PART 5 Macroeconomic Policy

5.1 Monetary Policy

5.2 Fiscal Policy
The Federal Reserve System

- Established by the Federal Reserve Act of 1913
- **Lender of Last Resort** in Financial Crises
- Entities
  - Federal Reserve Banks (12)
  - Board of Governors of the Federal Reserve System
  - Federal Open Market Committee
  - Federal Advisory Council
  - 2800 Member Banks
- Aimed at diffusing power, providing checks and balances.
Board of Governors of the Federal Reserve System

Leadership is provided by the Board of Governors:

- Seven members headquartered in Washington, D.C.
- Appointed by the president and confirmed by the Senate
  14-year non-renewable term (plus part of another term)
- Required to come from different districts
- Chairman is chosen from the governors and serves four-year term
Regional Federal Reserve Banks

†Hawaii and Alaska are included in the San Francisco district.
Federal Open Market Committee (FOMC)

1. Meets eight times a year (every 6 weeks)
2. Consists of seven members of the Board of Governors, the president of the Federal Reserve Bank of New York and the presidents of four other Federal Reserve banks
3. Chairman of the Board of Governors is also chair of FOMC
4. Issues directives to the trading desk at the Federal Reserve Bank of New York
Principles of Money Supply Determination

- Earlier we learned that by shifts the supply of money leads to changes in interest rates.
- What determines the money supply process?

**FIGURE 10** Response to a Change in the Money Supply
Players in the Money Supply Process

1. Central bank (Federal Reserve System)
2. Banks (depository institutions; financial intermediaries)
3. Depositors (individuals and institutions)
4. Borrowers (individuals and institutions)

The Fed’s conventional tools:

1. reserve requirements
2. open market operations
3. discount loans

influences the other players’ actions leading to changes in the monetary aggregates.
Fed’s Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Securities</td>
<td>Currency in Circulation</td>
</tr>
<tr>
<td>Discount Loans</td>
<td>Reserves</td>
</tr>
</tbody>
</table>

**Monetary Liabilities**
1. Currency in circulation: in the hands of the public
2. Reserves: bank deposits at the Fed and vault cash

**Assets**
1. Government securities: holdings by the Fed that affect money supply and earn interest
2. Discount loans: provide reserves to banks and earn the discount rate
Monetary Base

The Fed controls the Monetary Base (aka high-powered money):

\[ MB = C + R \]

*C*: Currency in circulation
*R*: Total reserves in the banking system

(also includes monetary liabilities of the US treasury, but these are small)

The Fed has more control over the monetary base than over reserves:

1. Open market operations
2. Discount loans
## Open Market Purchase from a Bank

<table>
<thead>
<tr>
<th>Banking System</th>
<th>Federal Reserve System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Securities −$100</td>
<td>Securities +$100</td>
</tr>
<tr>
<td>Reserves +$100</td>
<td>Reserves +$100</td>
</tr>
</tbody>
</table>

- Net result is that reserves have increased by $100
- No change in currency
- Monetary base and reserves have risen by $100
## Open Market Sale to Bank

<table>
<thead>
<tr>
<th></th>
<th>Banking System</th>
<th>Federal Reserve System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Securities +$100</td>
<td>Securities −$100</td>
</tr>
<tr>
<td>Liabilities</td>
<td>Reserves −$100</td>
<td>Reserves −$100</td>
</tr>
</tbody>
</table>

- Reserves are reduced by the amount of the sale
- Reduces the monetary base by the amount of the sale
### Random Shifts from Deposits into Currency

<table>
<thead>
<tr>
<th>Nonbank Public</th>
<th>Banking System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Assets</td>
</tr>
<tr>
<td>Liabilities</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Deposits −$100</td>
<td>Reserves −$100</td>
</tr>
<tr>
<td>Currency +$100</td>
<td>Deposits −$100</td>
</tr>
</tbody>
</table>

#### Federal Reserve System

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency in Circulation +$100</td>
<td></td>
</tr>
<tr>
<td>Reserves −$100</td>
<td></td>
</tr>
</tbody>
</table>

Net effect on monetary liabilities is zero. Reserves are changed by random fluctuations. The Fed has more control over the monetary base than over reserves.
## Discount Loans to Banks

<table>
<thead>
<tr>
<th>Banking System</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Reserves</td>
<td>+$100</td>
<td>Discount Loans</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Federal Reserve System</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Discount Loans</td>
<td>+$100</td>
<td>Reserves</td>
</tr>
</tbody>
</table>

- Monetary liabilities of the Fed have increased by $100
- Monetary base also increases by this amount
Paying off a Discount Loan to a Bank

**Banking System**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves −$100</td>
<td>Discount Loans −$100</td>
</tr>
</tbody>
</table>

**Federal Reserve System**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount Loans −$100</td>
<td>Reserves −$100</td>
</tr>
</tbody>
</table>

- Net effect on Monetary base is a reduction
- Monetary base changes one-for-one with a change in the borrowings from the Federal Reserve System
Money Supply Model I

How does the Fed control $M^s$?

