

The Multiple Expansion of Checkable Deposits

This activity is designed to illustrate how banks' lending of excess reserves can expand the nation's money supply and to explain how the Federal Reserve System can limit the growth of the money supply using the required reserve ratio.

Part A

Assume that

- the required reserve ratio is 10 percent of checkable deposits and banks lend out the other 90 percent of their deposits (banks wish to hold no excess reserves) and
 - all money lent out by one bank is redeposited in another bank.
1. Under these assumptions, if a new checkable deposit of \$1,000 is made in Bank 1,
 - (A) how much will Bank 1 keep as required reserves? \$ _____
 - (B) how much will Bank 1 lend out? \$ _____
 - (C) how much will be redeposited in Bank 2? \$ _____
 - (D) how much will Bank 2 keep as required reserves? \$ _____
 - (E) how much will Bank 2 lend out? \$ _____
 - (F) how much will be redeposited in Bank 3? \$ _____
 2. Use your answers to Question 1 to help you complete the table in Figure 37.1. Fill in the blanks in the table, rounding numbers to the second decimal (for example, \$59.049 = \$59.05). After you have completed the table, answer the questions that follow by filling in the blanks or underlining the correct answer in parentheses so each statement is true.



Figure 37.1

Checkable Deposits, Reserves and Loans in Seven Banks

Bank No.	New Checkable Deposits	10% Fractional Reserves	Loans
1	\$1,000.00	\$100.00	\$900.00
2	900.00		810.00
3		81.00	
4			656.10
5			
6		59.05	
7	531.44		478.30
All other banks combined			
Total for all banks	\$10,000.00		\$9,000.00

Adapted from Phillip Saunders, *Introduction to Macroeconomics: Student Workbook*, 18th ed. (Bloomington, Ind., 1998). Copyright Phillip Saunders. All rights reserved. Contributions made by Robert Wedge, Massachusetts Council on Economic Education, Waltham, Mass., and Lisa C. Hernan-Ellison, Kokomo High School-South Campus, Kokomo, Ind.

3. In this example:
- (A) The original deposit of \$1,000 increased total bank reserves by \$_____. Eventually, this led to a total of \$10,000 expansion of bank deposits, _____ of which was because of the original deposit, while _____ was because of bank lending activities.
 - (B) Therefore, if the fractional reserve had been 15 percent instead of 10 percent, the amount of deposit expansion would have been (*more / less*) than in this example.
 - (C) Therefore, if the fractional reserve had been 5 percent instead of 10 percent, the amount of deposit expansion would have been (*more / less*) than in this example.
 - (D) If banks had not loaned out all of their excess reserves, the amount of deposit expansion would have been (*more / less*) than in this example.
 - (E) If all loans had not been redeposited in the banking system, the amount of deposit expansion would have been (*more / less*) than in this example.
4. Another way to represent the multiple expansion of deposits is through *T-accounts*. In short, a T-account is an accounting relationship that looks at changes in balance sheet items. Since balance sheets must balance, so, too, must T-accounts. T-account entries on the asset side must be balanced by an offsetting asset or an offsetting liability. A sample T-account is provided below. For the bank, *assets* include accounts at the Federal Reserve District Bank, Treasury securities and loans; *liabilities* are deposits and *net worth* is assets minus liabilities. Show how the \$1,000 checkable deposit described in Question 1 would be listed in a T-account.

Assets	Liabilities

Part B

The Federal Reserve sets the reserve requirements: the percentages of the bank's deposits that the bank must hold as reserves. Banks may not loan out these required reserves. As we said in Part A, this fractional reserve system actually allows banks to create money. The amount of reserves a bank holds is known as its *total reserves*. Total reserves are composed of *required reserves*, which the bank must keep, and *excess reserves*, which the bank can loan to other customers. The reserves held by the bank beyond those required by the Fed are *excess reserves*.

