The Money Supply Process and Fed Policy
The Money Supply Model

• Define money as currency plus checkable deposits: M1
• The Fed can control the monetary base better than it can control reserves
• 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 I

Assume the desired level of currency $C$ and excess reserves $ER$ grows proportionally with checkable deposits $D$

Then

$$c = \left\{ \frac{C}{D} \right\} = \text{currency ratio}$$

$$e = \left\{ \frac{ER}{D} \right\} = \text{excess reserves ratio}$$
Deriving the Money Multiplier II

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

$$RR = r \times D$$

Substituting for $RR$ in the first equation

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

The Fed sets $r$ to less than 1
Deriving the Money Multiplier III

The monetary base $MB$ equals currency ($C$) plus reserves ($R$)

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

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

An increase in the monetary base that goes into currency is not multiplied, whereas an increase that goes into supporting deposits is multiplied.

An additional dollar of $MB$ that goes into excess reserves $ER$ does not support any additional deposits or currency.
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

\[ r = \text{required reserve ratio} = 0.10 \]
\[ C = \text{currency in circulation} = $400B \]
\[ D = \text{checkable deposits} = $800B \]
\[ ER = \text{excess reserves} = $0.8B \]
\[ M = \text{money supply (M1)} = C + D = $1,200B \]
\[ c = \frac{$400B}{$800B} = 0.5 \]
\[ e = \frac{$0.8B}{$800B} = 0.001 \]
\[ m = \frac{1+0.5}{0.1+0.001+0.5} = \frac{1.5}{0.601} = 2.5 \]

This is less than the simple deposit multiplier
Although there is multiple expansion of deposits,
there is no such expansion for currency
Factors that Determine the Money Multiplier

• Changes in the required reserve ratio $r$
  – The money multiplier and the money supply are negatively related to $r$

• Changes in the currency ratio $c$
  – The money multiplier and the money supply are negatively related to $c$

• Changes in the excess reserves ratio $e$
  – The money multiplier and the money supply are negatively related to the excess reserves ratio $e$
Factors that Determine the Money Multiplier

• The excess reserves ratio $e$ is negatively related to the market interest rate

• The excess reserves ratio $e$ is positively related to expected deposit outflows
**FIGURE 1** The Excess Reserves Ratio \( e \) and the Interest Rate (Federal Funds Rate)

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

\[ MB_n = MB - BR \Rightarrow M = m(MB_n + BR) \]

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
FIGURE 2  Money Supply (M1), 1980–2005

**Figure 3** Determinants of the Money Supply, 1980–2005

*Source: Federal Reserve; www.federalreserve.gov/releases.*
Explaining Movements in the Money Supply

• Over long periods, the primary determinant of movements in the money supply is the nonborrowed monetary base, which is controlled by the Fed’s open market operations
FIGURE 4
Deposits of Failed Commercial Banks, 1929–1933

![Graph showing deposits of failed commercial banks from 1929 to 1933 with marked points for the start of the First Banking Crisis and the end of the Final Banking Crisis.](image-url)
FIGURE 5  Excess Reserves Ratio and Currency Ratio, 1929–1933
**FIGURE 6  M1 and the Monetary Base, 1929–1933**
