

Exercise 6

IS-LM Model

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1. The IS-LM Model is a general equilibrium model, which means

that.....there is a common price that clears two or more markets.....

There are.....2.....markets, which are.....money market and goods market.....

The price that clears these markets is.....interest rate.....

The IS curve represents a.....negative.....relationship between

interest (I) and.....output (Y). This is because.....higher level of interest rate discourage

have investors from investing and decreases in output ($i \uparrow \rightarrow I \downarrow \rightarrow Y \downarrow$).....

The LM curve represents a.....positive.....relationship between

interest (I) and.....output (Y). This is because.....higher level of income people have

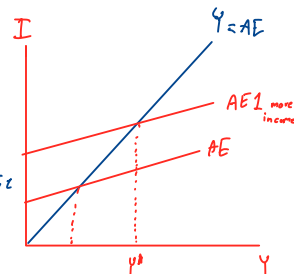
more demand for money, it will drive up interest rate ($Y \uparrow \rightarrow i \uparrow$).....

Each point on the IS curve is an equilibrium in the.....goods.....market.

Therefore, we have the equilibrium condition: $Y = AE$

Each point on the LM curve is an equilibrium in the.....money.....market.

Therefore, we have the equilibrium condition: $m_s = m_d$



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

IS equation: $Y = C(Y-T) + I(i) + G$ LM equation: $m/p = L(i, Y)$

Variable	IS Curve	LM Curve
$i \uparrow$	movement	movement
$G \downarrow$	shift left	—
$T \downarrow$	shift right	—
$G \& T \uparrow$ equally	shift right	—
$M \downarrow$	—	shift left
$P \downarrow$	—	shift right

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.

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

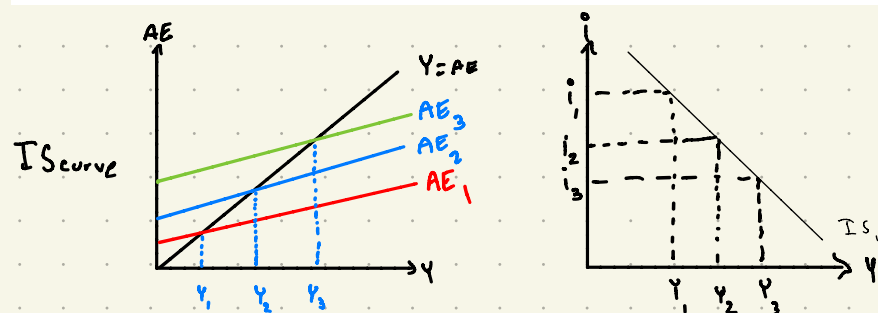
$$C = C_0 + C_1(Y - T) \quad I = I_0 - I_1 \cdot i \quad G = G_0 \quad T = T_0$$

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

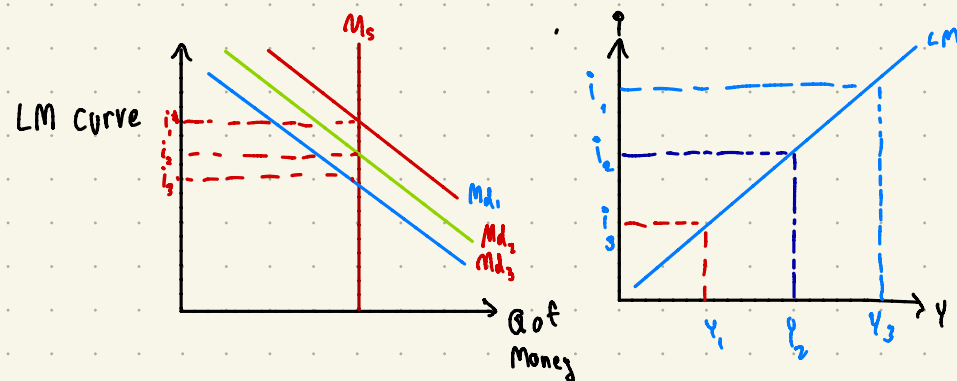
Answer the following questions.

- 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.

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.



In IS curve, the interest rate and output have negative relation.
In Goods market, when interest rate is high, it discourages investors to invest, so investment decreases. With lower investment, output falls.



In LM curve, the interest rate and output have positive relation.
In Money market, when interest rate is low, people have low income so they will demand less money, but if interest rate is high, people have high income so they will demand high money.

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.

① I_1 = sensitivity of Investment to change in interest rate

L_Y = sensitivity of money demand to change in income

L_i = sensitivity of money to change in interest rate

② I_1 is negative b/c when interest rate is growing up, it will discourage investment.

L_i is negative b/c when income is growing up, people will demand less money.

