Lecture 7. Midterm Review

The Midterm Exam

- In-class. April 1 (Wed). 1:30 pm **sharp**. Do not be late.
- **Open-book**.
- Please bring your **student ID**.
- Joint a Zoom meeting via Canvas.
  - Turn on your camera and mic.
  - There are two sessions. Choose one based on your family name.
  - Change your Zoom account name to your **Official Name + Student ID**, e.g., “LEE, Byoungchan 1234567(8).”

- Office hours: March 31 (Tue), 2-4 pm.

What we have studied so far…

- Blanchard, Chapter 1: Introduction
- Blanchard, Chapter 2: Measurement (Y, u, π)

- Blanchard, Chapter 3: The Goods (and Services) Market (Y)
- Blanchard, Chapter 4: The Financial Markets (i)
- Blanchard, Chapter 5: The IS-LM Model
  (Y and i in the Short Run)
- Blanchard, Chapter 6: The Extended IS-LM Model
  (Y and r in the Short Run)

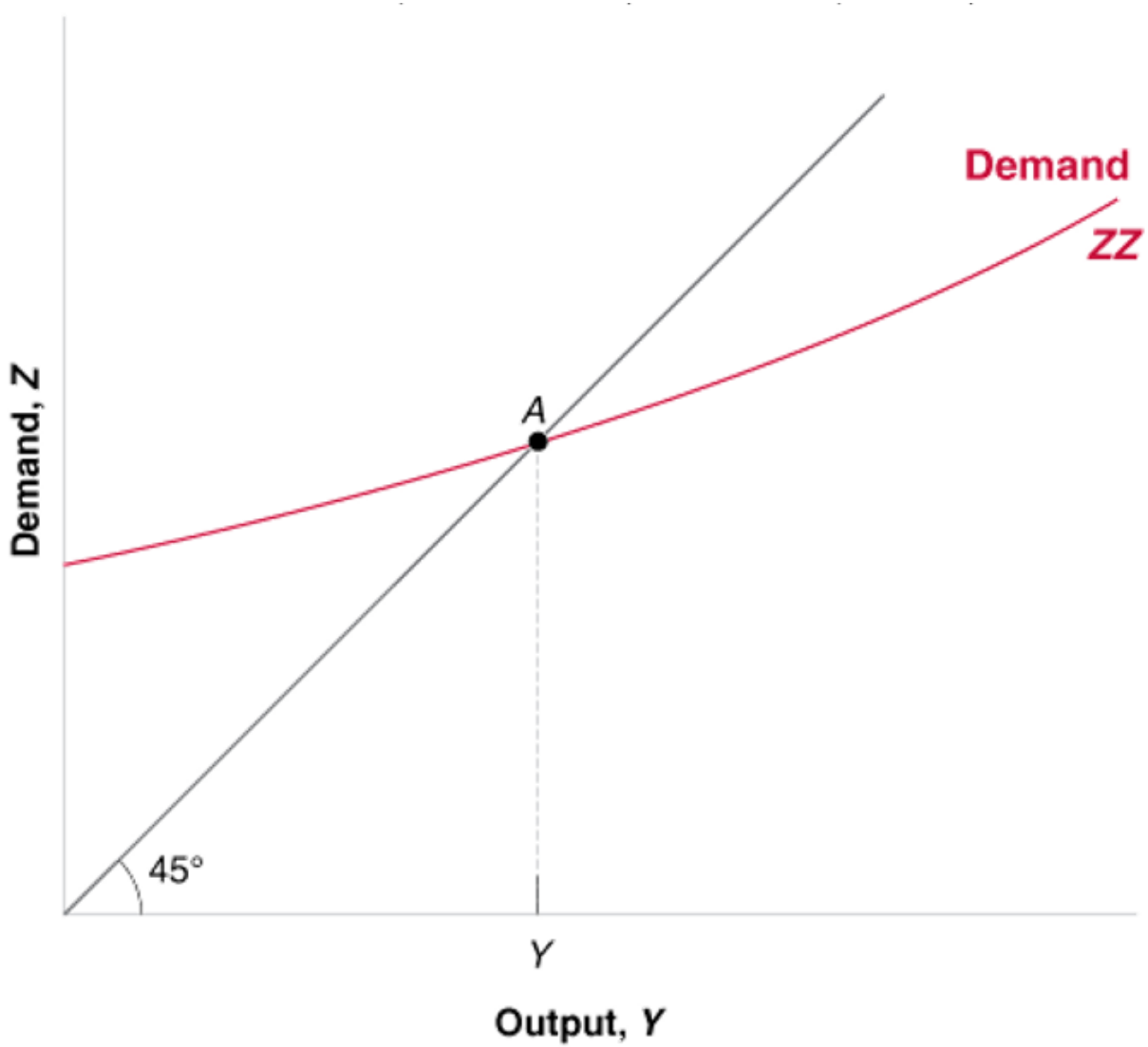
The Goods (and Services) Market

- Demand: $Z = C + I + G + NX = C(Y - T) + I(Y, i) + G$
  - People want to purchase Z amount of goods and services given income Y, i, G, T, c_0, etc.

- Supply: production Y

- Equilibrium condition for the goods and services market

  supply (production) = demand (expenditure) $\Rightarrow$ $Y = Z$



- Demand : $Z = C(Y - T) + I(Y, i) + G$
- Supply : Y (production) $= Y$ (income)
- ZZ shifts upward when $T \downarrow$, $G \uparrow$, $c_0 \uparrow$, $i \downarrow$, etc. How about $\frac{M^S}{P}$?

