Financial Institutions and System

Week 7: Central Banks, and The Money Supply Process

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April 18, 2025

Agenda

1. Central Banks
2. The Money Supply Process
3. Guest Lecture: Monetary Policy
4. Class Activity

1. Central Banks

Central Banks: An Introduction

What is a Central Bank?

- A central bank is the institution that manages a country's currency, money supply, and interest rates.
- Examples: Federal Reserve (U.S.), ECB (Eurozone), Bank of England, Bank of Korea.

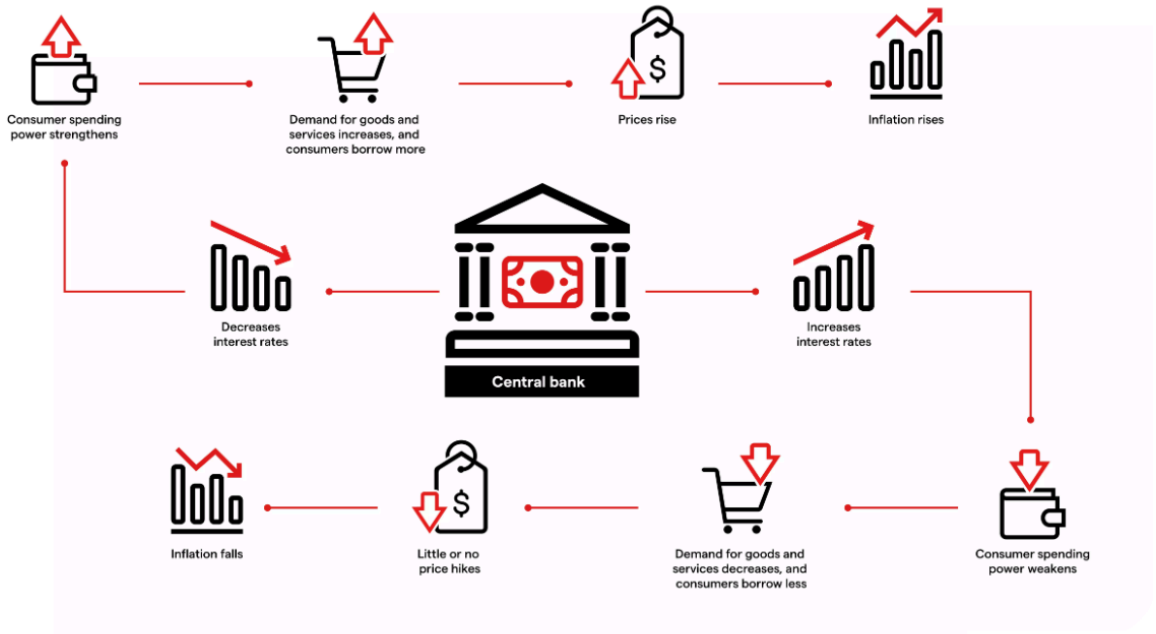
Key Functions of Central Banks

1. Monetary policy implementation
2. Currency issuance
3. Lender of last resort
4. Foreign exchange management
5. Maintaining financial stability
6. Regulation and supervision of commercial banks

Why Do We Need Central Banks?

Without a central bank:

- Who controls inflation?
- Who helps in a financial crisis?
- Who supervises commercial banks?



Source: IG.COM

Historical Perspective

Evolution of Central Banking:

- 17th century: Sweden’s Riksbank – first central bank
- 1694: Bank of England
- 20th century: Rise of modern independent central banks
- Post-2008: More focus on financial
- Post-COVID: New challenges (e.g., digital currencies)

Objectives of Central Banks

1. **Price stability** (control inflation)
2. **Full employment** (indirectly through monetary policy)
3. **Stable financial system**
4. **Stable exchange rates**

Illustration: ECB's mandate focuses almost solely on price stability, while the Fed has a dual mandate (price stability + maximum employment).

