National Income & Business Cycles

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8. Economic Fluctuations

Objectives

- difference between short run & long run
- the IS curve, and its relation to
  - the Keynesian Cross
  - the Loanable Funds model
- the LM curve, and its relation to
  - the Theory of Liquidity Preference
- how the IS-LM model determines income and the interest rate in the short run when $P$ is fixed
Unemployment

Index of Leading Economic Indicators

- Published monthly by the Conference Board.
- Aims to forecast changes in economic activity 6-9 months into the future.
- Used in planning by businesses and govt, despite not being a perfect predictor.

Components of the LEI index

- Average workweek in manufacturing
- Initial weekly claims for unempl. insurance
- New orders for consumer goods and materials
- New orders, nondefense capital goods
- Vendor performance
- New building permits issued
- Index of stock prices
- M2
- Yield spread (10year - 3month) on Treasuries
- Index of consumer expectations
Time horizons

- Long run:
  Prices are flexible, respond to changes in supply or demand
- Short run:
  many prices are “sticky” at some predetermined level

The economy behaves much differently when prices are sticky.

In Classical Macroeconomic Theory,

(what we studied in chapters 3-8)
- Output is determined by the supply side:
  • supplies of capital, labor
  • technology
- Changes in demand for goods & services
  \((C, I, G)\) only affect ________, not ____________.  
- Complete price flexibility is a crucial assumption, so classical theory applies in the ________.

When prices are sticky

...output and employment also depend on demand for goods & services,
- which is affected by
  • fiscal policy \((G \text{ and } T)\)
  • monetary policy \((M)\)
  • other factors, like exogenous changes in \(C\) or \(I\).

The model of aggregate demand and supply

- the paradigm that most mainstream economists & policymakers use to think about economic fluctuations and policies to stabilize the economy
- shows how the price level and aggregate output are determined
- shows how the economy’s behavior is different in the short run and long run
**The Big Picture**

- Keynesian Cross
- IS curve
- IS-LM model
- LM curve
- Explanation of short-run fluctuations
- Agg. demand curve
- Model of Agg. Demand and Agg. Supply
- Agg. supply curve

**The Keynesian Cross**

- A simple closed economy model in which income is determined by expenditure. *(due to J.M. Keynes)*
- Notation:
  - $I = $ planned investment
  - $E = C + I + G = $ planned expenditure
  - $Y = $ real GDP = actual expenditure
- Difference between actual & planned expenditure: unplanned inventory investment

**Elements of the Keynesian Cross**

- Consumption function:
- Gov’t policy variables:
  - For now, investment is exogenous:
  - Planned expenditure:
- Equilibrium condition:

**Graphing planned expenditure**

\[ E \]

\( Y \)

income, output
Graphing the equilibrium condition

\[ E \]
planned expenditure

income, output, \( Y \)

The equilibrium value of income

\[ E \]
planned expenditure

income, output, \( Y \)

\[ E = Y \]

\[ E = C + I + G \]

An increase in government purchases

At \( Y_1 \),
there is now an
increase in inventory...

...so firms increase output, and income increase toward a new equilibrium

Solving for \( \Delta Y \)

\[ Y = C + I + G \] equilibrium condition

in changes

because \( I \) exogenous

because \( \Delta C = MPC \Delta Y \)

Collect terms with \( \Delta Y \)
on the left side of the equals sign:

Finally, solve for \( \Delta Y \):
The government purchases multiplier

Definition: the increase in income resulting from a $1 increase in $G$.

In this model, the gov’t purchases multiplier equals

Example: If $MPC = 0.8$, then

Why $\Delta Y/\Delta G > 1$?

$\Delta G = \Delta Y$

An increase in $G$ causes income to increase ___ times as much!

\[ E = C_1 + I + G \]

Initially, the tax increase _____ consumption, and therefore $E$:

…so firms _____ output, and income _____ toward a new equilibrium

$E_1 = Y_1$

Solving for $\Delta Y$

$\Delta Y = \Delta C + \Delta I + \Delta G$

eq m condition in changes

$I$ and $G$ exogenous

Solving for $\Delta Y$:

Final result:

The Tax Multiplier

def: the change in income resulting from a $1 increase in $T$:

\[
\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - MPC}
\]

If $MPC = 0.8$, then the tax multiplier equals
Exercise:
- Use a graph of the Keynesian Cross to show the impact of a **decrease** in investment on the equilibrium level of income/output.

\[ E = Y \]
\[ E = C + I_1 + G \]

Results
In this simple model, the change in GDP is always _________ than the change in investment. Thus, relatively small fluctuations in \( I \) can lead to _________ fluctuations in \( Y \).

Intuition?
Suppose firms get pessimistic (due to “animal spirits”):
- The initial drop in \( I \) reduces \( Y \) _________, and some workers have lost jobs
- Remaining workers cut their consumption (\( C \)) in response to bad conditions
- This causes firms to cut output further (in a self-fulfilling downward spiral)

The **IS-LM** Model: Standard Keynesian Framework
4 equations:
1. \( Y = C + I + G \)
2. \( C = C(Y - T) \)
3. \( I = I(r) \)
4. \( M/P = L(r, Y) \)

Strategy: reduce this 4 equation system to two equations so we can plot
- this is the point of the **IS-LM** curves
- we can then do simple policy experiments

The **IS** curve
def: a graph of all combinations of \( r \) and \( Y \) that result in goods market equilibrium,
\( i.e. \) actual expenditure (output) = planned expenditure

The equation for the **IS** curve is:
Fiscal Policy and the IS curve

- We can use the IS-LM model to see how fiscal policy (G and T) can affect aggregate demand and output.
- Let’s start by using the Keynesian Cross to see how fiscal policy shifts the IS curve...