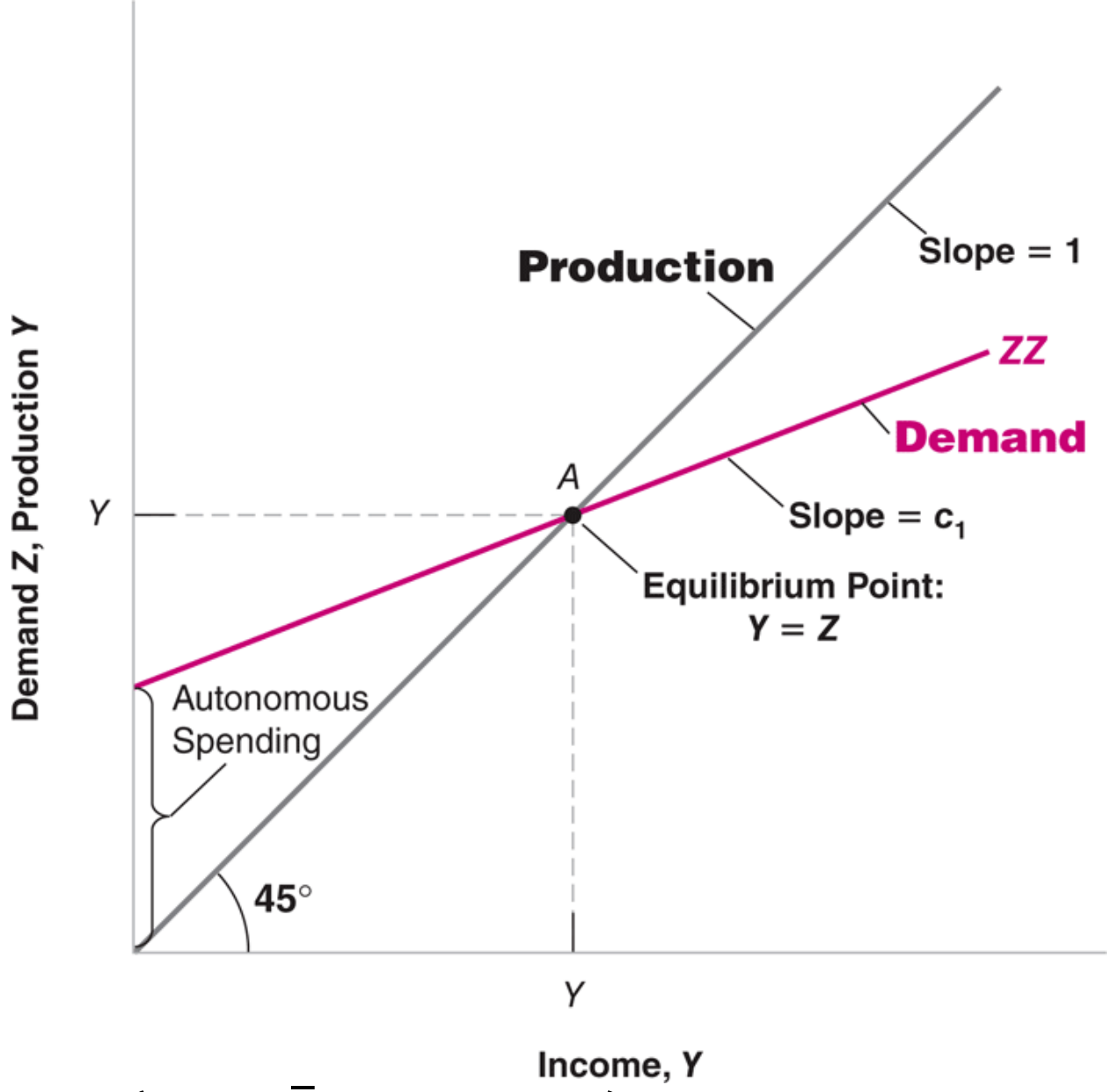
A simple case

- Demand: $Z = C + \bar{I} + G = c_0 + c_1(Y - T) + \bar{I} + G$

  $= (c_0 + \bar{I} + G - c_1 T) + c_1 Y$

  Autonomous Spending + MPC * Y

- Equilibrium output: $Y = \frac{1}{1-c_1}(c_0 + \bar{I} + G - c_1 T)$
- Multipliers in this simple case
  - Govt spending multiplier: $\frac{\Delta Y}{\Delta G} = \frac{1}{1-c_1}$
  - Tax multiplier: $\frac{\Delta \mathrm{Y}}{\Delta T} = -\frac{c_1}{1-c_1}$
  - Balanced budget multiplier: $\frac{\Delta Y}{\Delta G}\Big|_{\Delta T = \Delta G} = 1$



