to the Bank of Canada. What are excess reserves? How do you calculate the amount of excess reserves held by a bank? What is the significance of excess reserves?
3. "Whenever currency is deposited in a chartered bank, cash goes out of circulation and, as a result, the supply of money is reduced." Do you agree? Explain why or why not.
4. **KEY QUESTION** "When a chartered bank makes loans, it creates money; when loans are repaid, money is destroyed." Explain.
5. Explain why a single chartered bank could lend an amount equal only to its excess reserves, but the chartered banking system could lend by a multiple of its excess reserves. What is the monetary multiplier and how does it relate to the desired reserve ratio?
6. Assume that Jones deposits $500 in currency in the Bank of Vancouver. A half-hour later, Smith obtains a loan for $750 at this bank. By how much and in what direction has the money supply changed? Explain.
7. Suppose the Bank of Newfoundland has excess reserves of $8,000 and outstanding deposits of $150,000. If the desired reserve ratio is 10 percent, what is the size of the bank's actual reserves?
8. **KEY QUESTION** Suppose the Yukon Bank has the following simplified balance sheet and that the desired reserve ratio is 20 percent.

ASSETS

		(1)	(2)
Reserves	$22,000	_____	_____
Securities	38,000	_____	_____
Loans	40,000	_____	_____

LIABILITIES AND NET WORTH

		(1)	(2)
Deposits	$100,000	_____	_____

a. What is the maximum amount of new loans this bank can make? Show in column 1 how the bank's

balance sheet will appear after the bank has loaned this additional amount.

b. By how much has the supply of money changed? Explain.

c. How will the bank's balance sheet appear after cheques drawn for the entire amount of the new loans have been cleared against this bank? Show this new balance sheet in column 2.

d. Answer questions a, b, and c on the assumption that the desired reserve ratio is 15 percent.

9. The Bank of Manitoba has reserves of $20,000 and deposits of $100,000. The desired reserve ratio is 20 percent. Households deposit $5,000 in currency in the bank, which is added to reserves. How much excess reserves does the bank now have?

10. Suppose again that the Bank of Manitoba has reserves of $20,000 and deposits of $100,000. The desired reserve ratio is 20 percent. The bank now sells $5,000 in securities to the Bank of Canada, receiving a $5,000 increase in its deposit there in return. How much excess reserves does the bank now have? Why does your answer differ (yes, it does!) from the answer to question 9?

11. Suppose a chartered bank discovers its reserves will temporarily fall slightly short of those it desires to hold. How might it remedy this situation? Now, assume the bank finds that its reserves will be substantially and permanently deficient. What remedy is available to this bank? (Hint: Recall your answer to question 4.)

12. Suppose that Bob withdraws $100 of cash from his chequing account at Calgary Chartered Bank and uses it to buy a camera from Joe, who deposits the $100 in his chequing account in Annapolis Valley Chartered Bank. Assuming a desired reserve ratio of 10 percent and no initial excess reserves, determine the extent to which (a) Calgary Chartered Bank must reduce its loans and demand deposits because of the cash withdrawal, (b) Annapolis Valley Chartered Bank can safely increase its loans and demand deposits because of the cash deposit, and (c) the entire banking system, including Annapolis Valley, can increase loans and demand deposits because of the cash deposit. Have the cash withdrawal and deposit changed the total money supply?

13. **KEY QUESTION** Suppose the simplified consolidated balance sheet shown below is for the entire chartered banking system. All figures are in billions. The desired reserve ratio is 25 percent.

ASSETS

		(1)
Reserves	$ 52	_____
Securities	48	_____
Loans	100	_____

LIABILITIES AND NET WORTH

		(1)
Demand deposits	$200	_____

a. How much excess reserves does the chartered banking system have? What is the maximum amount the banking system might lend? Show in column 1 how the consolidated balance sheet would look after this amount has been lent. What is the monetary multiplier?

b. Answer the questions in 13(a) assuming that the desired reserve ratio is 20 percent. Explain the resulting difference in the lending ability of the chartered banking system.

INTERNET APPLICATION QUESTIONS

1. **How To Spot a Counterfeit Bank Note.** Counterfeit bank notes have always been a concern for the Bank of Canada. Visit the Bank of Canada through the McConnell-Brue-Barbiero Web site (Chapter 11) to find out how to detect counterfeit Canadian bank notes.

2. **The Balance Sheet of Canadian Chartered Banks.** Statistics Canada provides the balance sheet of chartered banks. Access their Web site through the McConnell-Brue-Barbiero homepage (Chapter 11). What has the trend been in the last five years for bank assets and liabilities?

Σ-STAT

3. **Web-Based Question: The Canadian Payments Association (CPA) and Cheque Clearing.** Visit the Canadian Payments Association Web site by going through the McConnell-Brue-Barbiero home page (Chapter11). How many transactions are cleared and settled through the CPA's systems each business day?