

Exercise 6

IS-LM Model

Sariya Jearakul
#6404641042

- The IS-LM Model is a general equilibrium model, which means that we are clear 2 markets at the same time and those 2 are relate to each others.
There are 2 markets, which are G & S market and money market
The price that clears these markets is Interest rate
The IS curve represents a negative relationship between i and Y. This is because when we have higher interest rate discourage investors and hence reduce AE(Y)
The LM curve represents a positive relationship between i and Y. This is because higher in i raises Y, so that $M_d = M_s$
Each point on the IS curve is an equilibrium in the goods market.
Therefore, we have the equilibrium condition: $Y_N = AE_N(i_N)$ [Each point in the IS curve represent each equilibrium point in the Keynesian cross.
Each point on the LM curve is an equilibrium in the money market.
Therefore, we have the equilibrium condition: Each point in the LM curve represent each equilibrium point in the Money market
Real $M_d =$ Real M_s

- Ceteris Paribus (other things equal), how will each variable affect each curve – shift (to which direction?) or movement?

Variable	IS Curve	LM Curve
$i \uparrow$	$I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$ / i move $\uparrow$, Y move $\downarrow$	$i \uparrow \rightarrow M_d \downarrow \rightarrow Y \uparrow \rightarrow M_d \uparrow$; $i \uparrow \rightarrow Y \uparrow$ both move $\uparrow$
$G \downarrow$	Shift to the left / $G \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$	
$T \downarrow$	Shift to the right / $T \downarrow \rightarrow AE \uparrow \rightarrow Y \uparrow$	
$G \& T \uparrow$ equally	Shift to the right / $T \downarrow \rightarrow AE \uparrow \rightarrow Y \uparrow$	
$M \downarrow$		Shift to the left
$P \downarrow$		Shift to the right

- Explain, together with diagrams, how we can derive the IS curve from Keynesian Cross, and how we can derive the LM curve from the money market.

EXAM

- Assume a closed economy with the government. The economy has the following parameters:

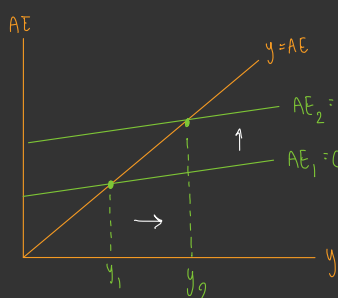
$$C = C_0 + C_1(Y - T) \quad I = I_0 - I_1 \cdot i \quad G = G_0 \quad T = T_0$$

$$L(i, Y) = L_Y \cdot Y - L_i \cdot i \quad M = M_0 \quad P = P_0$$

Answer the following questions.

- What are I_1 , L_Y , and L_i ?
- Why are I_1 and L_i negative?
- Derive the IS equation that shows how i and Y are related.

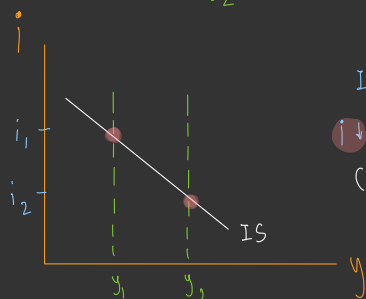
3. Explain, together with diagrams, how we can derive the IS curve from Keynesian Cross, and how we can derive the LM curve from the money market.



$i \downarrow \rightarrow I \uparrow \rightarrow AE \uparrow$

$$AE = C + I + G + NX$$

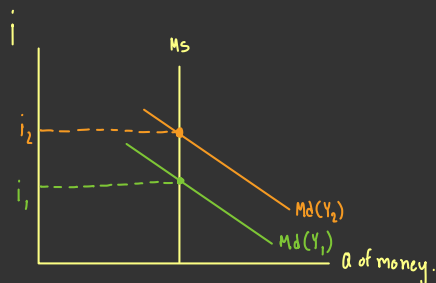
The IS curve is derived from a closed-economy Keynesian's cross.



IS relation:

$i \downarrow \rightarrow I \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$
(negative relationship btw i & Y)

A decrease in the interest rate shift the planned expenditure line up and thus increases the level of income at which actual and planned expenditure are equal, and decrease in the Interest rate.