- Demand : $Z = (c_0 + \bar{I} + G - c_1 T) + c_1 Y$
- Supply : Y (production) $= Y$ (income)

The Financial Markets

- Money Market + One-year Zero-coupon Risk-free Bond Market
- Tradeoff between liquidity and $i \geq 0$

Supply and Demand for Money

- M^s: Determined by the central bank. Adjusted via OMO.
- M^d: Liquidity for transactions (money) vs. interest rate (bond)

$$M^d = \$Y\ L(i)$$

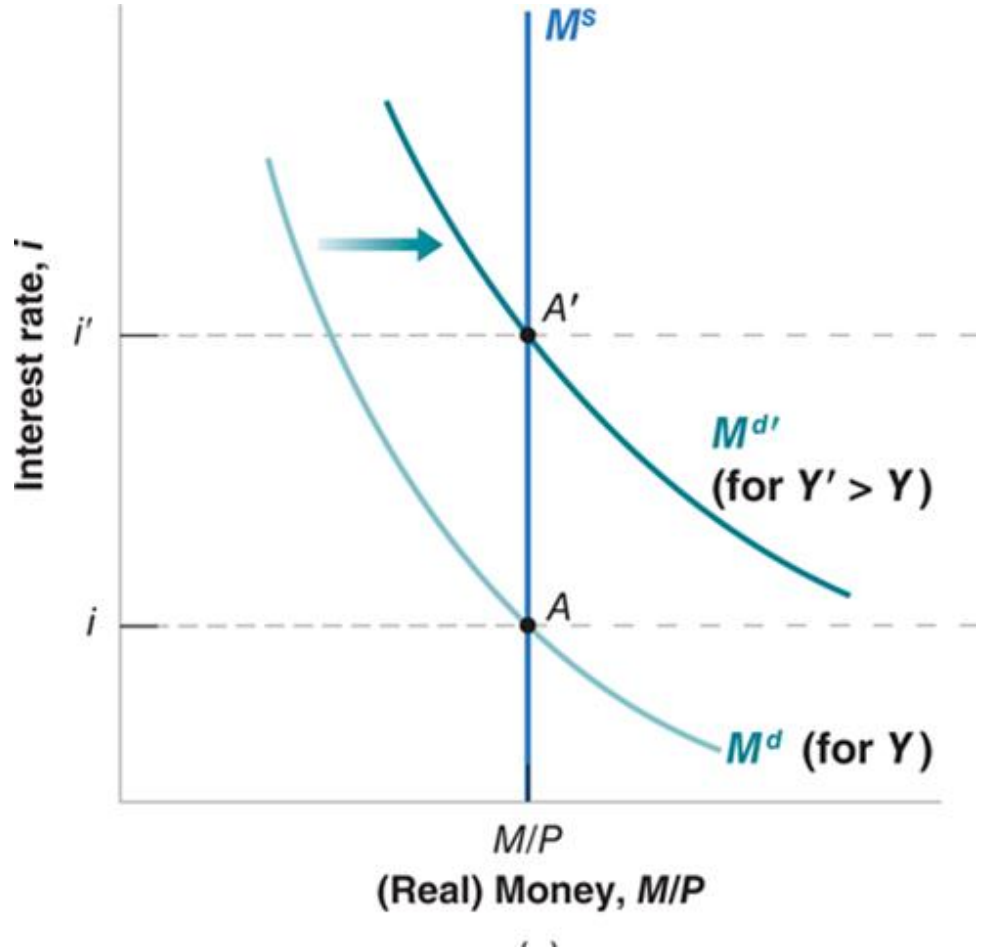
- Equilibrium condition in terms of nominal money:

