**Policy Goals in the Short Run: Applying the IS-LM Model**

**Topics to cover…**
- how to use the IS-LM model to analyze the effects of shocks, fiscal policy, and monetary policy
- how to derive the aggregate demand curve from the IS-LM model
- several theories about what caused the Great Depression

**Equilibrium in the IS-LM model**

The IS curve represents equilibrium in the goods market.

\[ Y = C(Y - T) + I(r) + G \]

The LM curve represents money market equilibrium.

\[ M/P = L(r, Y) \]

The intersection determines the unique combination of \( Y \) and \( r \) that satisfies equilibrium in both markets.

**Policy analysis with the IS-LM model**

\[ Y = C(Y - T) + I(r) + G \]

\[ M/P = L(r, Y) \]

We can use the IS-LM model to analyze the effects of:
- fiscal policy: \( G \) and/or \( T \)
- monetary policy: \( M \)

**Crowding Out**

- Why is expansionary fiscal policy less effective in the IS-LM framework, than it was when we focused on IS alone?
- A fiscal expansion causes the interest rate to rise which, in turn, crowds out investment, leading to a smaller final influence on \( Y \).
- The strength of the dampening effect on fiscal policy depends on the slope of the LM curve.
  - If money demand is very sensitive to income, the LM curve will be steep (because a large increase in \( r \) will be needed in order to equilibrate the money market) and a change in fiscal policy will have a small effect on output.
A (lump-sum) tax cut

Consumers save \((1-MPC)\) of the tax cut, so the initial boost in spending is smaller for \(\Delta T\) than for an equal \(\Delta G\) and the IS curve shifts by

\[ \frac{\text{MPC}}{1-\text{MPC}} \Delta T \]

...so the effects on \(r\) and \(Y\) are smaller for \(\Delta T\) than for an equal \(\Delta G\).

Monetary policy: An increase in \(M\)

1. \(\Delta M > 0\) shifts the \(LM\) curve down (or to the right)
2. ...causing the interest rate to fall
3. ...which increases investment, causing output & income to rise.

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How responsive is \(Y\) to monetary policy?

- This will depend on both the investment demand responsiveness to the interest rate, and the money demand responsiveness to the interest rate and income.
- If investment demand is very responsive to the interest rate, then the IS curve will be very flat (since a given interest rate change will correspond to a big investment change and therefore a big planned expenditure change), and any shift in \(LM\) will have a large effect on \(Y\).

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How responsive is \(Y\) to monetary policy? (cont.)

- One the money market side, the response of income to a change in monetary policy will depend on the responsiveness of money demand to both the interest rate and income.
- If money demand is very responsive to the interest rate, then a given increase in the money supply will require only a small change in the interest rate to bring the money market back into equilibrium.
- This small change in the interest rate means that the \(LM\) curve will shift down only a little, and the corresponding increase in output will be small.

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Interaction between monetary & fiscal policy

- Model: Monetary & fiscal policy variables (\(M\), \(G\), and \(T\)) are exogenous.
- Real world: Monetary policymakers may adjust \(M\) in response to changes in fiscal policy, or vice versa.
- Such interaction may alter the impact of the original policy change.
The Fed's response to $\Delta G > 0$

- Suppose Congress increases $G$.
- Possible Fed responses:
  1. hold $M$ constant
  2. hold $r$ constant
  3. hold $Y$ constant
- In each case, the effects of the $\Delta G$ are different:

Response 1: Hold $M$ constant

If Congress raises $G$, the IS curve shifts right.

If Fed holds $M$ constant, then $LM$ curve doesn’t shift.

Results:

$$\Delta Y = Y_2 - Y_1$$
$$\Delta r = r_2 - r_1$$

Response 2: Hold $r$ constant

If Congress raises $G$, the IS curve shifts right.

To keep $r$ constant, Fed increases $M$ to shift LM curve right.

Results:

$$\Delta Y = Y_3 - Y_1$$
$$\Delta r = 0$$

Response 3: Hold $Y$ constant

If Congress raises $G$, the IS curve shifts right.

To keep $Y$ constant, Fed reduces $M$ to shift LM curve left.