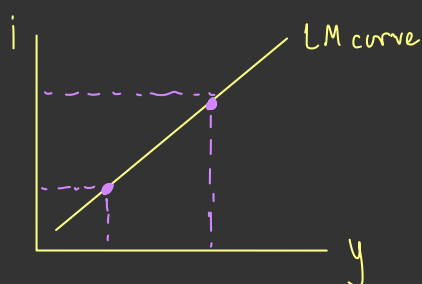


$Y \uparrow \rightarrow M_d \uparrow$

$i \uparrow \rightarrow M_d \downarrow$

LM curve is derived from money market i.e. M_d and M_s

The LM curve show the combination of output and interest rate that leads to the equilibrium in the money market for a given price.



Where money is high powered money which includes currency and reserves issued by the Government. High powered money pays no interest the opportunities cost of holding money is the nominal interest.

$$\frac{M}{P} = L(Y, i), \quad L_i < 0, \quad L_Y > 0$$

$$L(Y, i) = L_Y \cdot Y - L_i \cdot i$$

$\uparrow$ Sensitivity of M_d to Δ in Y $\uparrow$ Sensitivity of M_d to Δ in i

$$M_s = M_d$$

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

4. Assume a closed economy with the government. The economy has the following parameters:

$$C = C_0 + C_1(Y - T) \quad I = I_0 - I_1 \cdot i \quad G = G_0 \quad T = T_0$$

$$L(i, Y) = L_Y \cdot Y - L_i \cdot i \quad M = M_0 \quad P = P_0$$

Answer the following questions.

- 4.1 What are I_1 , L_Y , and L_i ?
- 4.2 Why are I_1 and L_i negative?
- 4.3 Derive the IS equation that shows how i and Y are related.

$$AE = C + I + G + NX$$

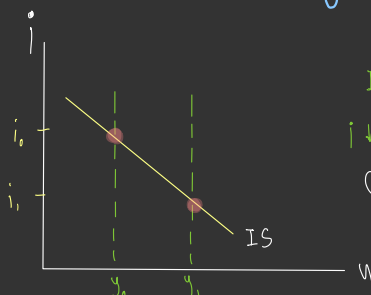
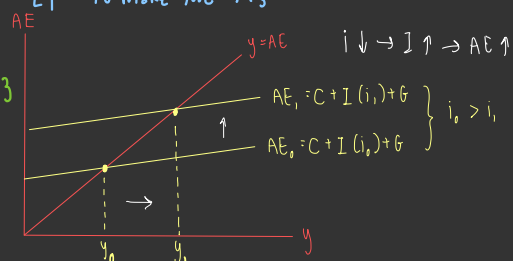
4.1 I_1 = The Investment that increase or decrease from the original (I_0).

L_Y = Sensitivity of M_d to change in Y (output).

L_i = Sensitivity of M_d to change in i (interest rate).

4.2 - I_1 = because when interest rate increase by 1 unit, investment will decrease by I_1 units.

- L_i = to make $M_d = M_s$



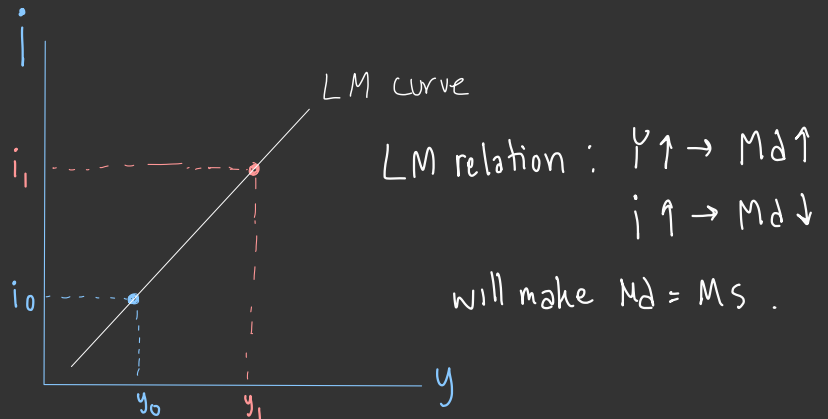
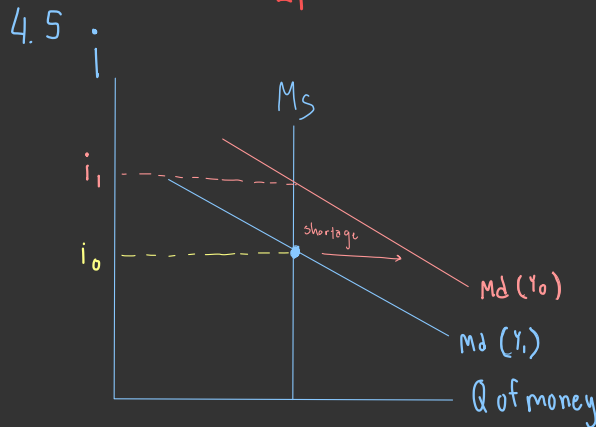
IS relation:

