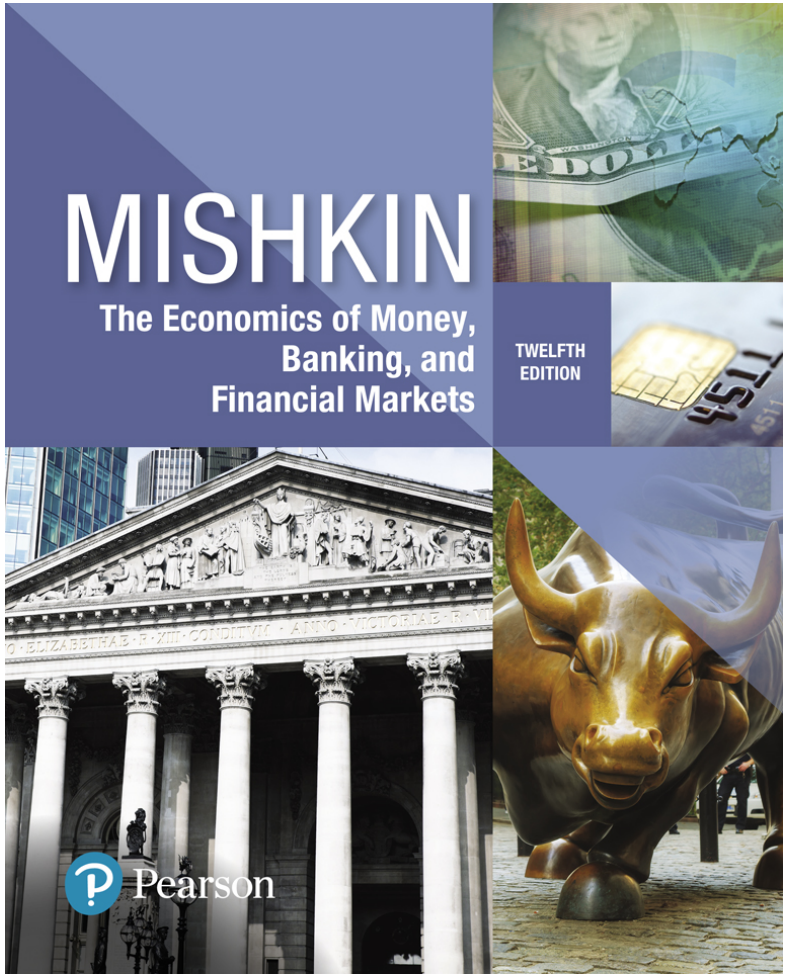
The Economics of Money, Banking, and Financial Markets

Twelfth Edition



Chapter 14

The Money Supply Process

Preview

- This chapter provides an overview of how commercial banks create deposits and describes the basic principles of the money supply creation process

Learning Objectives (1 of 2)

- List and describe the “three players” that influence the money supply.
- Classify the factors affecting the Federal Reserve’s assets and liabilities.
- Identify the factors that affect the monetary base and discuss their effects on the Federal Reserve’s balance sheet.
- Explain and illustrate the deposit creation process using T-accounts.

Learning Objectives (2 of 2)

- List the factors that affect the money supply.
- Summarize how the “three players” can influence the money supply.
- Calculate and interpret changes in the money multiplier.

Three Players in the Money Supply Process

1. **The Central bank:** Federal Reserve System
2. **Banks**: depository institutions; financial intermediaries
3. **Depositors**: individuals and institutions

The Fed's Balance Sheet

Federal Reserve System	
Assets	**Liabilities**
Securities	Currency in circulation
Loans to Financial Institutions	Reserves

- **Liabilities**
  - Currency in circulation: in the hands of the public
  - Reserves: bank deposits at the Fed and vault cash
- **Assets**
  - Government securities: holdings by the Fed that affect money supply and earn interest
  - Discount loans: provide reserves to banks and earn the discount rate

Control of the Monetary Base

High-powered money

$$MB = C + R$$

C = currency in circulation

R = total reserves in the banking system

Open Market Purchase from a Bank

Banking System		
Assets		**Liabilities**
Securities	−$100m	
Reserves	+$100m	

Federal Reserve System			
Assets		**Liabilities**	
Securities	+$100m	Reserves	+$100m

- Net result is that reserves have increased by $100
- No change in currency
- Monetary base has risen by $100

Open Market Purchase from the Nonbank Public (1 of 2)

