Monetary Policy
Module Objectives

• Define the major monetary aggregates
• Understand the money multiplier
• Know how the Federal Reserve controls the money supply
• Know how a one-time, unanticipated increase in the money supply affects interest rates, output, and employment
• Know how an unanticipated increase in the money growth rate affects interest rates, output, and employment
Monetary Aggregates

- Currency (C)
- Monetary Base (High-Powered Money)
  \[ C + \text{bank reserves} \]
- M1
  \[ C + \text{checkable deposits} \]
- M2
  \[ \text{M1} + \text{some other deposits} \]
- M3, etc.

Fiat money is declared legal tender
- currency and coin
- this is only a small fraction of the most commonly reported monetary aggregates
Functions of Banks

• Intermediation
  – matching borrowers and lenders
  – pooling of risks
  – evaluation of borrowers

• Money Creation
  – formerly unique to banks

Part of the matching of borrowers and lenders involves intermediation across maturities of assets and liabilities

• loans (bank assets) are generally of longer maturity than deposits (bank liabilities)
• by issuing deposits in the process of extending credit, banks create money
Fractional Reserve Banking

• Banks hold reserves equal to a fraction of deposit liabilities
  • reserve deposits at the Federal Reserve
  • vault cash
• Money multiplier
  • \( m = \frac{M}{H} \)
  • \( m = \frac{(1 + c)}{(c + rr)} \)

Banks would hold some reserves even if not required to.
## Commercial Bank Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>Deposits</td>
</tr>
<tr>
<td>Required</td>
<td>Demand Deposits</td>
</tr>
<tr>
<td>Excess</td>
<td>Other Deposits</td>
</tr>
<tr>
<td>Earning Assets</td>
<td>Net Worth</td>
</tr>
<tr>
<td>Loans</td>
<td></td>
</tr>
<tr>
<td>Securities</td>
<td></td>
</tr>
<tr>
<td>Buildings, etc.</td>
<td></td>
</tr>
</tbody>
</table>

Money multiplier with currency and deposits.

How would previous example be affected if people held some money in cash?
- credit expansion would be smaller at each stage

Algebraically

\[
M = D + C \\
H = C + R \\
R = \text{rr}*D \\
C = \text{c}*D \\
M = D + \text{c}*D = (1 + \text{c})D \\
H = \text{c}*D + \text{rr}*D = (\text{c} + \text{rr})D \\
\]

\[
m = \frac{M}{H} = \frac{(1 + \text{c})}{(\text{c} + \text{rr})} \\
\]

in the previous example, \( c = 0, \text{ rr} = 0.2, \) and \( m = 5 \)

if \( c = 0.2, \text{ rr} = 0.2, \) then \( m = 3 \)
Federal Reserve System

• Organization
  – Board of Governors (7 members)
  – 12 regional banks
  – FOMC (12 voting members)

• Policy tools
  – open market operations
  – discount rate
  – reserve requirements

Historical origins -- imagine a world of commercial banks with no Fed.

What would happen if people lost confidence in a bank?
• a bank run might result
• because most bank assets a less liquid than deposit liabilities, even a solvent bank could fail to meet promises to depositors
• repeated banking panics of late 1800s and early 1900s

Federal Reserve Act of 1913: purpose of Fed was
• to act as lender of last resort
• to regulate the supply of money and credit
• to provide an “elastic supply of credit”

The Fed controls H primarily through open market operations.

How successful has the Fed been?
### Federal Reserve Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>High-Powered Money</td>
</tr>
<tr>
<td>Gold</td>
<td>Bank Reserves</td>
</tr>
<tr>
<td>Foreign Exchange</td>
<td>Currency</td>
</tr>
<tr>
<td>SDRs, etc.</td>
<td></td>
</tr>
<tr>
<td>Earning Assets</td>
<td></td>
</tr>
<tr>
<td>Government Debt</td>
<td>Net Worth</td>
</tr>
</tbody>
</table>
Currency-Deposit Ratio

(c) Copyright 1998 by Douglas H. Joines
Critics blame the Fed for the collapse of the money supply during the Great Depression.

Others say the Fed could have done little more than it did, given the legal restrictions such as gold reserve requirements.

This still does not explain the increase in reserve requirements in the mid-1930s.