How much money would be created if the bank continued to loan out its excess reserves to the last penny? To find out, we must calculate the *deposit expansion multiplier*. The deposit expansion multiplier determines how much money can be created in the economy from an initial deposit. The formula for the deposit expansion multiplier is

$$\text{Deposit expansion multiplier} = \frac{1}{\text{reserve requirement}}$$

In the example in Part A, the Federal Reserve set the reserve requirement at 10 percent. So the deposit expansion multiplier would be

$$\text{Deposit expansion multiplier} = \frac{1}{0.10} = 10$$

To find the maximum amount of money that could be created, the formula is

$$\text{Expansion of the money supply} = \text{deposit expansion multiplier} \times \text{excess reserves}$$

The multiplier is 10, and excess reserves from the initial bank deposit are \$900. So the potential expansion of money (M1) would be

$$\text{Expansion of the money supply} = 10 \times \$900 = \$9,000$$

M1 now consists of the original \$1,000 deposit plus the \$9,000 created.

5. Assume that \$1,000 is deposited in the bank, and that each bank loans out all of its excess reserves. For each of the following required reserve ratios, calculate the amount that the bank must hold in required reserves, the amount that will be excess reserves, the deposit expansion multiplier and the maximum amount that the money supply could increase.

	Required Reserve Ratio					
	1%	5%	10%	12.5%	15%	25%
Required reserves						
Excess reserves						
Deposit expansion multiplier						
Maximum increase in the money supply						

6. If the required reserve ratio were 0 percent, then money supply expansion would be infinite. Why don't we want an infinite growth of the money supply? (Hint: remember the equation of exchange: $MV = PQ$.)
7. If the Federal Reserve wants to increase the money supply, should it raise or lower the reserve requirement? Why?
8. If the Federal Reserve increases the reserve requirement and velocity remains stable, what will happen to nominal GDP? Why?
9. What economic goal might the Federal Reserve try to meet by reducing the money supply?
10. Why might the money supply not expand by the amount predicted by the deposit expansion multiplier?

The Federal Reserve: The Mechanics of Monetary Policy

To manage the money supply, the Federal Reserve uses the tools of monetary policy to influence the quantity of reserves in the banking system. Increasing (decreasing) reserves tends to expand (contract) a bank's ability to make loans. Thus, reserve management gives the Fed powerful influence over the money supply and, in turn, over the general price level. The primary tool for reserve management today is open market operations (OMO). Discount rate changes serve primarily as signals; reserve requirements are rarely changed. Using T-accounts, Figures 38.1 and 38.2 show how the Fed could use open market operations to increase the money supply by \$100.

Example: Baseline case

Figure 38.1 shows a baseline T-account. The required reserve ratio is 10 percent of checking deposits. With \$26 in reserve accounts and \$4 in Federal Reserve notes (vault cash), total bank reserves equal \$30, exactly 10 percent of checkable deposits (in other words, no excess reserves). Net worth = assets – liabilities.



Figure 38.1
Baseline Case

Assets	The Fed		Liabilities
Treasury securities	\$83	\$26	Reserve accounts of banks
		\$57	Federal Reserve notes

	Banks		
Reserve accounts	\$26	\$300	Checkable deposits
Federal Reserve notes	\$4		
Loans	\$405	\$135	Net worth (to stockholders)

	Bank Customers		
Checkable deposits	\$300	\$405	Loans
Federal Reserve notes	\$53		
Treasury securities	\$52		
Money supply = \$353 (\$300 + \$53)			

Activity written by Robert Graboyes, University of Richmond, Richmond, Va.

Example: Expansionary policy via open market purchases

Suppose the Fed believes the economy is heading into a recession and wishes to increase the money supply by \$100. Using open market operations, the Fed purchases \$10 worth of Treasury securities from the public.

Figure 38.2 shows the consolidated accounts after the changes of this Fed action work their way through the economy. Changes are shown in boldface. Be sure to compare Figure 38.1 with Figure 38.2 to see the changes. The Fed's \$10 increase in reserve accounts yields a \$100 increase in the money supply.