Banking System			
Assets		**Liabilities**	
Reserves	+$100m	Checkable deposits	+$100m

Federal Reserve System			
Assets		**Liabilities**	
Securities	+$100m	Reserves	+$100m

- Person selling bonds to the Fed deposits the Fed's check in the bank
- Identical result as the purchase from a bank

Open Market Purchase from the Nonbank Public (2 of 2)

Nonbank Public			
Assets		**Liabilities**	
Securities	−$100m		
Currency	+$100m		

Federal Reserve System			
Assets		**Liabilities**	
Securities	+$100m	Currency in circulation	+$100m

- The person selling the bonds cashes the Fed's check
- Reserves are unchanged
- Currency in circulation increases by the amount of the open market purchase
- Monetary base increases by the amount of the open market purchase

Open Market Purchase: Summary

- The effect of an open market purchase on reserves depends on whether the seller of the bonds keeps the proceeds from the sale in currency or in deposits.
- The effect of an open market purchase on the monetary base always increases the monetary base by the amount of the purchase.

Open Market Sale

Nonbank Public			
Assets		**Liabilities**	
Securities	+$100m		
Currency	−$100m		

Federal Reserve System			
Assets		**Liabilities**	
Securities	−$100m	Currency in circulation	−$100m

- Reduces the monetary base by the amount of the sale
- Reserves remain unchanged
- The effect of open market operations on the monetary base is much more certain than the effect on reserves.

Shifts from Deposits into Currency

Nonbank Public		
Assets		**Liabilities**
Checkable deposits	−$100m	
Currency	+$100m	

Banking System			
Assets		**Liabilities**	
Reserves	−$100m	Checkable deposits	−$100m

Federal Reserve System			
Assets		**Liabilities**	
		Currency in circulation	+$100m
		Reserves	-$100m

- Net effect on monetary liabilities is zero
- Reserves are changed by random fluctuations
- Monetary base is a relatively stable variable

Loans to Financial Institutions

Banking System			
Assets		**Liabilities**	
Reserves	+$100m	Loans	+$100m
		(borrowing from Fed)	

Federal Reserve System			
Assets		**Liabilities**	
Loans	+$100m	Reserves	+$100m
(borrowing from Fed)			

- Monetary liabilities of the Fed have increased by $100
- Monetary base also increases by this amount

Other Factors That Affect the Monetary Base

- Float
- Treasury deposits at the Federal Reserve
- Interventions in the foreign exchange market

Overview of the Fed's Ability to Control the Monetary Base

- Open market operations are controlled by the Fed.
- The Fed cannot determine the amount of borrowing by banks from the Fed.
- Split the monetary base into two components:

$$MB_n = MB - BR$$

- The money supply is positively related to both the non-borrowed monetary base MB_n and to the level of borrowed reserves, BR, from the Fed.

Multiple Deposit Creation: A Simple Model
(1 of 2)

Deposit Creation: Single Bank

First National Bank			
Assets		**Liabilities**	
Securities	−$100m		
Reserves	+$100m		

First National Bank			
Assets		**Liabilities**	
Securities	−$100m	Checkable deposits	+$100m
Reserves	+$100m		
Loans	+$100m		

- Excess reserves increase
- Bank loans out the excess reserves
- Creates a checking account
- Borrower makes purchases
- The Money supply has increased

First National Bank			
Assets		**Liabilities**	
Securities	−$100m		
Reserves	+$100m		

Multiple Deposit Creation: A Simple Model
(2 of 2)

Deposit Creation: The Banking System

Bank A			
Assets		**Liabilities**	
Reserves	+$100m	Checkable deposits	+$100m

Bank A			
Assets		**Liabilities**	
Reserves	+$10	Checkable deposits	+$100m
Loans	+$90		

Bank B			
Assets		**Liabilities**	
Reserves	+$90	Checkable deposits	+$90

Bank B			
Assets		**Liabilities**	
Reserves	+$9	Checkable deposits	+$90
Loans	+$81		

Table 1 Creation of Deposits (Assuming 10% Reserve Requirement and a $100 Increase in Reserves)

Bank	Increase in Deposits ($)	Increase in Loans ($)	Increase in Reserves ($)
First National	0.00	100.00 m	0.00
A	100.00 m	90.00 m	10.00 m
B	90.00 m	81.00 m	9.00 m
C	81.00 m	72.90 m	8.10 m
D	72.90 m	65.61 m	7.29 m
E	65.61 m	59.05 m	6.56 m
F	59.05 m	53.14 m	5.91 m
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
Total for all banks	1,000.00 m	1,000.00 m	100.00 m

