

Money Supply Process

Economics 301: Money and Banking

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1.1 Goals

Goals and Learning Outcomes

- Goals:
 - Understand balance sheets of Federal Reserve system and banking system.
 - Understand how money is created and multiplied.
 - Understand determinants of money supply.
- Learning Outcomes:
 - LO4: Explain the structure of the Federal Reserve System and the mechanisms in which it controls the money supply.

1.2 Reading

Reading

- Read Hubbard and O'Brien, Chapter 14.

2 Balance Sheets

2.1 Federal Reserve System

Federal Reserve Balance Sheet

Federal Reserve System	
Assets	Liabilities
Government securities	Currency in circulation
Discount loans	Reserves
Corporate securities	
Mortgage backed securities	

- Assets: securities purchased by the Federal Reserve.

- Reserves:
 - Banks have accounts at the Fed in which they hold deposits to be used to meet their own depositors needs.
 - Reserves = Deposits of banks at Fed + currency physically held by banks in vaults.

2.2 Banking System

Banking System Balance Sheet

Banking System	
Assets	Liabilities
Government securities	Checkable deposits
Personal/Corporate Loans	Other types of deposits
Loaned federal funds	Borrowed federal funds
Reserves	Discount Loans
Physical Collateral on Defaults	

2.3 Open Market Operations

Open Market Operations

- Monetary base = currency in circulation + total reserves in banking system ($MB=C+R$).
- Open market purchase of \$100 in Treasury Bills from Banking system.

Banking System	
Assets	Liabilities
Government Securities	-\$100
Reserves	+\$100

Federal Reserve System	
Assets	Liabilities
Government Securities	+\$100
	Reserves
	+\$100

Open Market Purchase from Public

- Open market purchase of \$100 from non-bank public.
- Suppose public deposits \$80 of proceeds in banks and holds \$20 currency.

Non-bank Public	
Assets	Liabilities
Government Securities	-\$100
Checkable Deposits	+\$80
Currency	+\$20

Open Market Purchase from Public (continued)

- Open market purchase of \$100 from non-bank public.
- Suppose public deposits \$80 of proceeds in banks and holds \$20 currency.

Banking System

Assets		Liabilities	
Reserves	+\$80	Checkable Deposits	+\$80

Federal Reserve System

Assets		Liabilities	
Government Securities	+\$100	Reserves	+\$80
		Currency in circulation	+\$20

2.4 Discount Loans

Discount Loan

- **Discount loan:** loan in which a bank or financial institution borrows funds directly from the Federal Reserve.
- Suppose Acme Bank makes a \$200 discount loan.

Banking System

Assets		Liabilities	
Reserves	+\$200	Discount Loans	+\$200

Federal Reserve System

Assets		Liabilities	
Discount Loans	+\$200	Reserves	+\$200

3 Money Multiplier

3.1 Deposit Creation

Deposit Creation

- Suppose **required reserve ratio** is 5% and banks hold no excess reserves.
- Suppose Fed makes a \$100 open market purchase of bonds.
- Increases banks' reserves by \$100, they in turn loan full amount to non-bank public.
- Non-bank public borrows \$100 and spends it.
- \$100 expenditure becomes \$100 income for others in non-bank public.
- Suppose non-bank public holds zero currency, puts full amount in checkable deposits.

Deposit Creation (continued)

- Banks deposits increase by \$100.
- Put puts $(0.05)(\$100) = \5 in reserves (minimum required), loans out remaining \$95.
- Non-bank public borrows \$95, this becomes income for others, which ends up in deposits.
- Banks put $(0.05)(\$95) = \4.75 in reserves, loans out remaining \$90.25.
- Non-bank public borrows \$90.25, this becomes income for others, which ends up in deposits again.
- Banks put $(0.05)(\$90.25) = \4.51 in reserves, loans out remaining \$85.74...

3.2 Algebraic Solution

Money Multiplier

- A single \$100 open market purchase of bonds created an increase of deposits equal to...

$$\Delta D = \$100 + 95 + 90.25 + 85.74 + \dots$$

- Let ΔR denote initial change in reserves (\$100), r denote required reserve ratio.

$$\Delta D = \Delta R + (1 - r)\Delta R + (1 - r)^2\Delta R + (1 - r)^3\Delta R + \dots$$

- Can you simplify this expression? How much larger is change in deposits compared to open market purchase?

Money Multiplier Algebra

- Required reserves = (required reserve ratio)(deposits).
- Recall, we assume Actual reserves = Required Reserves.

$$R = rD$$

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

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

- Money multiplier = $m = \frac{1}{r}$.
- Money Supply = (money multiplier) (monetary base).

3.3 General Money Multiplier

General Money Multiplier

- Suppose people do hold currency, banks hold excess reserves.
- Notation:
 - C: Currency holdings.
 - D: Deposits.
 - RR: Required reserves.
 - ER: Excess reserves.
 - R: Actual reserves.
 - MB: Monetary base.
- For simplicity, assume ratios of currency holdings and excess reserves are constant:
 - $c = C/D =$ currency ratio.
 - $e = ER/D =$ excess reserves ratio.
- Use $MB = R+C$ and $M1 = C+D$ to derive money multiplier.

General Money Multiplier

General Money Multiplier

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

Impact on Money Supply?

- If there is a *decrease* in the currency ratio (suppose from a fraction of total money that people hold in currency)?
- If there is an *increase* in the fraction of deposits that banks keep in excess reserves?
- If there is an *increase* in the required reserve ratio?

3.4 Example Problem

General Money Multiplier Problem

Suppose the required reserve ratio is 5%, banks hold an extra 8% of deposits in excess reserves, and consumers hold currency balances that are about 2% of what they hold in deposits in banks.

Suppose the Fed makes an open market purchase of \$100 million of government bonds.

1. Compute the impact on the monetary base.
2. Compute the impact on the M1 money supply.
3. Compute the impact on the amount of deposits held in the banking sector.
4. Compute the impact on required reserves, excess reserves, and total reserves held by banks.
5. Describe and illustrate the impact on the equilibrium interest rate.

4 Money Supply

4.1 Determinants

Determinants of Money Supply

Factors affecting money supply:

- Open market operations (affect non-borrowed monetary base).
- Changes in required reserve ratio.
- Changes in banks desire to hold excess reserves.
- Changes in consumers' desire to hold currency versus deposits.
- Changes in borrowed reserves.

4.2 Endogenous Money Supply

Endogenous Money Supply

- Typical assumption: central bank exogenously influences money supply through open market operations.
- Typical assumption implication for money supply function?
- How might excess reserves be influenced by interest rate?
- What is the implication for the money supply function?