Tools of Monetary Policy

1. Open Market Operations (OMOs)
2. Policy interest rates (discount rate, repo rate)
3. Reserve requirements
4. Forward guidance

Monetary Policy in Action

When inflation is high:

- Central banks increase interest rates
- Reduce money supply
- Slow down borrowing and spending

When recession hits:

- Lower interest rates
- Inject liquidity
- Stimulate demand

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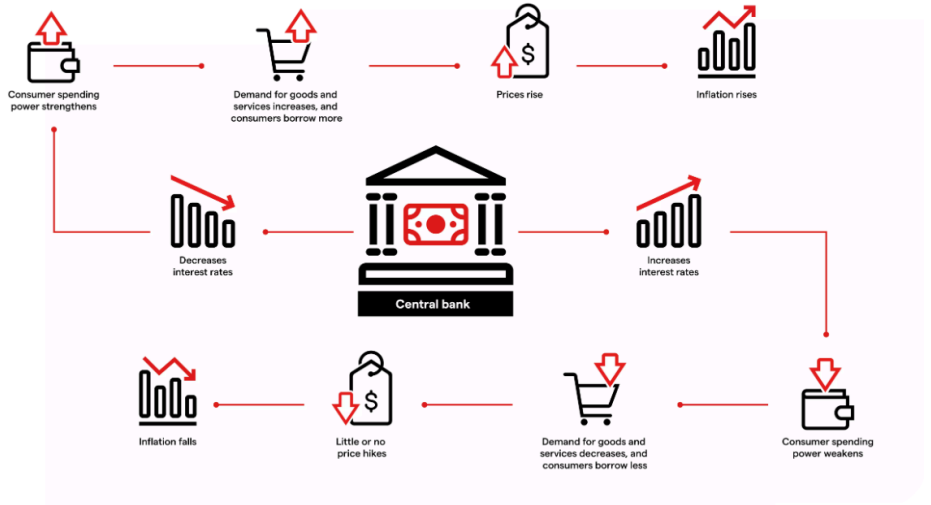

Source: IG.COM

Central Bank Independence

Why is it important?

- Insulates from political pressure
- Helps maintain credibility
- Anchors inflation expectations

Forms of independence:

- Goal independence
- Instrument independence

Example: Bundesbank was historically independent, influencing ECB's design.

Case Study: The Federal Reserve

- Dual mandate: price stability + full employment
- 12 regional banks + Board of Governors
- FOMC meets 8 times/year
- Sets the federal funds rate

Case Study: The European Central Bank

- Primary mandate: price stability
- Governing Council (ECB + 20 central banks)
- Uses OMOs, MROs, and LTROs

Illustration: ECB response during the Eurozone crisis

The Role During Crises

Global Financial Crisis 2008

- Central banks cut rates to near-zero
- Quantitative easing (QE)
- Emergency lending facilities

COVID-19

- Pandemic response: liquidity support
- Rate cuts, asset purchases
- Coordination with fiscal policy

Challenges Facing Central Banks Today

1. Persistently low interest rates
2. Financial market distortions
3. Central bank digital currencies (CBDCs)
4. Climate risk and sustainable finance
5. Political pressure

2. The Money Supply Process

Three Players in the Money Supply Process

- **The Central bank**
  - Oversees the banking system and conducts monetary policy
- **Banks (Depository Institutions)**
  - Accept deposits and make loans
- **Depositors**
  - Hold deposits in banks

Illustration: Picture of central bank, commercial bank, and depositors linked in a triangle

The Fed's Balance Sheet

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

- **Liabilities**:
  - Currency in circulation (held by public)
  - Reserves (bank deposits at the Fed + vault cash)
  - Increases in either increase money supply
  - Fed liabilities + Treasury liabilities = **Monetary base**
- **Reserves**:
  - Required and excess reserves

Fed's Assets and Impact

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

- **Assets**:
  - **Securities**: Mainly Treasury; purchases increase reserves
  - **Loans**: Discount loans to banks → increase reserves
- Importance:
  - Affects monetary base and money supply
  - Fed earns income from these assets