Figure 38.2
After \$10 Open Market Purchase

Assets	The Fed		Liabilities
Treasury securities (+\$10)	\$93	\$36	Reserve accounts of banks (+\$10)
		\$57	Federal Reserve notes

	Banks		
Reserve accounts (+\$10)	\$36	\$400	Checkable deposits (+\$100)
Federal Reserve notes	\$4		
Loans (+\$90)	\$495	\$135	Net worth (to stockholders)

	Bank Customers		
Checkable deposits (+\$100)	\$400	\$495	Loans (+\$90)
Federal Reserve notes	\$53		
Treasury securities (– \$10)	\$42		
Money supply = \$453 (\$400 + \$53)			

For Questions 1 through 4, start with the baseline case in Figure 38.1. The Fed wishes to *decrease* the money supply from \$353 to \$303 by open market operations. The reserve requirement is 10 percent.

1. Will the Fed want to buy or sell existing Treasury securities? _____
2. What is the money multiplier? _____
3. What is the value of Treasury securities that need to be bought or sold? _____
4. Fill in Figure 38.3 to show the accounts after open market operations are finished and all changes have worked their way through the economy:



Figure 38.3
After Open Market Operations Are Finished

Assets			Liabilities
	The Fed		
Treasury securities			Reserve accounts of banks
		\$57	Federal Reserve notes
	Banks		
Reserve accounts			Checkable deposits
Federal Reserve notes			
Loans		\$135	Net worth (to stockholders)
	Bank Customers		
Checkable deposits			Loans
Federal Reserve notes	\$53		
Treasury securities			
Money supply = _____			

For Questions 5 through 7, suppose banks keep zero excess reserves and the reserve requirement is 15 percent.

5. What is the deposit expansion multiplier? _____

6. A customer deposits \$100,000 in his checking account.
- (A) How much of this can the bank lend to new customers? _____
 - (B) How much must the bank add to its reserves? _____
 - (C) In what two forms can a bank hold the new required reserves?
7. Suppose that the \$100,000 had previously been held in Federal Reserve notes under the customer's mattress and that banks continue to hold no excess reserves. By how much will the customer's deposit cause the money supply to grow? _____
8. A very low discount rate may (*encourage banks to borrow / discourage banks from borrowing*) from the Federal Reserve. Underline the correct answer and explain why.
9. The federal funds rate is the interest rate at which financial institutions can borrow from other financial institutions. Suppose the federal funds rate is 5 percent and the discount rate is 4.5 percent. Why is it that a bank might choose to borrow in the federal funds market, rather than getting the lower interest rate available through the discount window?
10. In a foreign country, the reserve requirement is 100 percent. What will be the deposit expansion multiplier? _____
11. If the Fed decided to implement a policy action designed to increase the money supply, in which direction would bank reserves and the federal funds rate change and why?

12. Circle the correct symbol (↑ for increase, ↓ for decrease) in Figure 38.4.



Figure 38.4
Fed Actions and Their Effects

Federal Reserve Action	Bank Reserves	Money Supply	Fed Funds Rate
A. Sold Treasury securities on the open market	↑ ↓	↑ ↓	↑ ↓
B. Bought Treasury securities on the open market	↑ ↓	↑ ↓	↑ ↓
C. Raised the discount rate	↑ ↓	↑ ↓	↑ ↓
D. Lowered the discount rate	↑ ↓	↑ ↓	↑ ↓
E. Raised the reserve requirement	↑ ↓	↑ ↓	↑ ↓
F. Lowered the reserve requirement	↑ ↓	↑ ↓	↑ ↓

13. Indicate in the table in Figure 38.5 how the Federal Reserve could use each of the three monetary policy tools to pursue an expansionary policy and a contractionary policy.



Figure 38.5
Tools of Monetary Policy

Monetary Policy	Expansionary Policy	Contractionary Policy
A. Open market operations		
B. Discount rate		
C. Reserve requirements		

14. Why do banks hold excess reserves, which pay no interest?

15. Why does the Fed rarely use the reserve requirement as an instrument of monetary policy?
16. What does it mean to say that the Fed changes the discount rate mostly as a *signal* to markets? _____
17. Why does the Fed currently target the federal funds rate rather than the money supply?

