Money Supply Process

ECO 301: Money and Banking

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.

Reading and Exercises

- Fed's balance sheets and open market operations: Chapter 14, pp. 469-477
- Money multiplier: Chapter 14, pp. 481-488; 501-502
- 2007-2009 Financial Crisis: Chapter 14, pp. 488-490
- **Canvas quiz due Wed 11:59 PM**.
- **Homework/Exercise due Fri 11:59 PM**. We will work together in class on Thursday
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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.

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	

Open Market Operations

- Central banks change the money supply by making an **open market operation**
- Federal Open Market Committee (FOMC) makes these decisions for the U.S. Federal Reserve System
- Increase money supply: The central bank makes an *open market* purchase of government bonds from banks and financial institutions
- Decrease money supply: The central bank makes an *open market* sale of government bonds from banks and financial institutions

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

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

Deposits and Reserves

- **Required Reserve Ratio:** The Federal Reserve Board used to require banks to hold a minimum percentage of deposits on reserve
- Requirement was removed on March 26, 2020
- Since 2008, the Federal Reserve has paid banks interest on reserves, an additional incentive for banks to keep a fraction of deposits on reserves

Deposit Creation: Simplified Example

- 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...

Money Multiplier

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

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

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

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

- Can you simply 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).

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?

General Money Multiplier Problem

Suppose the required reserve ratio is 0%, banks hold 8% of deposits in excess reserves, and consumers hold currency balances that are about 4% of what they hold in deposits in banks. Suppose the Fed makes an open market purchase of $100 million of government bonds.

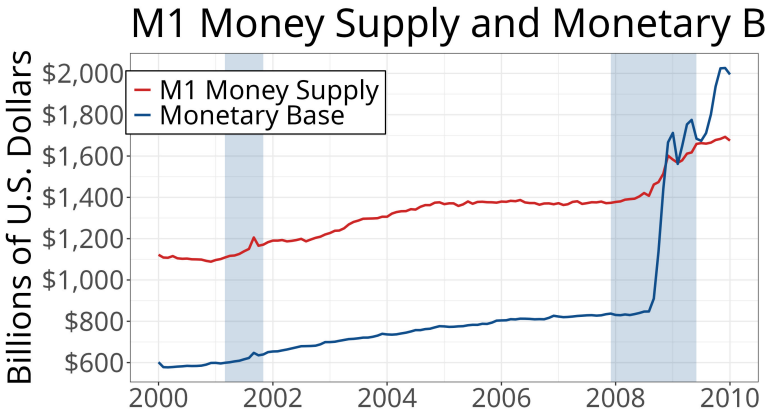
1. Compute the impact on the monetary base.
2. Compute the impact on the M1 money supply.
3. Compute the impact on the amount of deposits held in the banking sector.
4. Compute the impact on required reserves, excess reserves, and total reserves held by banks.
5. Describe and illustrate the impact on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

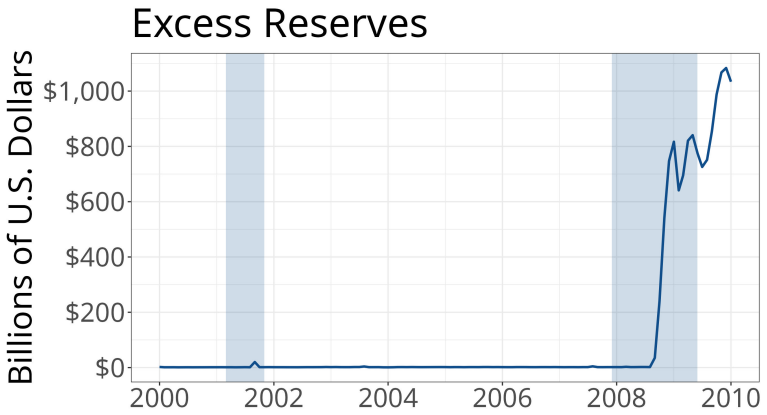
Determinants of Money Supply

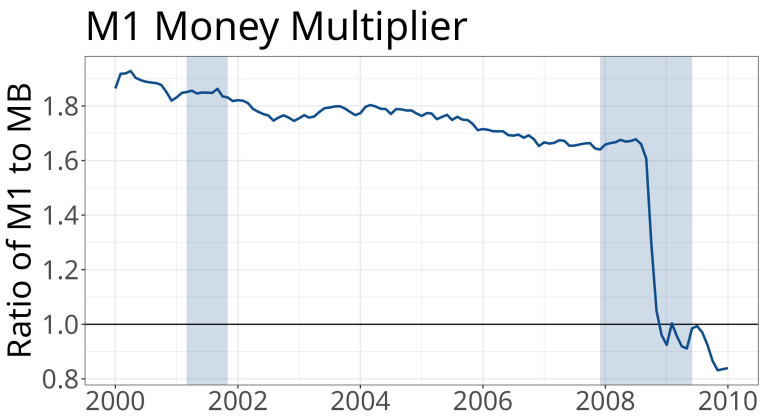
Factors affecting money supply:

- Open market operations
- Changes in required reserve ratio
- Changes in the interest rate paid on reserves
- Changes in banks desire to hold excess reserves
- Changes in consumers' desire to hold currency versus deposits
- Changes in borrowed reserves (discount loans to banks)

Monetary Policy during 2007-2009 Financial Crisis







- Huge increase in banks holdings of excess reserves
- Huge increases by Fed to monetary base to both offset impact of excess reserves, stimulate the economy

Scholar Spotlight: Elena Seghezza

Why the money multiplier has remained persistently so low in the post-crisis United States?
(with Pierluigi Morelli), *Economic Modelling*, November 2020.

Low Money Multiplier

- Money multiplier collapsed in 2008
- Remained permanently lower through 2018
- Larger excess reserves due to significantly and persistent lower demand for loans

About the Scholar

Dr. Elena Seghezza
Professor of Economics ,University of Genoa

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