Deriving the Formula for Multiple Deposit Creation

Assuming banks do not hold excess reserves

Required Reserves (RR) = Total Reserves (R)

RR = Required Reserve Ratio (r) times the total amount of checkable deposits (D)

Substituting

$$r \times D = R$$

Dividing both sides by r

$$D = \frac{1}{r} \times R$$

Taking the change in both sides yields

$$\Delta D = \frac{1}{r} \times \Delta R$$

Critique of the Simple Model

- Holding cash stops the process
  - Currency has no multiple deposit expansion
- Banks may not use all of their excess reserves to buy securities or make loans.
- Depositors' decisions (how much currency to hold) and bank's decisions (amount of excess reserves to hold) also cause the money supply to change.

Factors That Determine the Money Supply
(1 of 2)

- Changes in the nonborrowed monetary base MB_n
  - The money supply is positively related to the non-borrowed monetary base MB_n
- Changes in borrowed reserves from the Fed
  - The money supply is positively related to the level of borrowed reserves, *BR,* from the Fed

Factors That Determine the Money Supply (2 of 2)

- Changes in the required reserves ratio
  - The money supply is negatively related to the required reserve ratio.
- Changes in currency holdings
  - The money supply is negatively related to currency holdings.
- Changes in excess reserves
  - The money supply is negatively related to the amount of excess reserves.

Overview of the Money Supply Process

SUMMARY TABLE 1

Money Supply Response

Player	Variable	Change in Variable	Money Supply Response	Reason
Federal Reserve System	Nonborrowed monetary base, MB_n	↑	↑	More *MB* for deposit creation
	Required reserve ratio, *rr*	↑	↓	Less multiple deposit expansion
Banks	Borrowed reserves, *BR*	↑	↑	More *MB* for deposit creation
	Excess reserves	↑	↓	Less loans and deposit creation
Depositors	Currency holdings	↑	↓	Less multiple deposit expansion

Note: Only increases (↑) in the variables are shown. The effects of decreases on the money supply would be the opposite of those indicated in the "Money Supply Response" column.

The Money Multiplier

- Define money as currency plus checkable deposits: M1
- Link the money supply (*M*) to the monetary base (*MB*) and let *m* be the money multiplier

$$M = m \times MB$$

Deriving the Money Multiplier (1 of 4)

- Assume that the desired holdings of currency *C* and excess reserves *ER* grow proportionally with checkable deposits *D*.
- Then,

  $c = \{C/D\}$ = currency ratio

  $e = \{ER/D\}$ = excess reserves ratio

Deriving the Money Multiplier (2 of 4)

The total amount of reserves (R) equals the sum of required reserves (RR) and excess reserves (ER).

$$R = RR + ER$$

The total amount of required reserves equals the required reserve ratio times the amount of checkable deposits

$$RR = r \times D$$

Subsituting for RR in the first equation

$$R = (r \times D) + ER$$

The Fed sets r to less than 1

Deriving the Money Multiplier (3 of 4)

- The monetary base *MB* equals currency (*C*) plus reserves (*R*):

$$MB = C + R = C + (r \times D) + ER$$

- Equation reveals the amount of the monetary base needed to support the existing amounts of checkable deposits, currency, and excess reserves.

Deriving the Money Multiplier (4 of 4)