The Money Market

The money market consists of the demand for money and the supply of money. We generally assume that the Federal Reserve determines the supply of money. Thus, the supply of money is a vertical line. The demand for money is based on a decision of whether to hold your wealth in the form of interest bearing assets (savings accounts, stocks, etc.) or as money (noninterest bearing). The demand for money is a function of interest rates and income, and is determined by three motives:

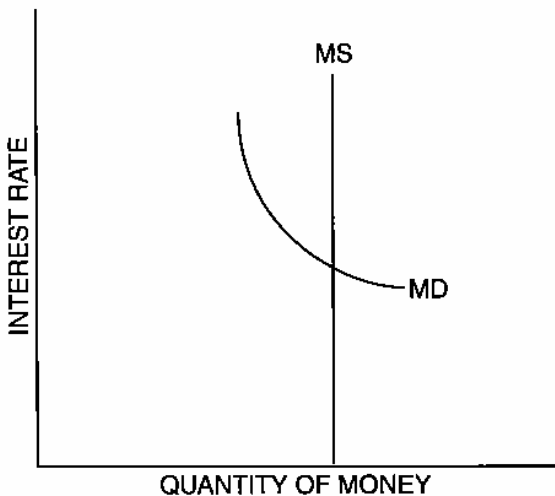
- Transactions demand — the demand for money to make purchases of goods and services
- Precautionary demand — the demand for money to serve as protection against an unexpected need
- Speculative demand — the demand for money because it serves as a store of wealth

The interest rate represents the opportunity cost of holding money; that is, the interest rate represents the forgone income you might have made had you held an interest-bearing asset rather than money, a noninterest-bearing asset. Thus the demand for money has an inverse relationship with the interest rate. The demand curve represents the demand for money at various levels of the interest rate for the given income level (GDP). The graph of the money market looks like this:



Figure 39.1

The Money Market



Activity written by Rae Jean B. Goodman, U.S. Naval Academy, Annapolis, Md.

1. Suppose the Federal Reserve increases the money supply by buying Treasury securities.
 - (A) What happens to the interest rate?

 - (B) What happens to the quantity of money demanded?

 - (C) Explain what happens to loans and interest rates as the Fed increases the money supply.

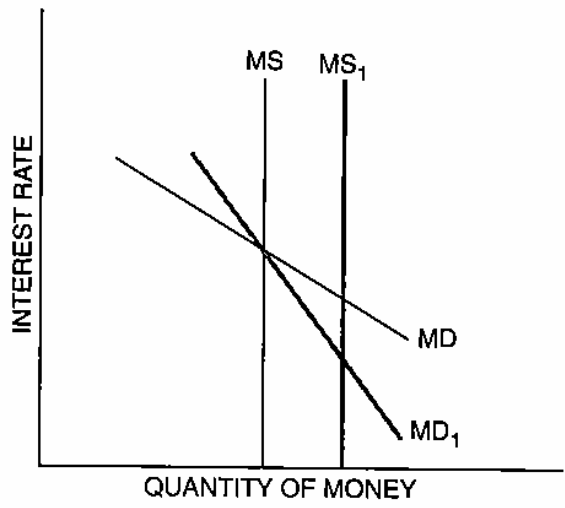
2. Suppose the demand for money increases.
 - (A) What happens to the interest rate?

 - (B) What happens to the quantity of money supplied?

 - (C) If the Fed wants to maintain a constant interest rate when the demand for money increases, explain what policy the Fed needs to follow and why.

 - (D) Why might the Fed want to maintain a constant interest rate?

Figure 39.2
Alternative Money Demand Curves



3. Suppose there are two money demand curves — MD and MD₁ — and the Fed increases the money supply from MS to MS₁ as shown in Figure 39.2.
 - (A) Compare what happens to the interest rate with each MD curve.

 - (B) Explain the effect of the change in the money supply on consumption, investment, real output and prices. Would there be a difference in the effects under the two different money demand curves? If so, explain.

 - (C) How would you describe, in economic terms, the difference between the two money demand curves?

 - (D) If the Federal Reserve is trying to get the economy out of a recession, which money demand curve would it want to represent the economy? Explain.