$$M^s = M^d = \$Y\ L(i)$$

- Equilibrium condition in terms of real money:

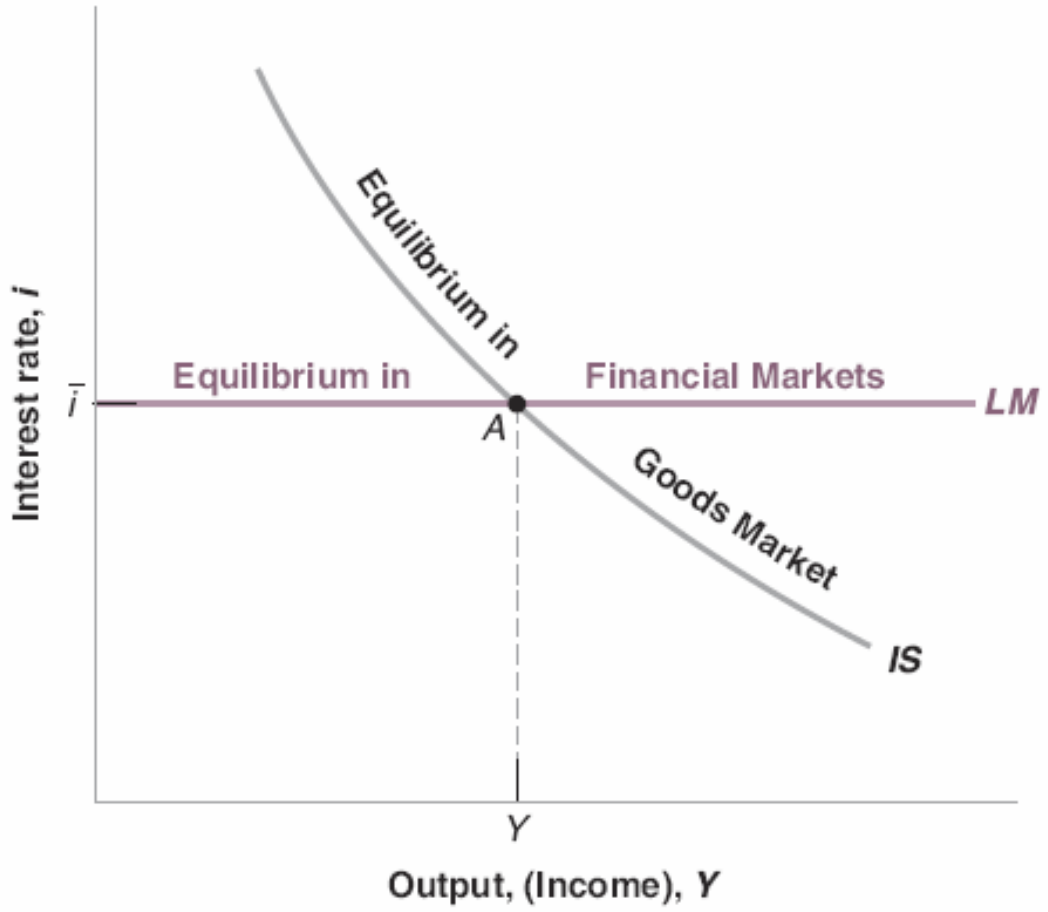
$$\frac{M^s}{P} = \frac{M^d}{P} = Y\ L(i)$$