$i \downarrow \rightarrow I \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$
(negative relationship btw i & Y)

- 4.4 Find the slope of the IS curve.
(Hint: The coefficient before Y is the slope of IS.)
- 4.5 Derive the LM equation that shows how i and Y are related.
(Hint: Start with the equilibrium condition $M_d = M_s$. Then, substitute relevant variables into the expression. Lastly, rearrange i to the LHS and everything else on the RHS.)
- 4.6 Find the slope of the LM curve.
(Hint: The coefficient before Y is the slope of LM.)

4.4 Slope of IS curve = $-I_i$; Maybe flat or steep depending on the sensitivity of investment to the interest rate.

$$= -\frac{[1-c(1-t)]}{-I_i} < 0$$



4.6 Slope of LM curve = L_y / L_i , Maybe flat or steep depending on how sensitive money demand is to changes in the interest rate.

5. From Question 4.4, we can see that the slope of IS curve depends on two factors. Explain how each of these factors affects the slope of the IS curve. We also can see that the slope of LM curve depends on two factors. Explain how each of these factors affects the slope of the LM curve.

steep: (slope is a large negative number) when investment is insensitive to changes in the interest rate (small change in I and Y).

flat: (slope is close to zero) when a small change in interest rate leads to a large change in investment (large change in income).

steep: (slope is a large positive number) when money demand is insensitive to changes in the interest rate is needed to increase money demand to the new higher level of money supply. A change in money supply can have big impacts on the economy.

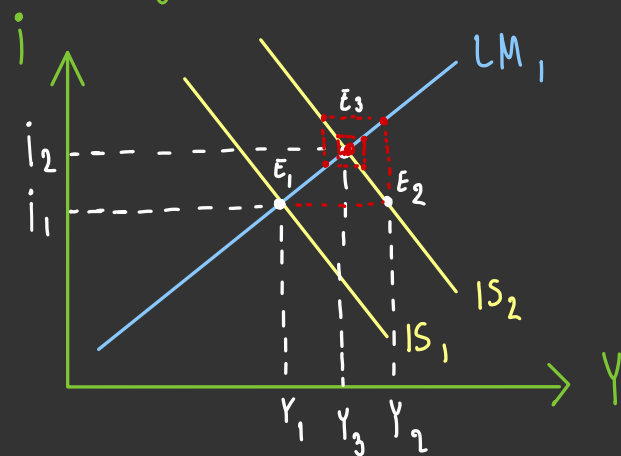
(LM)

flat: (slope is close to zero) when a small change in interest rate leads to a large change in money demand. A change in Money supply will have little impact on interest rates and the economy.

6. What is the Crowding-Out Effect?

Suppose that the government increases its spending, i.e. **expansionary fiscal policy**. Use the IS-LM diagram to explain how the economy moves to the new general equilibrium and the crowding-out effect.

Crowding-out Effect : G reduces or eliminates I . ($Y \uparrow, i \uparrow$)



$G \uparrow T \downarrow$ or both $G \& T \uparrow$

1st : in GM ; $G \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$

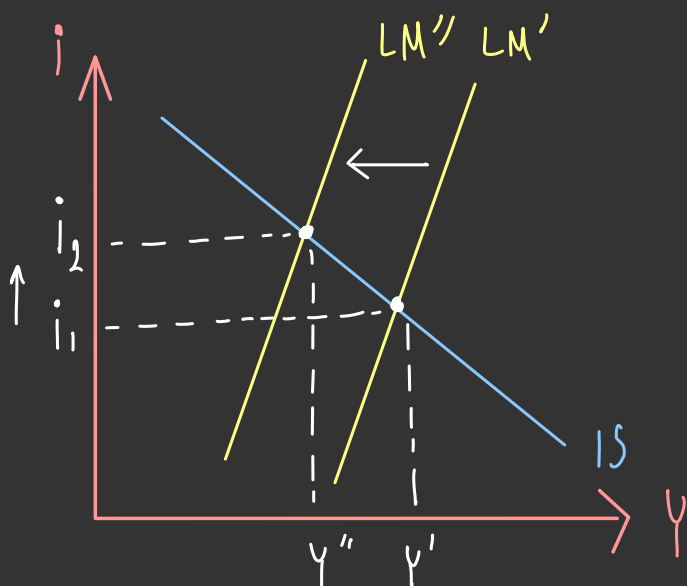
2nd : in MM ; $Y \uparrow \rightarrow M_d \uparrow \rightarrow i \uparrow$

3rd : in GM ; $i \uparrow \rightarrow I \downarrow \rightarrow Y \downarrow$

Now, GM and MM are in equilibrium at E3.