$$c = \{C / D\} \Rightarrow C = c \times D \text{ and}$$

$$e = \{ER / D\} \Rightarrow ER = e \times D$$

Substituting in the previous equation

$$MB = (r \times D) + (e \times D) + (c \times D) = (r + e + c) \times D$$

Divide both sides by the term in parentheses

$$D = \frac{1}{r + e + c} \times MB$$

$$M = D + C \text{ and } C = c \times D$$

$$M = D + (c \times D) = (1 + c) \times D$$

Substituting again

$$M = \frac{1 + c}{r + e + c} \times MB$$

The money multiplier is then

$$m = \frac{1 + c}{r + e + c}$$

Intuition Behind the Money Multiplier

r = required reserve ratio = 0.10

C = currency in circulation = \$400B

D = checkable deposits = \$800B

ER = excess reserves = \$0.8B

M = money supply (M1) = $C + D$ = \$1,200B

$$c = \frac{\$400B}{\$800B} = 0.5$$

$$e = \frac{\$0.8B}{\$800B} = 0.001$$

$$m = \frac{1+0.5}{0.1+0.001+0.5} = \frac{1.5}{0.601} = 2.5$$

This is less than the simple deposit multiplier

Although there is multiple expansion of deposits,

there is no such expansion for currency

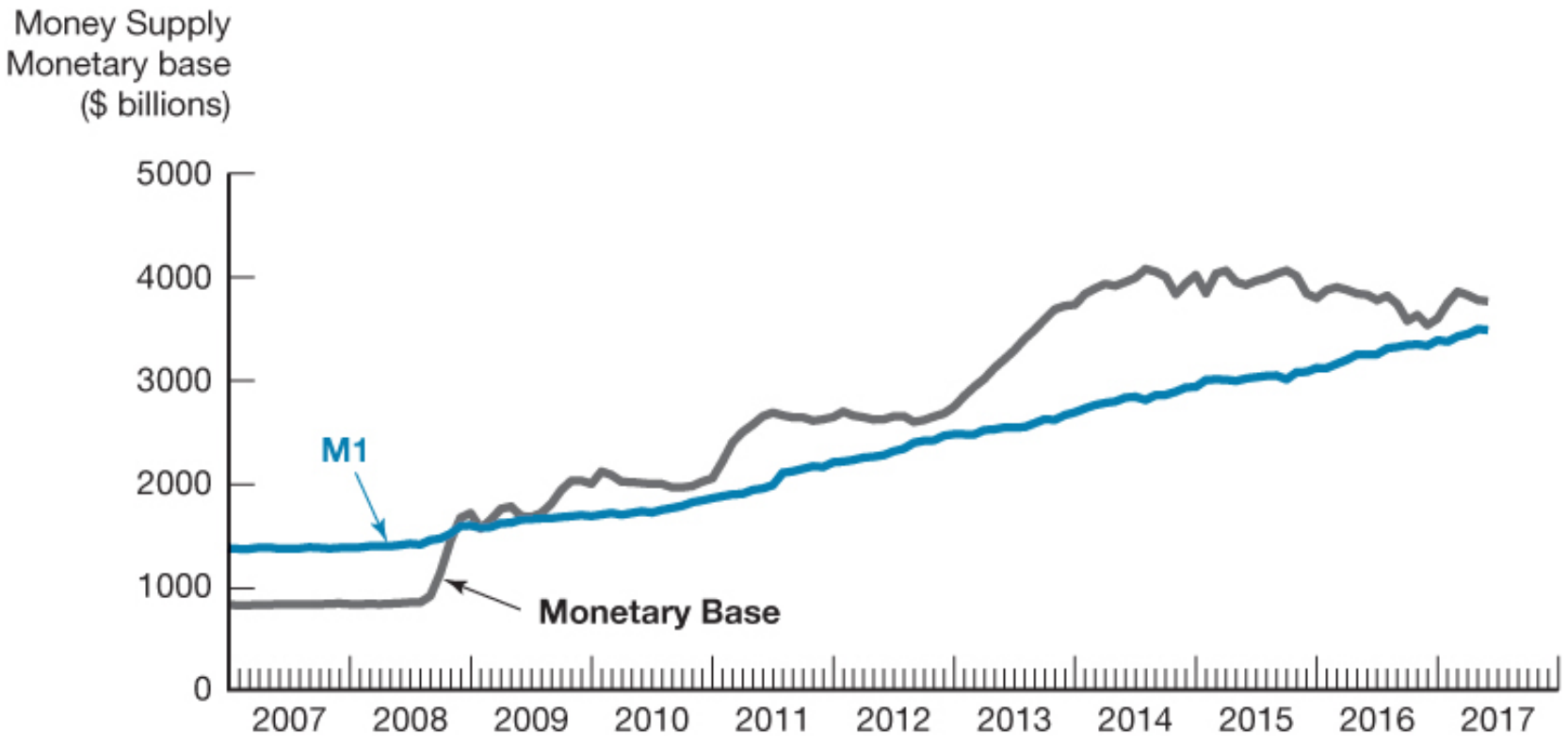
Quantitative Easing and the Money Supply, 2007–2017

- When the global financial crisis began in the fall of 2007, the Fed initiated lending programs and large-scale asset-purchase programs in an attempt to bolster the economy.
- By the fall of 2017, these purchases of securities had led to a quintupling of the Fed's balance sheet and a 350% increase in the monetary base.