No comparable disasters since World War II.
Friedman Question

• $MV = PY$
• When $M$ changes, how is $\Delta(PY)$ split between $\Delta P$ and $\Delta Y$?
• Long run
  – classical dichotomy
  – $Y$ unaffected by $M$
• Short run
  – stylized facts indicate money is not neutral
This and the following two graphs appear to show a relation between the real supply of M2 and industrial production.
Year-to-Year Growth Rates

![Graph showing Year-to-Year Growth Rates for M2 and Industrial Production]

(c) Copyright 1998 by Douglas H. Joines
Time aggeration makes the relation between real M2 and industrial production clearer and also makes clear the fact that turning points in M2 generally precede those in industrial production by several months. The relation appears weaker during the 1990s.
Why Non-neutrality?

• Price Stickiness
• Disequilibrium models
  – markets do not clear
  – people may be irrational
• Equilibrium models
  – markets clear
  – people are rational
  – markets are complicated by features such as imperfect information
Transmission Mechanism

- One-shot increase in $M$
- Assume $P$ and $Y$ sticky
- Interest rate channel:
  \[ \uparrow M \Rightarrow \uparrow \left(\frac{M}{P}\right), \downarrow V \]
  \[ \Rightarrow \downarrow i, \quad i = r + \pi \]
  \[ \Rightarrow \downarrow r, \]
  \[ \Rightarrow \uparrow C^d, \uparrow I^d \]
- The rise in $C^d, I^d$ may be reinforced as people try to get rid of excess $M/P$

The demand for real money balances ($M/P$) is negatively related to the nominal rate of interest.

An increase in the supply of money requires a decline in the nominal interest rate to clear the money market.

In this situation, a decline in the nominal interest rate almost certainly implies a decline in the real interest rate.

A lower real interest rate stimulates consumption and investment demand.

This increase in aggregate demand leads to an increase in output and a reduction in unemployment.
Imperfect Information Models

- Mankiw text describes several different models
- *Economist* Schools Briefs also contain summaries
- Different variants depend on temporary confusion of workers or firms about inflation vs. relative price changes
As time passes after the Federal Reserve has increased the money supply, prices begin to rise. Thus, for a time, we observe higher inflation and lower unemployment following an increase in the money supply.

This negative relation between the inflation and unemployment rates is known as the Phillips Curve.
Eventual Response

• Prices can eventually change.
• This eventually restores variables to their original levels:
  – real money balances $M/P$
  – real and nominal interest rates
  – consumption and investment demand
  – output
• In imperfect information models, people eventually learn

Once prices have risen in the same proportion as the money supply, real money balances are back to their original level. This implies that interest rates, aggregate demand, output, and employment return to their original levels.

The one-time increase in the money supply raises output and lowers unemployment only temporarily. It temporarily raises the inflation rate while prices are adjusting to their new, higher levels.
Repeated Increases in Money

• Why not repeatedly increase $M$?
  – permanently increase $\pi$
  – permanently reduce $u$?

• People learn that $\pi$ has increased
  – no long-run increase in $M/P$
  – no permanent reduction in interest rates
  – no increase in aggregate demand

• Short-run Phillips Curve shifts up

• Long-run Phillips Curve is vertical

If there is a permanent increase in money growth and inflation, people come to expect the higher inflation.

Nominal interest rates rise to offset higher expected inflation, leaving real interest rates unchanged.

Without lower real interest rates, aggregate demand returns to its original level.

Output and unemployment return to their original levels.

The long-run consequence is higher inflation without lower unemployment.

Graphically, the short-run Phillips Curve shifts upward.

The long-run Phillips Curve is vertical, meaning there is no long-run tradeoff between inflation and unemployment.
Connecting these points reveals shifts in the short-run Phillips Curve.

Also, international evidence reveals that high-inflation countries (primarily in Latin America) have very steep short-run Phillips Curves.

A vertical long-run Phillips Curve means that the government cannot permanently hold unemployment below its natural rate through inflationary monetary policy. This ultimately just results in higher inflation.

A steep short-run Phillips Curve means that monetary policy cannot even have much short-run effect on unemployment.

Alternatively stated, only unexpected inflation affects real interest rates, output, and employment. The effect of sustained inflation wears off because the inflation cannot remain unexpected forever. Shifts in inflationary expectations cause shifts in the short-run Phillips Curve.