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Housekeeping

• The reading for next time (“A Non-Technical Introduction to Regressions”) is in the main course reader, after the “Short-Run Fluctuations” material.

• Reminder: The final exam is Monday, May 7, 3–6 P.M.
I. The IS–LM/MP Model
The IS–LM/MP Model: Where We Are Headed

Y is output; r is the real interest rate (≡ i − π^e)
What Have You Seen in Previous Courses?

- IS plus an interest rate rule for monetary policy (IS–MP)?
- IS plus a curve describing equilibrium in the money market under the assumption that the central bank is targeting the money supply (IS–LM)?
- Both?
- Neither or don’t know?
A Key Assumption

• The starting point of the IS–LM/MP model: prices and wages are not completely flexible.
• In today’s lecture, a stronger assumption: the price level and expected inflation are exogenous.
• A general comment about models and assumptions:
  – The purpose of a model is not to be “realistic.”
  – It is to provide insights about particular features of the world.
The Equations of the IS Curve #1:
Planned Expenditure and Output

\[ E = Y \]

E is planned expenditure, Y is output.
The Equations of the IS Curve #2: Modeling Planned Expenditure

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

- T is taxes (net of transfers)
- G is government purchases
- C (Y – T) is a function giving consumption as a function of disposable income.
- I(r) is a function giving desired investment as a function of the real interest rate.
Assumptions about Planned Expenditure

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

- T is exogenous:  \[ T = \bar{T}. \]
- G is exogenous:  \[ G = \bar{G}. \]
- C(Y – T): When Y – T rises, consumption rises, but by less than the increase in Y – T.
- I(r): When r rises, desired investment falls.
The Keynesian Cross

\[ E = Y \]

\[ E = C(Y - T) + I(r) + G \]
The Effects of a Rise in the Interest Rate in the Keynesian Cross

\[ E = Y \]

\[ E = C(Y - T) + I(r_0) + G \]

\[ E_0 \]

\[ Y_0 \]

\[ E_1 \]

\[ Y_1 \]

\[ (r_1 > r_0) \]
The IS Curve
One Approach to the Other Curve: An Interest Rate Rule and the MP Curve
An Interest Rate Rule

• When $Y$ rises, the central bank raises $r$.
• When $\pi$ rises, the central bank raises $r$.

So:

$$r = r(Y,\pi)$$

The real interest rate the central bank targets is an increasing function of both $Y$ and $\pi$. 
The MP Curve and the IS–MP Diagram
But How is the Central Bank Able to Control the Real Interest Rate?

By adjusting the money supply

• Unless all prices are completely and instantaneously flexible, an increase in the money supply lowers the real interest rate, and a decrease in the money supply raises the real interest rate.

• The central bank can change the money supply.

• Therefore, the central bank, by changing the money supply, can raise \( r \) when \( Y \) rises or \( \pi \) rises, and can lower \( r \) when \( Y \) falls or \( \pi \) falls.
The Other Approach to the Other Curve: The Money Market and the LM Curve
The Concept of Money We Will Focus On

High-powered money

- Controlled directly by the central bank.
- Pays no nominal interest (usually), so the opportunity cost of holding it is the nominal interest rate.
The Supply and Demand for Money

- Money supply: \( M = \bar{M} \)

- Demand for “real” money balances \((M/P)\): \( L(i,Y) \)

Money demand is an increasing function of output \((Y)\), and a decreasing function of the nominal interest rate \((i)\).
The Interest Rate for a Given Level of Output: The Money Market

\[ \bar{M}/P = L(i, Y) \]
The Effects of a Rise in Output in the Money Market Diagram

Recall: \( i = r + \pi^e \)
The LM Curve and the IS–LM Diagram
MP or LM?

• Where the two models differ is in what they assume about how monetary policy is conducted.

• Thus, in deciding whether to use MP or LM, the key consideration is how monetary policy is conducted in the situation you are looking at.
MP or LM? Examples

• The effects of any development in the United States in the 1990s.  **MP**

• The central bank is targeting the money supply, and decides to raise its target.  **LM**

• The Island of Yap.  **LM**
II. EXAMPLES
Example: A Fall in Investment Demand

The development we want to analyze: In 2000 and 2001, firms realized that high-tech investment goods, such as fiber-optic cable, were not going to have as large payoffs as they had thought.

Corresponds to a shift of the $I(r)$ function: $I$ at a given $r$ is lower.
MP or LM?

MP
The Effects of a Fall in Investment Demand in the Keynesian Cross

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

\[ Y' = C(Y' - T) + I^{\text{NEW}}(r) + G \]
The Effects of a Fall in Investment Demand in the IS-MP Diagram

The IS and MP curves are shown, with the original equilibrium at $Y_0$ and $r_0$. After a fall in investment demand, the IS curve shifts to the left to IS$_1$, and the new equilibrium is at $Y_1$ and $r_1$.
The Effects of a Fall in Investment Demand in the IS-LM Diagram

- The IS curve shifts from $IS_0$ to $IS_1$.
- The LM curve remains at $LM_0$.
- The equilibrium interest rate falls from $r_0$ to $r_1$.
- The equilibrium income falls from $Y_0$ to $Y_1$. 

Graph:
- $r$ (interest rate) on the y-axis.
- $Y$ (income) on the x-axis.
- $LM_0$ and $IS_0$ intersect initially at $(Y_0, r_0)$.
- $IS_1$ intersects $LM_0$ at a lower income level $(Y_1, r_1)$. 

Legend:
- LM0: Liquidity Preference Function
- IS0: Investment Function
- IS1: Shifted Investment Function
Example: Financial Innovation

The development we want to analyze: New technologies allow people to make many purchases using debit cards that they used to have to make using cash.

Corresponds to a shift of the $L(i,Y)$ function: money demand at a given $i$ and $Y$ is lower.
If the Central Bank Keeps the Money Supply Fixed
Step 1: The Effect on the Money Market at a Given Y?

\[ \frac{M}{P} \]

\[ i \]

\[ i_0 \]

\[ i_1 \]

\[ L^{\text{OLD}}(i,Y) \]

\[ L^{\text{NEW}}(i,Y) \]
If the Central Bank Keeps the Money Supply Fixed

Step 2: The Effect on the IS and/or LM Curves?
If the Central Bank Is Following an Interest Rate Rule
The Effect on the IS and/or MP Curves?

Neither curve changes.
Interest rates were very volatile in the period when the Fed was – to some extent – targeting the money supply.