CHAPTER 11

Aggregate Demand II:
Applying the IS-LM Model

MACROECONOMICS  SIXTH EDITION
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PowerPoint® Slides by Ron Cronovich

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Context

- Chapter 9 introduced the model of aggregate demand and supply.
- Chapter 10 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.
\[ Y = C(Y - T) + I(r) + G \]

The LM curve represents money market equilibrium.
\[ \frac{M}{P} = L(r, Y) \]

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

Policy analysis with the IS-LM model

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

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 \( \frac{\Delta G}{1 - MPC} \), 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 \( \frac{\Delta G}{1 - MPC} \).
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 \(\Delta G\). …and the IS curve shifts by \(\frac{\Delta T}{1 - \text{MPC}}\).

1. …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 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 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
  ⇒ change in households' wealth
  ⇒ $\Delta C$
- change in business or consumer confidence or expectations
  ⇒ $\Delta I$ 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.

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,

a. use the IS-LM diagram to show the effects of the shock on $Y$ and $r$.

b. determine what happens to $C$, $I$, and the unemployment rate.

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 ⇒ ↓C

![Graph of Standard & Poor's 500 Index (1942 = 100)]

- **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

![Graph of Three-month T-Bill Rate]

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**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.

**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.
**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:
- \( \uparrow P \Rightarrow \downarrow (M/P) \Rightarrow LM \) 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 \( P \)

**Fiscal policy and the AD curve**

Expansionary fiscal policy (\( \uparrow G \) and/or \( \downarrow T \)) increases aggregate demand:
- \( \downarrow T \Rightarrow \uparrow C \Rightarrow IS \) shifts right
  - \( \Rightarrow IS \) 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>
</thead>
<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, $Y < Y^*$

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

This process continues until economy reaches a long-run equilibrium with $Y = Y^*$

EXERCISE: Analyze SR & LR effects of $\Delta M$

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

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
Chapter Summary

2. AD curve
- shows relation between $P$ and the IS-LM model’s equilibrium $Y$.
- negative slope because
  $\uparrow P \Rightarrow \downarrow (MP) \Rightarrow \uparrow r \Rightarrow \downarrow I \Rightarrow \downarrow Y$
- 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.

The Great Depression

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 MONEY HYPOTHESIS: A shock to the LM curve
- asserts that the Depression was largely due to huge fall in the money supply.
- evidence:
  $M1$ fell 25% during 1929-33.
- But, two problems with this hypothesis:
  $P$ fell even more, so $MP$ actually rose slightly during 1929-31.
  nominal interest rates fell, which is the opposite of what a leftward LM 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 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:
  \[ \downarrow P \Rightarrow \uparrow (M/P) \Rightarrow LM \text{ shifts right} \Rightarrow \uparrow Y \]

- Pigou effect:
  \[ \downarrow P \Rightarrow \uparrow (M/P) \Rightarrow \uparrow C \Rightarrow IS \text{ shifts right} \Rightarrow \uparrow Y \]

- The destabilizing effects of expected deflation:
  \[ \downarrow \pi^e \Rightarrow r \uparrow \text{ for each value of } i \Rightarrow I \downarrow \text{ because } I = I(r) \Rightarrow \text{planned expenditure & agg. demand } \downarrow \Rightarrow \text{income & output } \downarrow \]

THE MONEY HYPOTHESIS AGAIN:
The effects of falling prices

- The destabilizing effects of unexpected deflation:
  debt-deflation theory
  \[ \downarrow P \text{ (if unexpected)} \Rightarrow \text{transfers purchasing power from borrowers to lenders} \Rightarrow \text{borrowers spend less, lenders spend more} \Rightarrow \text{if borrowers’ propensity to spend is larger than lenders’, then aggregate spending falls, the IS curve shifts left, and } Y \text{ falls} \]

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.