Chapter 11: Aggregate Demand II, Applying the IS-LM Model

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.

\[ \text{MP} - L(r, Y) \]

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

Policy analysis with the IS-LM model

\[ Y = C(Y - T) + I(r) + G \quad \text{LM} \]

\[ \text{MP} - L(r, Y) \]

We can use the IS-LM model to analyze the effects of

- fiscal policy: \( G \) and/or \( T \)
- monetary policy: \( M \)

An increase in government purchases

1. IS curve shifts right by \( \frac{1}{1 - \text{MPC}} \Delta G \), causing output & income to rise.
2. This raises money demand, causing the interest rate to rise...
3. …which reduces investment, so the final increase in \( Y \) is smaller than \( \frac{1}{1 - \text{MPC}} \Delta G \).

A tax cut

Consumers save \((1 - \text{MPC})\) of the tax cut, so the initial boost in spending is smaller for \( \Delta T \) than for an equal \( \Delta G \)...

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

…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.
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 macroeconometric 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>
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</tbody>
</table>
**Shocks in the IS-LM model**

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

Examples:
- stock market boom or crash $\Rightarrow \Delta C$
- change in business or consumer confidence or expectations $\Rightarrow \Delta I$ and/or $\Delta C$

**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.

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**NOW YOU TRY:**

**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.

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**CASE STUDY:**

**The U.S. recession of 2001**

Causes: 1) Stock market decline $\Rightarrow \downarrow C$

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

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**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
CASE STUDY: The U.S. recession of 2001

- 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 (*introduced in Chap. 9*) captures this relationship between \( P \) and \( Y \).

**Deriving the AD curve**

Intuition for slope of AD curve:

\[ \uparrow P \Rightarrow \downarrow (M/P) \]

\[ \Rightarrow LM \text{ shifts left} \]

\[ \Rightarrow \uparrow r \]

\[ \Rightarrow \downarrow I \]

\[ \Rightarrow \downarrow Y \]
Monetary policy and the AD curve

The Fed can increase aggregate demand:

\[ \uparrow M \Rightarrow LM \text{ shifts right} \]

\[ \Rightarrow \downarrow r \]

\[ \Rightarrow \uparrow I \]

\[ \Rightarrow \uparrow Y \text{ at each value of } P \]

Fiscal policy and the AD curve

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

\[ \downarrow T \Rightarrow \uparrow C \]

\[ \Rightarrow IS \text{ shifts right} \]

\[ \Rightarrow \uparrow Y \text{ at each value of } P \]

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

Recall from Chapter 9: 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>
</tr>
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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, \( Y < \bar{Y} \)

Over time, \( P \) gradually falls, causing

- SRAS to move down
- \( M/P \) to increase, which causes LM to move down
The SR and LR effects of an IS shock

Over time, \( P \) gradually falls, causing
- SRAS to move down
- \( M/P \) to increase, which causes \( LM \) to move down

This process continues until economy reaches a long-run equilibrium with \( Y = \overline{Y} \)

NOW YOU TRY:
Analyze SR & LR effects of \( \Delta M \)

a. Draw the IS-LM and AD-AS diagrams as shown here.
b. Suppose Fed increases \( M \). Show the short-run effects on your graphs.
c. Show what happens in the transition from the short run to the long run.
d. How do the new long-run equilibrium values of the endogenous variables compare to their initial values?

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 \( \Rightarrow \) 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:
  - $\downarrow P \Rightarrow \uparrow (M/P) \Rightarrow LM$ shifts right $\Rightarrow \uparrow Y$
- Pigou effect:
  - $\downarrow P \Rightarrow \uparrow (M/P)$
  - $\Rightarrow$ consumers’ wealth $\uparrow$
  - $\Rightarrow \uparrow C$
  - $\Rightarrow IS$ shifts right
  - $\Rightarrow \uparrow Y$

THE MONEY HYPOTHESIS AGAIN:
The effects of falling prices
- The destabilizing effects of expected deflation:
  - $\downarrow E \pi$
  - $\Rightarrow r \uparrow$ for each value of $i$
  - $\Rightarrow I \downarrow$ because $I = I(r)$
  - $\Rightarrow$ planned expenditure & agg. demand $\downarrow$
  - $\Rightarrow$ income & output $\downarrow$

THE MONEY HYPOTHESIS AGAIN:
The effects of falling prices
- The destabilizing effects of unexpected deflation: debt-deflation theory
  - $\downarrow P$ (if unexpected)
  - $\Rightarrow$ transfers purchasing power from borrowers to lenders
  - $\Rightarrow$ borrowers spend less, lenders spend more
  - $\Rightarrow$ if borrowers’ propensity to spend is larger than lenders’, then aggregate spending falls, the $IS$ curve shifts left, and $Y$ falls

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.
CASE STUDY
The 2008-09 Financial Crisis & Recession
- 2009: Real GDP fell, u-rate approached 10%
- Important factors in the crisis:
  - early 2000s Federal Reserve interest rate policy
  - sub-prime mortgage crisis
  - bursting of house price bubble, rising foreclosure rates
  - falling stock prices
  - failing financial institutions
  - declining consumer confidence, drop in spending on consumer durables and investment goods

Interest rates and house prices

Change in U.S. house price index and rate of new foreclosures, 1999-2009

House price change and new foreclosures, 2006:Q3 - 2009Q1

U.S. bank failures by year, 2000-2009

Major U.S. stock indexes
(% change from 52 weeks earlier)
Chapter Summary

1. **IS-LM model**
   - A theory of aggregate demand
   - Exogenous: \( M, G, T, P \) exogenous in short run, \( Y \) in long run
   - Endogenous: \( r \)
     - \( Y \) endogenous in short run, \( P \) in long run
   - **IS curve**: goods market equilibrium
   - **LM curve**: money market equilibrium

2. **AD curve**
   - Shows relation between \( P \) and the IS-LM model’s equilibrium \( Y \).
   - Negative slope because
     \[ \uparrow P \Rightarrow \downarrow \frac{M}{P} \Rightarrow \uparrow r \Rightarrow \downarrow I \Rightarrow \downarrow Y \]
   - Expansionary fiscal policy shifts IS curve right, raises income, and shifts AD curve right.
   - Expansionary monetary policy shifts LM curve right, raises income, and shifts AD curve right.
   - IS or LM shocks shift the AD curve.