- Fed controls the **monetary base**: 
  $$MB = \text{Currency } C + \text{Reserves } R$$

- **Fractional Reserve System**: 
  $$R = \rho \times \text{Deposits } D$$
  where $0 < \rho < 1$ is the legally required **reserve ratio**

- Assume households hold currency $C = cD$ where $0 < c < 1$ is the **currency ratio**

  $$M^s = D + C = (1 + c)D = \frac{1 + c}{\rho} R$$

  $$= \frac{1 + c}{c + \rho} MB$$

  $\frac{1+c}{\rho+c} > 1$ is the **money multiplier**.
Money Supply Model II

Banks in practice hold reserves in excess of the minimum requirement.

\[ TR = RR + ER \]

TR: total reserves
RR: required reserves
ER: excess reserves

\[ MB = RR + ER + C = (\rho + e + c) \times D \]

where \( e = \frac{ER}{D} \) is the excess reserve ratio.
\[ M^s = D + C \]
\[ = (1 + c)D \]
\[ = \frac{1 + c}{c + \rho + e} MB \]

\[ \frac{1+c}{\rho+c+e} \] is the **money multiplier**.

The money multiplier is decreasing in \( \rho \), \( c \) and \( e \).
The excess reserves ratio \( e \) is *negatively* related to *the market interest rate* \( R \)
i.e. \( R \uparrow \rightarrow e \downarrow \rightarrow \text{money multiplier} \uparrow \)

Reserves do not pay any interest, so \( R \) is the opportunity cost of holding reserves.

The excess reserves ratio \( e \) is *positively* related to *expected deposit outflows*
i.e. \( D \text{ outflows} \uparrow \rightarrow e \uparrow \rightarrow \text{money multiplier} \downarrow \)

Reserves provide insurance against losses due to deposit outflows.
The Great Depression
The Great Depression

(a) The monetary base and the money multiplier in the Great Depression
The Great Depression

(b) The money supply in the Great Depression
2008 Financial Crisis
2008 Financial Crisis

Source: Federal Reserve Bank of St. Louis
Shaded areas indicate US recessions - 2015 research.stlouisfed.org
2008 Financial Crisis

(a) The money multiplier and the monetary base, 2007–2012
2008 Financial Crisis

(b) The money supply, 2007–2012
Open market operations are controlled by the Fed
The Fed cannot determine the amount of borrowing by banks from the Fed at the discount window
Split the monetary base into two components:

$$MB = NBR + BR \Rightarrow M = m(NBR + BR)$$

The money supply is positively related to both the non-borrowed reserves $NBR$ and to the level of borrowed reserves, $BR$, from the Fed
Discount Loans to Banks

<table>
<thead>
<tr>
<th>Banking System</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Reserves +$100</td>
<td>Discount Loans +$100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Federal Reserve System</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Discount Loans +$100</td>
<td>Reserves +$100</td>
</tr>
</tbody>
</table>

- Monetary liabilities of the Fed have increased by $100
- Monetary base also increases by this amount
Paying off a Discount Loan to a Bank

<table>
<thead>
<tr>
<th>Banking System</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Reserves −$100</td>
<td>Discount Loans −$100</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Federal Reserve System</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
<td></td>
</tr>
<tr>
<td>Discount Loans −$100</td>
<td>Reserves −$100</td>
<td></td>
</tr>
</tbody>
</table>

- Net effect on Monetary base is a reduction
- Monetary base changes one-for-one with a change in the borrowings from the Federal Reserve System
The Fed directly controls the non-borrowed monetary base $NBR$ through open market operations.

The Fed sets the discount rate to affect non-borrowed reserves, but does not directly control the amount of $BR$.

In practice, the Fed generally sets the discount rate above market interest rates such that $BR$ is very small.

$$M = m(NBR + BR)$$
Total Borrowings of Depository Institutions from the Federal Reserve (TOTBORR)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate recessions as determined by the NBER.
2007 Federal Reserve Bank of St. Louis: research.stlouisfed.org
Total Borrowings of Depository Institutions from the Federal Reserve (TOTBORG)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate US recessions.
2009 research.stlouisfed.org
Summary: Traditional Tools of Monetary Policy

1. Open market operations
   → Affect the quantity of reserves and the monetary base

2. Changes in borrowed reserves (discount lending)
   → Affect the monetary base

3. Changes in reserve requirements
   → Affect the money multiplier

In recent years, the focus is increasingly on the Federal Funds rate, i.e. the interest rate on overnight loans of reserves from one bank to another
Market for Reserves

Demand for Reserves:
- Two components: required and excess reserves
  \[ TR^d = RR + ER \]
- The price is the interest rate that could have been earned, i.e. the funds rate \( i_{ff} \)
- As \( i_{ff} \downarrow \), the opportunity cost falls and \( ER \uparrow \rightarrow TR^d \uparrow \rightarrow \) Downward sloping demand curve

Supply of Reserves
- Two components: non-borrowed and borrowed reserves
  \[ TR^s = NBR + BR \]
- Cost of borrowing from the Fed is the discount rate \( i_d \).
- If \( i_{ff} < i_d \), banks will not borrow and supply curve is vertical
- If \( i_{ff} > i_d \), banks can borrow at \( i_d \), and re-lend at \( i_{ff} \), the supply curve is horizontal (perfectly elastic) at \( i_d \).
Figure 1: Equilibrium in the Market for Reserves
FIGURE 2  Response to an Open Market Operation
**Figure 5** How the Primary Credit Facility Puts a Ceiling on the Federal Funds Rate
In 2008, the Federal Reserve Board announced that it would begin paying interest on depository institutions’ reserve balances.

Interest on reserves
- provides a floor on the federal funds rate
- allows better control of excess reserves when it begins to remove monetary policy stimulus in the future