Shifting the IS curve: $\Delta G$

At any value of $r$,
$\uparrow G \Rightarrow E \Rightarrow Y$

...so the IS curve shifts to the ____.

The horizontal distance of the IS shift equals
Exercise: Shifting the IS curve

Use the diagram of the Keynesian Cross to show how an increase in taxes ($T$) shifts the IS curve.

\[ E = Y = C_1 + I(r_1) + G \]

![Graph](image)

Facts about the IS curve

- The IS curve is ____________ sloped.
- Intuition: A fall in the interest rate motivates firms to ________ investment spending, which drives up total planned spending ($E$).

To restore equilibrium in the goods market, output (a.k.a. actual expenditure, $Y$) must increase.

- Changes in $r$ lead to ______________ a given IS curve.
- Changes in $G$, $T$, and $I$ _________ the IS curve.

The Theory of Liquidity Preference 

\( M^s \& M^d \rightarrow r \)

Money Supply:

\[ (\frac{M}{P})^s = \bar{M}/\bar{P} \]

Money Demand:

\[ (\frac{M}{P})^d = L(r) \]

The interest rate adjusts to equate the S and D for money.

How the Fed raises the interest rate

To increase $r$, Fed ______

![Graph](image)

![Graph](image)
CASE STUDY
Volcker’s Monetary Tightening

- Late 1970s: \( \pi > 10\% \)
- Oct 1979: Fed Chairman Paul Volcker announced that monetary policy would aim to reduce inflation.
- Aug 1979-April 1980: Fed reduces \( M/P \) 8.0%
- Jan 1983: \( \pi = 3.7\% \)

How do you think this policy change would affect interest rates?

Volcker’s Monetary Tightening, cont.

<table>
<thead>
<tr>
<th>The effects of a monetary tightening on nominal interest rates</th>
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<tbody>
<tr>
<td>model</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Liquidity Preference</td>
</tr>
<tr>
<td>(Keynesian)</td>
</tr>
<tr>
<td>prices</td>
</tr>
<tr>
<td>prediction</td>
</tr>
</tbody>
</table>
| actual outcome | 8/1979: \( i = 10.4\% \) | 8/1979: \( i = 10.4\% \)
| | 4/1980: \( i = 15.8\% \) | 1/1983: \( i = 8.2\% \) |

The \( LM \) curve

Now let’s put \( Y \) back into the money demand function:

\[
\left( \frac{M}{P} \right)^d = L(r, Y)
\]

The \emph{LM curve} is a graph of all combinations of \( r \) and \( Y \) that equate the supply and demand for real money balances.

The equation for the \( LM \) curve is:

Deriving the \( LM \) curve
How $\Delta M$ shifts the LM curve

(a) The market for real money balances

(b) The LM curve

Exercise: Shifting the LM curve

- Suppose a wave of credit card fraud causes consumers to use cash more frequently in transactions.
- Use the Liquidity Preference model to show how these events shift the LM curve.

Facts about the LM curve

- The LM curve is __________ sloped.
- Intuition: An increase in income raises money demand.

Since the supply of real balances is fixed, there is now excess demand in the money market at the initial interest rate.

The interest rate must rise to restore equilibrium in the money market.

- Changes in $r$ lead to movements ______ a given LM curve.
- Changes in $M^s$ and $M^d$ ______ the LM curve.

The short-run equilibrium

The short-run equilibrium is the combination of $r$ and $Y$ that simultaneously satisfies the equilibrium conditions in the goods & money markets:

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

$\frac{\bar{M}}{\bar{P}} = L(r, Y)$

Equilibrium interest rate

Equilibrium level of income
Summary

1. Keynesian Cross
   - basic model of income determination
   - takes fiscal policy & investment as exogenous
   - fiscal policy has a multiplied impact on income.

2. IS curve
   - comes from Keynesian Cross when planned investment depends negatively on interest rate
   - shows all combinations of $r$ and $Y$ that equate planned expenditure with actual expenditure on goods & services

3. Theory of Liquidity Preference
   - basic model of interest rate determination
   - takes money supply & price level as exogenous
   - an increase in the money supply lowers the interest rate

4. LM curve
   - comes from Liquidity Preference Theory when money demand depends positively on income
   - shows all combinations of $r$ and $Y$ that equate demand for real money balances with supply

5. IS-LM model
   - Intersection of IS and LM curves shows the unique point ($Y$, $r$) that satisfies equilibrium in both the goods and money markets.
Preview of Chapter 11

- In Chapter 11, we will
  - use the IS-LM model to analyze the impact of policies and shocks
  - learn how the aggregate demand curve comes from IS-LM
  - use the IS-LM and AD-AS models together to analyze the short-run and long-run effects of shocks