7. Suppose the central bank decreases its money supply, i.e. **contractionary monetary policy**. Use the IS-LM diagram to explain how the economy moves to the new general equilibrium.

$M \downarrow, i \uparrow$

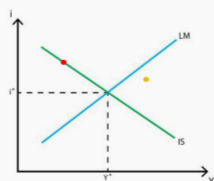


increase in interest rate to reduce inflation.

$i \uparrow \rightarrow C, I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$

So firms produce less because of the lower demand will make $Y = AE$ new equilibrium.

8. Use the graph below to answer the following questions.



8.1 At the **Red** point, which market is in equilibrium, and which is not?

8.2 Explain how the goods and money markets at the **Orange** point will adjust towards the general equilibrium (Y^*, i^*).

8.2 IS curve : At points to the right of the IS curve ($Y > AE$). Producers will produce less, and hence Y falls back to equilibrium.

LM curve : At points to the right of the LM curve ($i > i^*$). People will buy bond $\rightarrow$ The demand for bond will be high $\rightarrow$ Bond Issuers will respond by reducing the interest rate $\rightarrow$ return to equilibrium.

8.1 Goods & Service market is in equilibrium, Money market is not.

9. The government is worried about the effectiveness of its policies. You are to advise which policy – fiscal or monetary – should be used in each of the following cases.

9.1 Consumers have high MPC. *Monetary*

9.2 Investment is NOT sensitive to changes in interest rate. *Fiscal*

9.3 Money demand is very sensitive to changes in interest rate. *Monetary*

9.4 Money demand is very sensitive to changes in income (Y). *Fiscal*

10. Assume a closed economy with the government. The economy has the following parameters:

$$C = 100 + 0.5(Y_d) \quad I = 80 - 100(i) \quad G = 40 \quad T = 40$$

$$L(i, Y) = 0.5(Y) - 200(i) = \frac{M}{P} \quad M = 400 \quad P = 2$$

Answer the following questions.

Money Price

10.1 Derive the IS equation.

10.2 Derive the LM equation.

10.3 Find the general equilibrium output and interest rate.

$$10.1 \quad Y = C + I + G$$

$$= (100 + 0.5(Y - 40)) + (80 - 100i) + 40$$

$$= 100 + 0.5Y - 20 + 80 - 100i + 40$$

$$= 200 + 0.5Y - 100i$$

$$0.5Y = 200 - 100i$$

$$IS \text{ curve: } Y^* = 400 - 200i$$

$$10.2 \quad = \frac{M}{P} = 0.5Y - 200i$$

$$M = 400, P = 2 \quad ; \quad \frac{400}{2} = 200$$

$$0.5Y = 200 - 200i$$

$$LM \text{ curve: } Y^* = 400 - 400i$$

$$10.3 \quad IS \text{ curve: } Y = 400 - 200i$$

$$LM \text{ curve: } Y = 200 + 400i$$

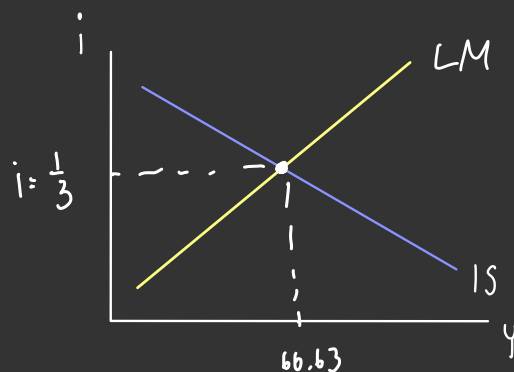
$$Y = 400 - 200i = Y = 200 + 400i$$

$$= 400 - 200i = 200 + 400i$$

$$= 200 = 600i$$

$$i = \frac{200}{600} = \frac{1}{3} \approx 0.33$$

$$i^* = \frac{1}{3}$$



$$IS : Y^* = 400 - 200\left(\frac{1}{3}\right)$$

$$LM : Y^* = 400 - 400\left(\frac{1}{3}\right)$$

$$Y^* = 66.63$$