Results:

$$\Delta Y = 0$$
$$\Delta r = r_3 - r_1$$

Estimates of fiscal policy multipliers

from the DRI macroeconomic model

<table>
<thead>
<tr>
<th>Assumption about monetary policy</th>
<th>Estimated value of $\Delta Y/\Delta G$</th>
<th>Estimated value of $\Delta Y/\Delta T$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fed holds money supply constant</td>
<td>0.60</td>
<td>-0.26</td>
</tr>
<tr>
<td>Fed holds nominal interest rate constant</td>
<td>1.93</td>
<td>-1.19</td>
</tr>
</tbody>
</table>

Shocks in the IS-LM model

**IS shocks**: exogenous changes in the demand for goods & services.

Examples:

- stock market boom or crash
  $$\Rightarrow$$ change in households’ wealth
  $$\Rightarrow$$ $\Delta C$
- change in business or consumer confidence or expectations
  $$\Rightarrow$$ $\Delta I$ and/or $\Delta C$
Shocks in the IS-LM model

**LM shocks:** exogenous changes in the demand for money.

Examples:
- A wave of credit card fraud increases demand for money.
- More ATMs or the Internet reduce money demand.

EXERCISE:
Analyze shocks with the IS-LM model

Use the IS-LM model to analyze the effects of
1. A boom in the stock market that makes consumers wealthier.
2. After a wave of credit card fraud, consumers using cash more frequently in transactions.

For each shock,
- Use the IS-LM diagram to show the effects of the shock on \( Y \) and \( r \).
- Determine what happens to \( C, I, \) and the unemployment rate.

Effects of a Stock Market boom

- The IS curve shifts to the right, because consumers feel they can afford to spend more given this exogenous increase in their wealth. This causes \( Y \) and \( r \) to rise.
- \( C \) rises for two reasons: the stock market boom, and the increase in income. \( I \) falls, because \( r \) is higher. \( u \) falls, because firms hire more workers to produce the extra output that is demanded.

Consumers use more cash

- The increase in money demand shifts the LM curve to the left. We are assuming that all other exogenous variables, including \( M \) and \( P \), remain unchanged, so an increase in money demand causes an increase in the value of \( r \) associated with each value of \( Y \) (this can be seen using the Liquidity Preference diagram).
- This translates to an upward (i.e. leftward) shift in the LM curve. This shift causes \( Y \) to fall and \( r \) to rise.
- The fall in income causes a fall in \( C \). The increase in \( r \) causes a fall in \( I \). The fall in \( Y \) causes an increase in \( u \).

CASE STUDY:
The U.S. recession of 2001

- During 2001,
  - 2.1 million people lost their jobs, as unemployment rose from 3.9% to 5.8%.
  - GDP growth slowed to 0.8% (compared to 3.9% average annual growth during 1994-2000).

CASE STUDY:
The U.S. recession of 2001

- Causes: 1) Stock market decline \( \Rightarrow \downarrow C \)
CASE STUDY: The U.S. recession of 2001

- Causes: 2) 9/11
  - increased uncertainty
  - fall in consumer & business confidence
  - result: lower spending, IS curve shifted left
- Causes: 3) Corporate accounting scandals
  - Enron, WorldCom, etc.
  - reduced stock prices, discouraged investment

Fiscal policy response: shifted IS curve right
- tax cuts in 2001 and 2003
- spending increases
  - airline industry bailout
  - NYC reconstruction
  - Afghanistan war

Monetary policy response: shifted LM curve right

What is the Fed’s policy instrument?
- The news media commonly report the Fed’s policy changes as interest rate changes, as if the Fed has direct control over market interest rates.
- In fact, the Fed targets the federal funds rate – the interest rate banks charge one another on overnight loans.
- The Fed changes the money supply and shifts the LM curve to achieve its target.
- Other short-term rates typically move with the federal funds rate.