Control of the Monetary Base

- **Monetary base** (MB) = Currency in circulation (C) + Reserves (R)

$$\text{MB} = C + R$$

- Controlled via **open market operations**:
  - Purchases increase MB
  - Sales decrease MB

Open Market Operations

- **Open Market Purchase** = Fed buys bonds from primary dealers
- **Open Market Sale** = Fed sells bonds
- **Impact**:
  - Purchase → ↑ Reserves, ↑ MB
  - Sale → ↓ Reserves or ↓ Currency, ↓ MB

Open Market Purchase from a Bank

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

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

- Fed buys $100m in bonds from a primary dealer
- Bank reserves ↑ $100m
- MB ↑ $100m

Open Market Sale

- Fed sells $100m in bonds
- MB decreases by $100m
- **Reserves unchanged** if banks pay via reserves

Shifts from Deposits to 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

- Depositors convert deposits into currency
- Reserves ↓, Currency ↑, MB constant
- **Fed controls MB more than reserves**

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)			

- Fed lends to a bank (e.g., $100m)
- Reserves ↑, MB ↑ by same amount

Other Influences on MB

- Float
- Treasury deposits at Fed
- Foreign exchange operations

Fed Control of Monetary Base

- MB = BR (borrowed reserves) + MB_n (nonborrowed base)

$$MB = MB_n + BR$$

- MB_n: fully controlled by Fed (via open market ops)
- BR: depends on bank borrowing decisions

Multiple Deposit Creation: Basic Idea

- Fed adds $1 in reserves → multiple deposit creation
- A single bank lends excess reserves → new deposits

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

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

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

System-Wide Deposit Creation

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		

- Loans at one bank → deposits at another
- Process continues if no excess reserves held
- Deposit creation = geometric series

Total Increase in Deposits

- Reserve requirement = 10%
- Simple deposit multiplier:

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

- \$100m reserves → \$1,000m deposits

Table 1: Deposit Creation Summary

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
.	.	.	.
.	.	.	.
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Total for all banks	1,000.00 m	1,000.00 m	100.00 m

- Process stops when no more excess reserves
- Simple multiplier depends on **r**

Deposit Creation Limits

- Loans or securities purchases create same deposit expansion
- System vs individual bank:
  - System: total reserves stay in system
  - Single bank: reserves lost if loans transferred

Final Deposit Expansion Equation

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

- Equilibrium: no excess reserves remain
- Total R = Required R when deposit creation stops

Critique of Simple Model

- **Not all excess reserves are lent out**
- **Depositors may hold cash** → stops deposit expansion
- **Banks may hold excess reserves**
- Real-world multiplier < simple multiplier

Determinants of Money Supply

Factor	Effect on Money Supply
↑ Nonborrowed MB (MB_n)	↑ Money supply
↑ Borrowed reserves (BR)	↑ Money supply
↑ Required reserve ratio (r)	↓ Money supply
↑ Excess reserves	↓ Money supply
↑ Currency holdings	↓ Money supply

Money Multiplier

$$M = m \times MB$$

- M = money supply (M1)
- m = money multiplier

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

- c = currency ratio, e = excess reserve ratio, r = reserve ratio

Multiplier Intuition (Example)

- c = 0.5, e = 0.001, r = 0.1

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

- Less than 10 (simple multiplier)
- Currency doesn't multiply

Quantitative Easing (QE)

- Post-2007: Fed bought long-term securities to increase MB
- MB ↑ 350% → M1 ↑ only 100%
- Why? **Money multiplier ↓**:
  - Excess reserve ratio ↑↑↑

COVID-19 Crisis: Similar QE Patterns

- Fed again engaged in QE
- MB ↑, but M1 ↑ less due to rising excess reserves
- Interest on excess reserves incentivized banks to hold them

Figure: M1 and Monetary Base (2007–2020)