The equilibrium interest rate (real money version)



- Real money supply curve M^s shifts to the right when $M^s/P \uparrow$
- Real money demand curve M^d shifts to the right when $Y \uparrow$

The IS-LM model



- Each point on the *IS* curve represents an equilibrium in the goods market.
- Each point on the *LM* curve represents an equilibrium in the money market.

The General Equilibrium (in the short run)

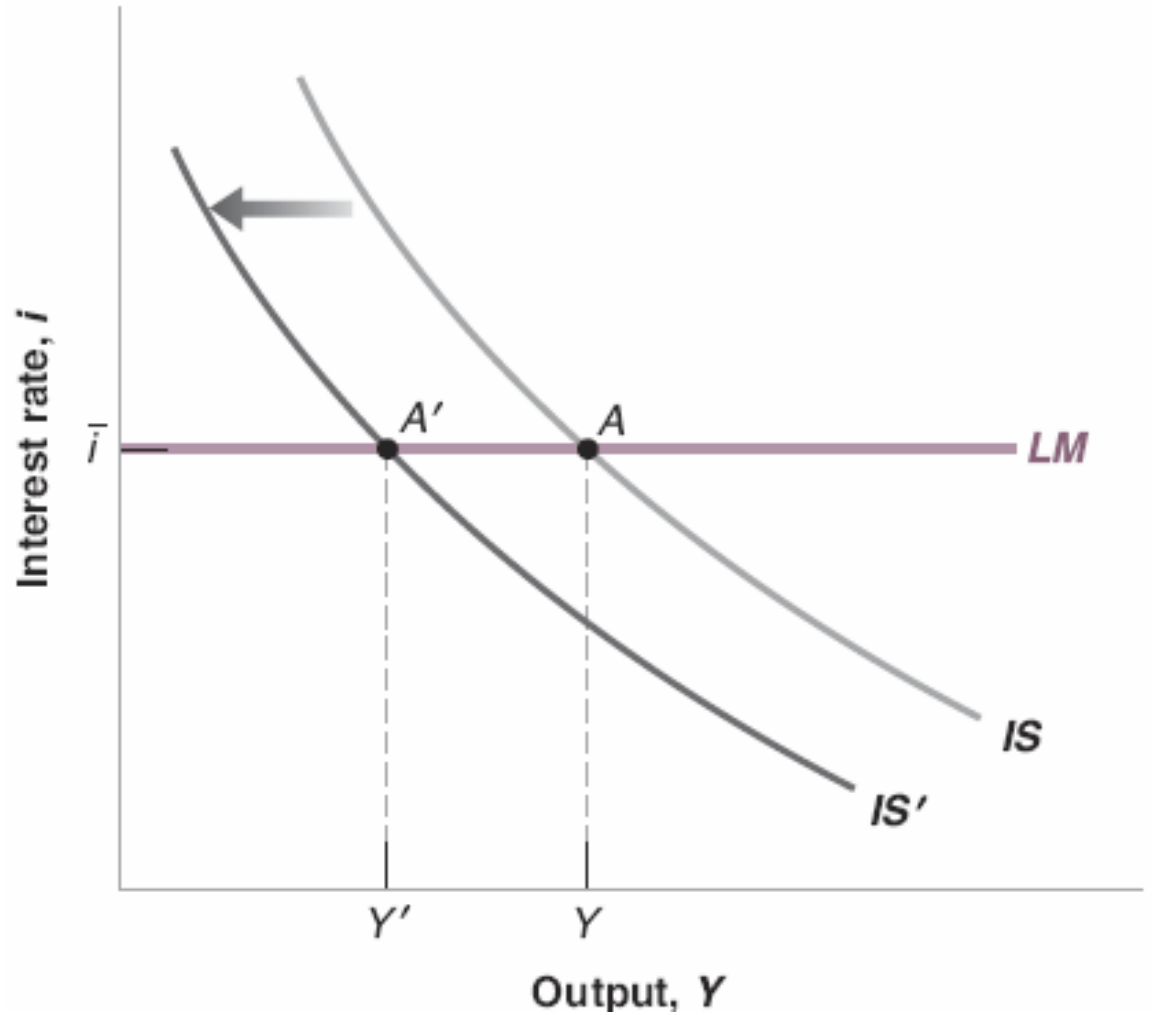
- IS Relation: $Y = C(Y - T) + I(Y, i) + G$

