Money and Banking

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Lecture 9 The Money Supply Process

- The FED's Balance Sheet
- Control of the Monetary Base
- Multiple Deposit Creation: a Simple Model
- Factors that Determine the Money Supply
- Overview of the Money Supply Process
- The Money Multiplier

Three Players in the Money Supply Process

- Central bank

  - Government agency overseeing the bank system and responsible for monetary policy

- Banks

  - Commercial banks, savings and loan associations, mutual saving banks, and credit unions

- Depositors (individuals and institutions)

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

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

- Person selling bonds to the Fed deposits the Fed's check in the bank

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

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

  - Identical result as the purchase from a bank

- The person selling the bonds cashes the Fed's check

Nonbank Public	
Assets	Liabilities
Securities -$100m	
Currency +$100m	

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

- 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 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

Shift from Deposit 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

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

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

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	

First National Bank	
Assets	Liabilities
Securities -$100m	
Loans +$100m	

- Fed make public purchase; Excess reserves increase; Bank loans out the excess reserves; Creates a checking account; Borrower makes purchases

Multiple Deposit Creation: A Simple Model

Deposit Creation: The Banking System

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

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

Creation of Deposits (assuming 10% reserve requirement and a $100 increase in reserves)

Creation of Deposits (assuming 10% reserve requirement and a $100 million 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

- Changes in the non-borrowed 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
- 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

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.

Deriving 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
- 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