IS-LM and aggregate demand
- So far, we’ve been using the IS-LM model to analyze the short run, when the price level is assumed fixed.
- However, a change in \( P \) would shift \( LM \) and therefore affect \( Y \).
- The aggregate demand curve captures this relationship between \( P \) and \( Y \).
Deriving the AD curve

Intuition for slope of AD curve:

\( \uparrow P \Rightarrow \downarrow (M/P) \Rightarrow LM \) shifts left

\( \Rightarrow \uparrow r \Rightarrow \downarrow I \Rightarrow \downarrow Y \)

Fiscal policy and the AD curve

Expansionary fiscal policy (\( \uparrow G \) and/or \( \downarrow T \)) increases aggregate demand:

\( \downarrow T \Rightarrow \uparrow C \Rightarrow \uparrow Y \) at each value of \( P \)

IS-LM and AD-AS in the short run & long run

Recall: The force that moves the economy from the short run to the long run is the gradual adjustment of prices.

<table>
<thead>
<tr>
<th>In the short-run equilibrium, if</th>
<th>then over time, the price level will</th>
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<tbody>
<tr>
<td>( Y &gt; \bar{Y} )</td>
<td>rise</td>
</tr>
<tr>
<td>( Y &lt; \bar{Y} )</td>
<td>fall</td>
</tr>
<tr>
<td>( Y = \bar{Y} )</td>
<td>remain constant</td>
</tr>
</tbody>
</table>

The SR and LR effects of an IS shock

A negative IS shock shifts IS and AD left, causing \( Y \) to fall.

The SR and LR effects of an IS shock

In the new short-run equilibrium, \( Y < \bar{Y} \)
The SR and LR effects of an IS shock

*In the new short-run equilibrium, $Y < \bar{Y}$*

Over time, $P$ gradually falls, which causes:
- SRAS to move down.
- $M/P$ to increase, which causes $LM$ to move down.

The Great Depression

- Unemployment (right scale)
- Real GNP (left scale)

The SR and LR effects of an IS shock

This process continues until economy reaches a long-run equilibrium with $Y = \bar{Y}$

THE SPENDING HYPOTHESIS:

**Shocks to the IS curve**

- asserts that the Depression was largely due to an exogenous fall in the demand for goods & services – a leftward shift of the IS curve.
- evidence:
  - output and interest rates both fell, which is what a leftward IS shift would cause.

THE SPENDING HYPOTHESIS:

**Reasons for the IS shift**

- Stock market crash ⇒ exogenous $\downarrow C$
  - Oct-Dec 1929: S&P 500 fell 17%
  - Oct 1929-Dec 1933: S&P 500 fell 71%
- Drop in investment
  - "correction" after overbuilding in the 1920s
  - widespread bank failures made it harder to obtain financing for investment
- Contractionary fiscal policy
  - Politicians raised tax rates and cut spending to combat increasing deficits.
THE MONEY HYPOTHESIS: A shock to the $LM$ curve

- asserts that the Depression was largely due to huge fall in the money supply.
- evidence: $M_1$ fell 25% during 1929-33.
- But, two problems with this hypothesis:
  - $P$ fell even more, so $M/P$ actually rose slightly during 1929-31.
  - nominal interest rates fell, which is the opposite of what a leftward $LM$ shift would cause.

THE MONEY HYPOTHESIS AGAIN: The effects of falling prices

- asserts that the severity of the Depression was due to a huge deflation: $P$ fell 25% during 1929-33.
- This deflation was probably caused by the fall in $M$, so perhaps money played an important role after all.
- In what ways does a deflation affect the economy?

THE MONEY HYPOTHESIS AGAIN: The effects of falling prices

- The stabilizing effects of deflation:
  - $P \downarrow \Rightarrow (M/P) \uparrow \Rightarrow LM$ shifts right $\Rightarrow Y$}
- **Pigou effect:**
  - $P \downarrow \Rightarrow (M/P) \uparrow$
  - $\Rightarrow$ consumers’ wealth $\uparrow$
  - $\Rightarrow C$
  - $\Rightarrow IS$ shifts right
  - $\Rightarrow Y$

Why another Depression is unlikely

- Policymakers (or their advisors) now know much more about macroeconomics:
  - The Fed knows better than to let $M$ fall so much, especially during a contraction.
  - Fiscal policymakers know better than to raise taxes or cut spending during a contraction.
  - Federal deposit insurance makes widespread bank failures very unlikely.
  - Automatic stabilizers make fiscal policy expansionary during an economic downturn.