⇒ IS Curve: Given T, G, c_0 and i, what is the equilibrium output Y in the goods market?

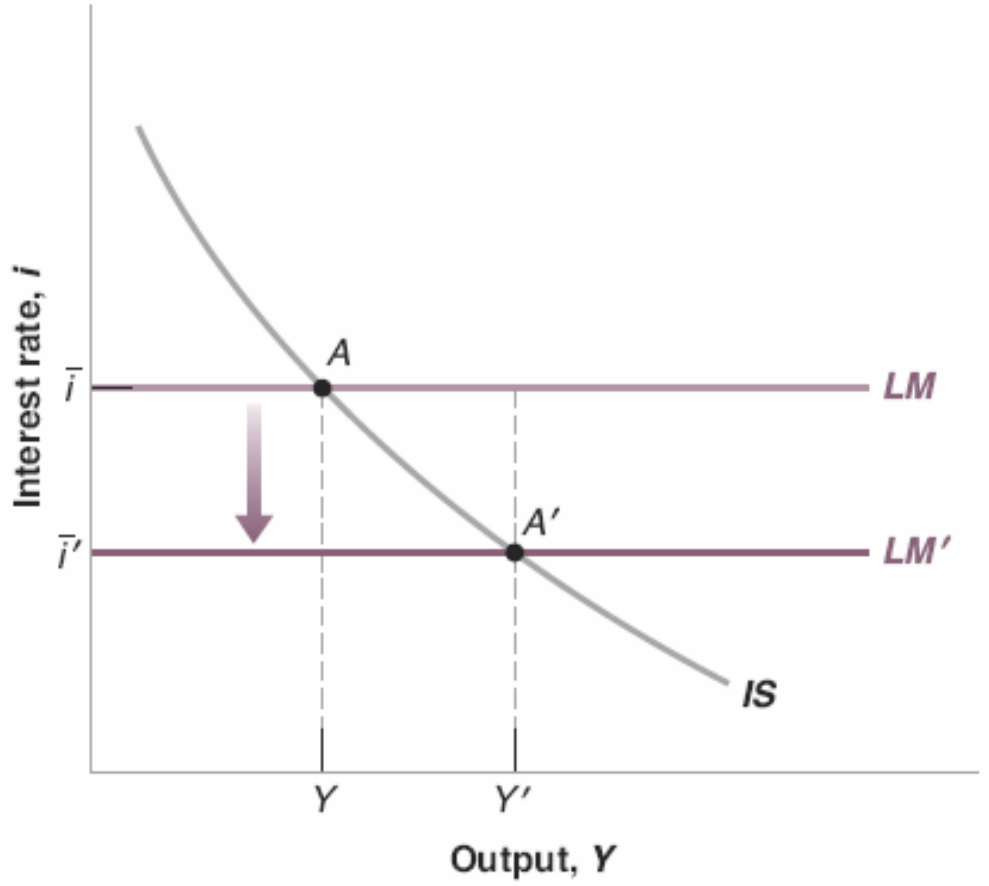
- LM Relation: $i = \bar{\imath}$

⇒ LM Curve: i selected by the CB. It is achieved by adjusting M^S to satisfy $\frac{M}{P} = YL(\bar{\imath})$, given P, Y, and the target interest rate, $\bar{\imath}$.