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

$$RR = r ? D$$

Subsituting for RR in the first equation

$$R = (r ? D) + ER$$

The Fed sets r to less than 1

Deriving the Money Multiplier

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

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

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

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

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

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

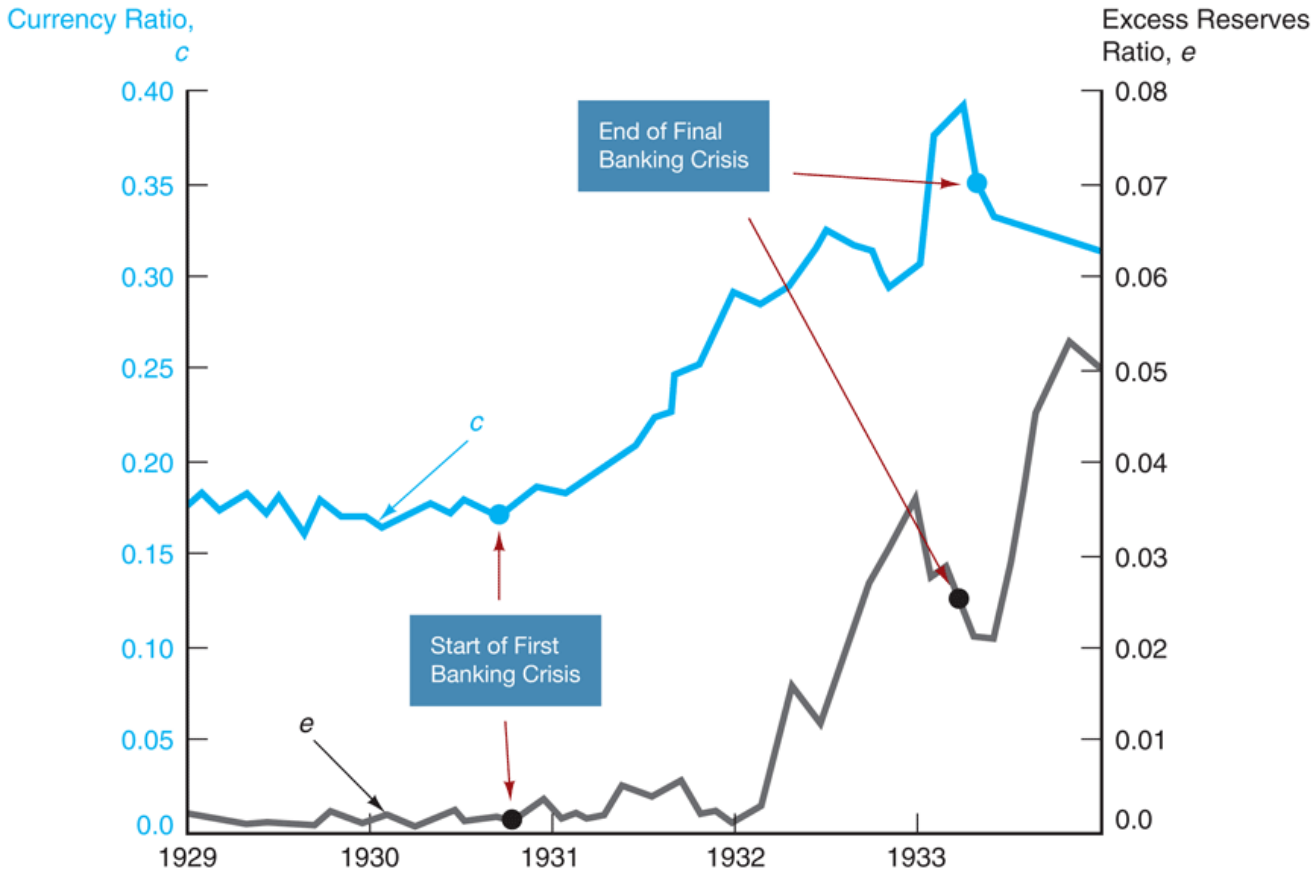
Substituting again

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

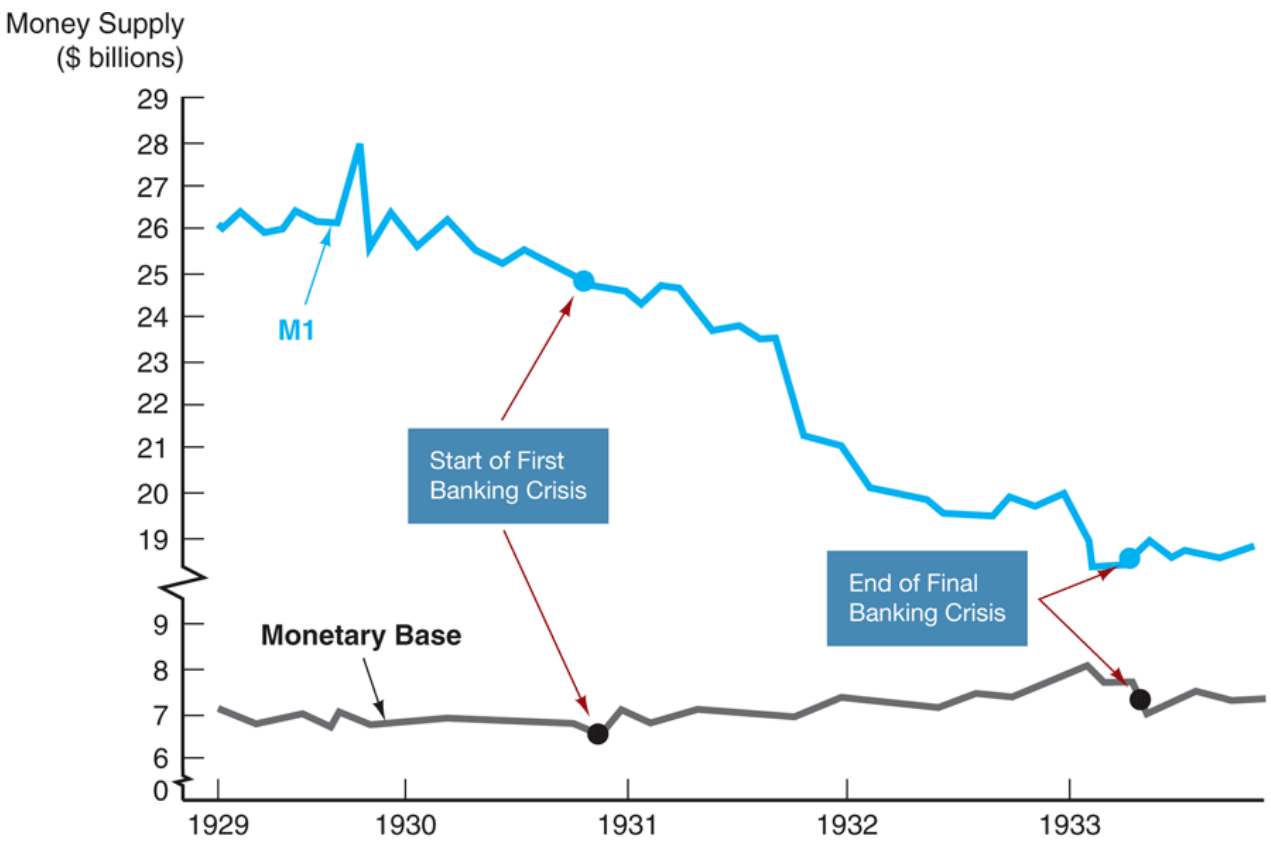
The money multiplier is then

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

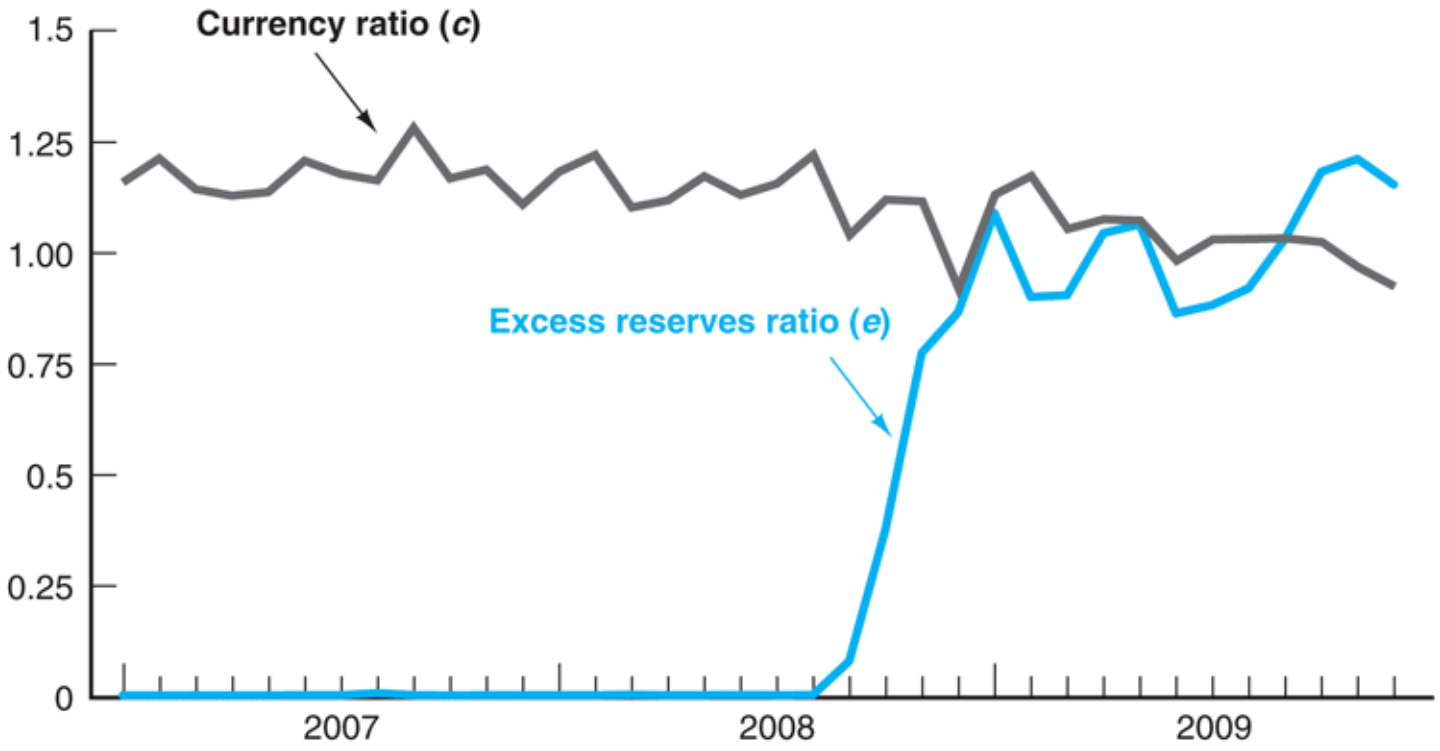
Excess Reserves Ratio and Currency Ratio, 1929–1933



M1 and the Monetary Base, 1929–1933



Excess Reserves Ratio and Currency Ratio, 2007-2009



M1 and the Monetary Base, 2007-2009