Chapter 12/11

Aggregate Demand II: Applying the IS-LM Model

Context

- Chapter 10 introduced the model of aggregate demand and supply.
- Chapter 11 developed the IS-LM model, the basis of the aggregate demand curve.

IN THIS CHAPTER, YOU WILL LEARN:

- 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.
\[ Y = C(Y - T) + I(r) + G \]
\[ Y = C(Y - T) + I(r) + G \]
The LM curve represents money market equilibrium.
\[ \frac{M}{P} \cdot L = L(r,Y) \]
The intersection determines the unique combination of \( Y \) and \( r \) that satisfies equilibrium in both markets.

Policy analysis with the IS-LM model

\[ Y = C(Y - T) + I(r) + G \]
\[ \frac{M}{P} \cdot L = L(r,Y) \]

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 \( \frac{1}{1 - MPC} \Delta G \) 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 \( \frac{1}{1 - MPC} \Delta G \)

I’ll show the dynamics on the board
A 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

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

2. ...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 \((M, G, \text{and } T)\) are exogenous.

- Real world:
  - Monetary policymakers may adjust \(M\) in response to changes in fiscal policy, or vice versa.
  - Such interactions 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>
</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.

NOW YOU TRY

Analyze shocks with the IS-LM model

Use the IS-LM model to analyze the effects of

1. a housing market crash that reduces consumers’ wealth

For this shock,

a. use the IS-LM diagram to determine the effects on Y and r.

b. figure out what happens to C, I, and the unemployment rate.

Housing market crash

IS shifts left, causing r and Y to fall.

C falls due to lower wealth and lower income,
I rises because r is lower
u rises because Y is lower (Okun’s law)
CASE STUDY: The U.S. recession of 2001

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).

Causes: 1) Stock market decline → ↓C

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

CASE STUDY: The U.S. recession of 2001
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.
**What is the Fed’s policy instrument?**

Why does the Fed target interest rates instead of the money supply?

1) They are easier to measure than the money supply.

2) The Fed might believe that LM shocks are more prevalent than IS shocks. If so, then targeting the interest rate stabilizes income better than targeting the money supply. (See problem 8 on p.364.)

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**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. 10) captures this relationship between $P$ and $Y$.

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**Deriving the AD curve**

Intuition for slope of $AD$ curve:

$\uparrow P \rightarrow \downarrow (M/P)$

$\rightarrow LM$ shifts left

$\rightarrow \uparrow r$

$\rightarrow \downarrow I$

$\rightarrow \downarrow Y$
Monetary policy and the $AD$ curve

The Fed can increase aggregate demand:

$\uparrow M \rightarrow LM$ shifts right

$\rightarrow \downarrow r$

$\rightarrow \uparrow I$

$\rightarrow \uparrow Y$ at each value of $P$

\[ Y_1 < Y_2 \]

Fiscal policy and the $AD$ curve

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

$\downarrow T \rightarrow \uparrow C$

$\rightarrow IS$ shifts right

$\rightarrow \uparrow Y$ at each value of $P$

\[ P_1 < P_2 \]

$IS - LM$ and $AD - AS$

in the short run & long run

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.

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
- \( MP \) to increase, which causes \( LM \) to move down

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

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?
Short-run effects of $\Delta M$

$LM$ and $AD$ shift right.

$r$ falls, $Y$ rises above $\dddot{Y}$

Over time,
- $P$ rises
- SRAS moves upward
- $M/P$ falls
- $LM$ moves leftward

New long-run eq'm
- $P$ higher
- all real variables back at their initial values

Money is neutral in the long run.