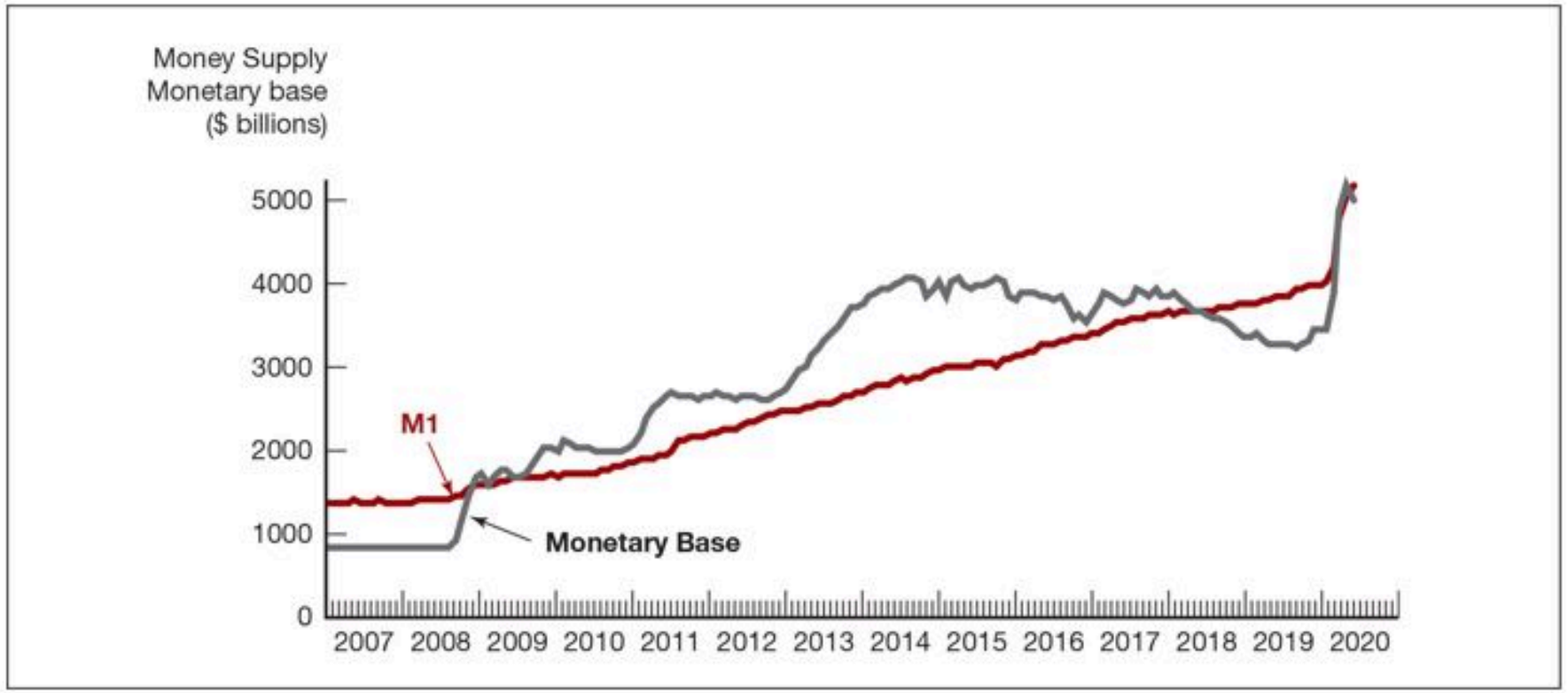
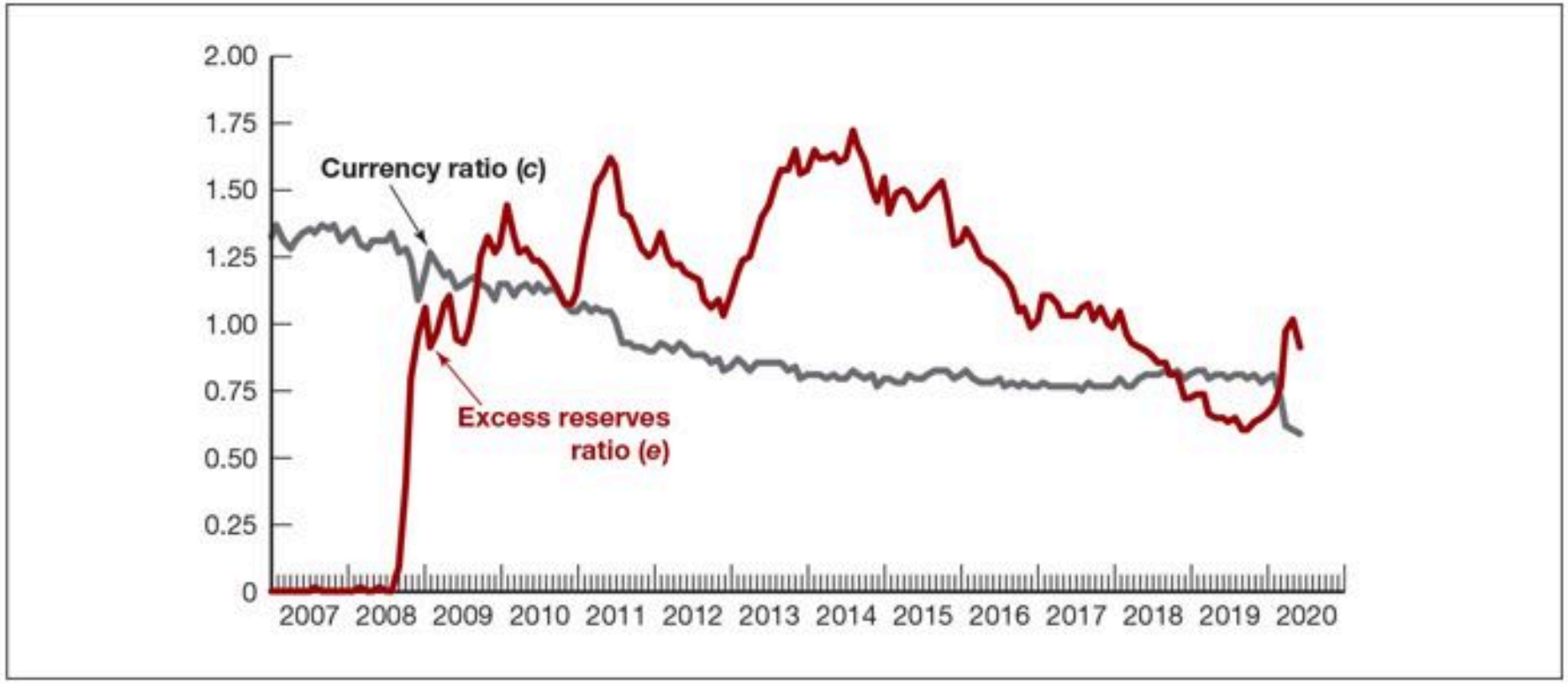


Figure: Excess Reserves & Currency Ratio (2007-2020)



Summary

- Fed controls money supply mainly via **open market ops**
- Reserves → deposit creation → **multiplied money supply**
- Final supply depends on:
  - Reserve ratio
  - Currency preferences
  - Excess reserves

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

3. Guest Lecture: Monetary Policy (10 - 11:15 am)

4. Class Activity

Class Discussion

- Discuss the role of central banks in managing inflation and employment.
- How do central banks respond to financial crises?
- Your takeaway from the guest lecture on monetary policy.
- How do you think the role of central banks will evolve in the future?

Any QUESTIONS?

Thank You!

Next Class

-(April 25) Midterm Exam (09:32-11:45)

- Please review slides for conceptual based questions.
- Please review in-class activities for practical/case based questions.