- Where the two curves intersect (point A), both goods and money markets are cleared (i.e., in equilibrium): “General Equilibrium”



- The IS curve shifts to the left when $T \uparrow, G \downarrow, c_0 \downarrow$, etc.
- Contractionary FP, consumer confidence ↓, …
- $Y \downarrow, i \ -$



- The LM curve shifts downward when $\bar{\imath} \downarrow$.
- Expansionary MP.
- $Y \uparrow, i \downarrow$

Policy mix (an example)

- How can we achieve a higher interest rate without changing output?

How about $C, I, G, T, T - G, S, M$?

Only the demand side?

- The IS-LM model: General equilibrium in the short run.
- The goods market (IS) + The money market (LM)
- In the short run, P does not change.
- Output is largely determined by the demand Z.

- So far, we have studied the demand side of the economy.
- After the midterm, we will start to think about the supply (production) side of the economy. That is, firms hire workers to produce goods and services.

The Fisher Equation

- $1 + r_t = (1 + i_t)/(1 + \pi^e_{t+1})$
- $r_t \approx \ln(1 + r_t) = \ln(1 + i_t) - \ln(1 + \pi^e_{t+1}) \approx i_t - \pi^e_{t+1}$

- $r_t \approx i_t - \pi^e_{t+1}$: ex-ante real interest rate
- $i_t - \pi_{t+1}$: ex-post real interest rate

- What will be the value of r when the zero-lower bound is binding?

The interest rate that matters for firms

- Previously, we assumed that $I = I(Y, i)$.

- However, when firms make an investment decision, what is important for them is the ***real*** interest rate at which ***they*** borrow, not the nominal risk-free rate at which the US government borrow.
- Firms cannot borrow at the risk-free rate. When a firm issues a bond, investors (lenders) worry that this firm may default.
- To compensate for the risk, bond holders require a **risk premium**, x.

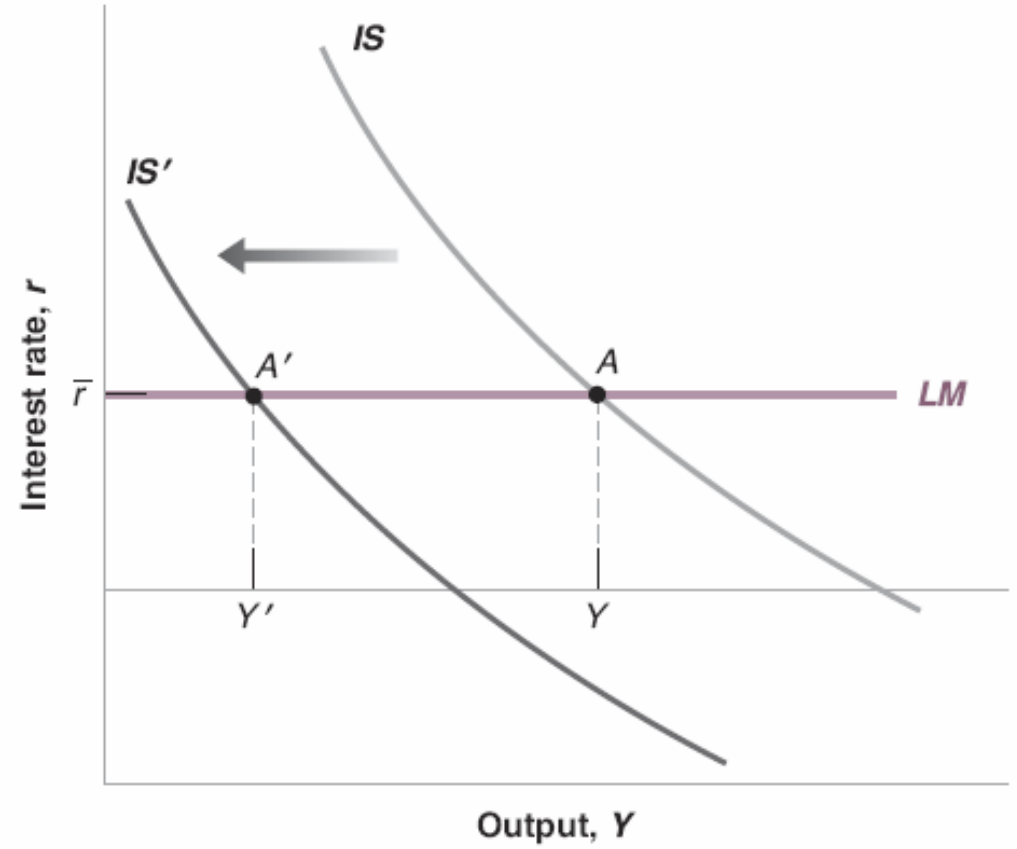
- A new assumption: $I = I(Y, r + x) = I(Y, i - \pi^e + x)$.