Quantitative Easing and the Money Supply, 2007–2014

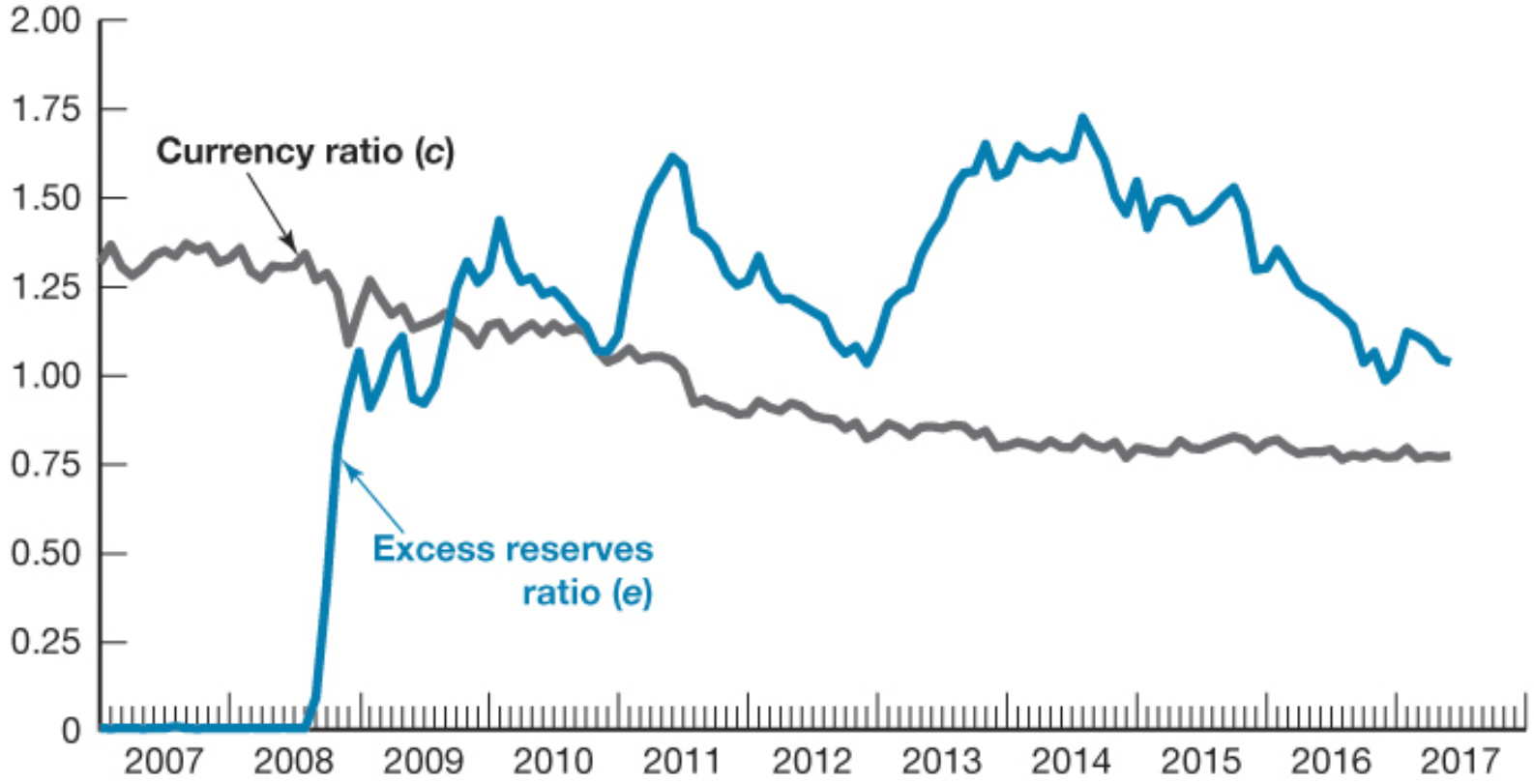
- These lending and asset-purchase programs resulted in a huge expansion of the monetary base and have been given the name “quantitative easing.”
- This increase in the monetary base did not lead to an equivalent change in the money supply because excess reserves rose dramatically.

Figure 1 M1 and the Monetary Base, 2007–2017



Source: Federal Reserve Bank of St. Louis, FRED database: http://research.stlouisfed.org/fred2/.

Figure 2 Excess Reserves Ratio and Currency Ratio, 2007–2017



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