The Extended IS-LM Model

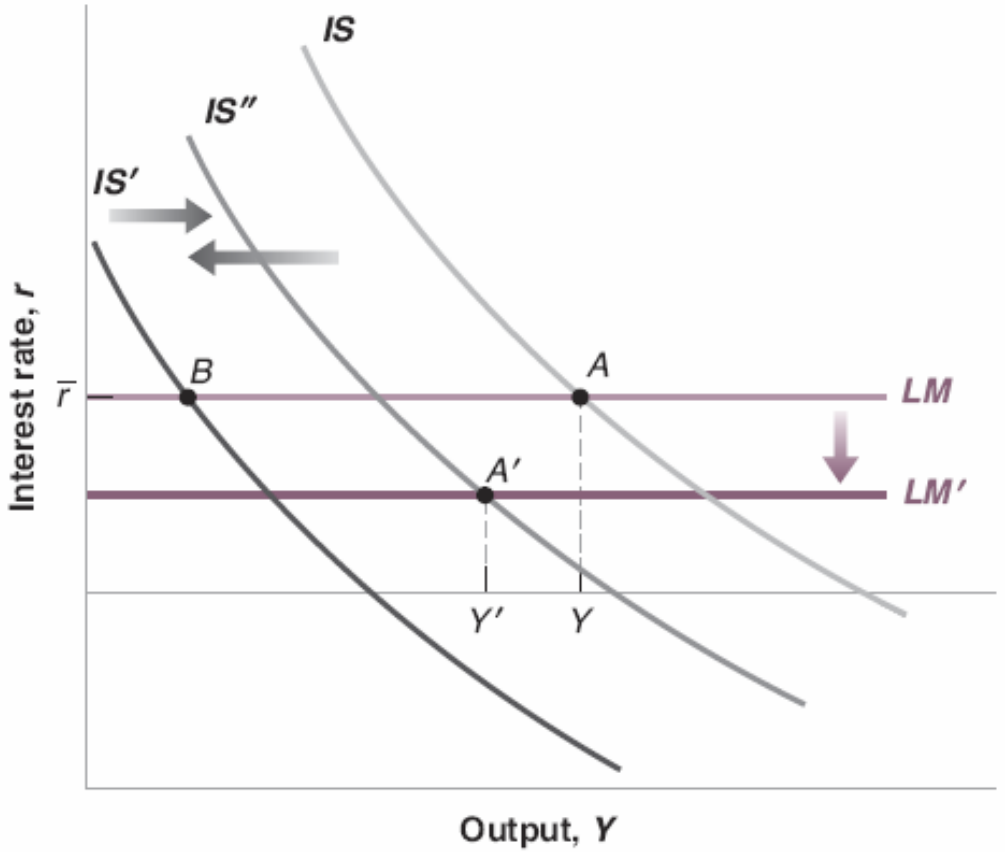
- IS: $Y = C(Y - T) + I(Y, r + x) + G$
- LM: $r = \bar{r}$
- At the onset of the global financial crisis, housing prices ↓, stock price ↓, and consumer confidence ↓: $c_0 \downarrow$ $IS \leftarrow$
- The risk premium $x \uparrow \rightarrow I \downarrow$ given Y, r, T, and G $\rightarrow$ $IS \leftarrow$

- Policy responses
  - Fiscal Policy: $G \uparrow, T \downarrow$
  - Monetary Policy: $i \downarrow$ to 0.
    The CB could not lower r below $0 - \pi^e$

The financial crisis in 2007-08 and policy responses



- w/o policy responses



- w/ policy responses
- $\bar{r}\downarrow$ was not sufficient due to the ZLB.