③ $Y = AE$

$$Y = C + I + G$$

$$Y = C_0 + C_1(Y - T) + I + G$$

$$Y = C_0 + C_1(Y - T) + I_0 - I_1 \cdot i + G_0$$

$$I_1 \cdot i = C_0 + C_1(Y - T) + I_0 + G_0 - Y$$

$$i = \frac{C_0 + C_1(Y - T) + I_0 + G_0 - Y}{I_1}$$

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

$Y = m \times c$ (slope)

$$i = \frac{G_0 + C_1(Y - T_0) + I_0 + G_0 - Y}{I_1}$$

multiplier: $\frac{1}{1 - MPC}$

$$i = \frac{-(1 - c_1)Y + c_0 - c_1T_0 + I_0 + G_0}{I_1}$$

$$i = -\frac{(1 - c_1)Y}{I_1} + \frac{c_0 - c_1T_0 + I_0 + G_0}{I_1}$$

$$i = -\left(\frac{1}{m} \times \frac{1}{I_1}\right)Y + \frac{c_0 - c_1T_0 + I_0 + G_0}{I_1}$$

slope of is equation is $-\left(\frac{1}{m} \times \frac{1}{I_1}\right)$

⑤

$$M_d = M_s$$

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.

Slope of IS is $-(\frac{1}{\alpha} \times \frac{1}{I_1})$

Slope of LM is $\frac{L_y}{L_i}$

Slope of IS is depend on α and I_1 . When these two factor are high, IS curve will be flat. If these two factors are low IS curve will be steep.

Slope LM depend on L_y, L_i

When L_y is high, LM curve will be steep

When L_i is low, LM curve will be flat

(Hint: Start with the equilibrium condition $Y = AE$. Then, substitute relevant variables into the expression. Lastly, rearrange i to the LHS and everything else on the RHS.)

4.4 Find the slope of the IS curve.

(Hint: The coefficient before Y is the slope of IS.)

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(Hint: The coefficient before Y is the slope of LM.)

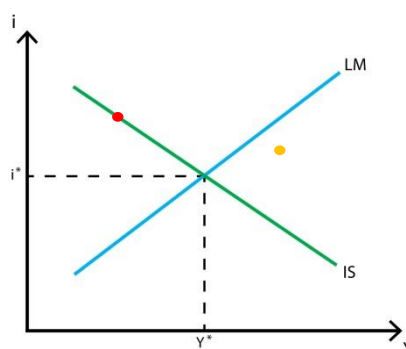
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6. What is the Crowding-Out Effect?

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.

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.

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^*) .

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.

9.2 Investment is NOT sensitive to changes in interest rate.

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

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

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

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

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

Answer the following questions.

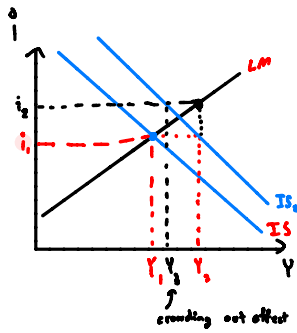
10.1 Derive the IS equation.

10.2 Derive the LM equation.

10.3 Find the general equilibrium output and interest rate.

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.



$G \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$: Good market
 $Y \uparrow \rightarrow I \uparrow$: Money market
 $I \uparrow \rightarrow Y \downarrow$: Good market

Firstly

in GM $i \downarrow$

crowding out effect is a problem
 fiscal policy that gov. increase its spending
 or reduce taxes

From the graph, Firstly the gov., is increase spending ($G \uparrow$), it cause AE which output will rise as well.

Hence, its represent by shifting rightward of IS curve ($IS \rightarrow IS'$) at Y_2 .

Then, in money market, as output increases, it leads to shift money demand to the right, so it also pushed up the interest level at i^2 .

Increasing interest rate, it will discourage the investors from investing, hence the AE falls which output will drop from Y^2 to Y^3 . This represent the crowding-out effect.

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IS equation: $Y = C + I + G$

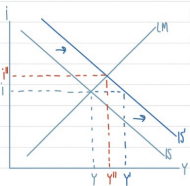
LM equation: $M = L(i, Y)$

Expansionary fiscal policy $\rightarrow G \uparrow$ (IS shift)

GM: $G \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$

MM: $Y \uparrow \rightarrow Md \uparrow \rightarrow i \uparrow$

GM: $i \uparrow \rightarrow I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$

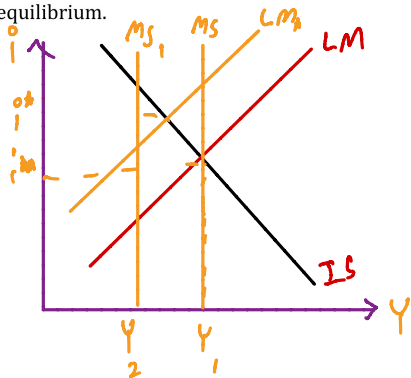


Crowding-out effect is a problem of fiscal policy when gov. increases its spending or reduces tax.

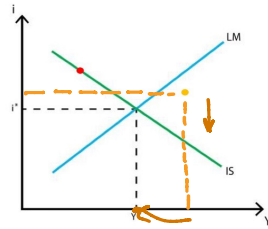
From the graph, Firstly the gov. increases its spending ($G \uparrow$), it causes AE rises which output will rise as well. Hence, this represented by shifting rightward of IS curve ($IS \rightarrow IS'$) at Y_2 .

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8.1 Goods market in equilibrium

8.2 Money market = $i \uparrow$

GM = $i \uparrow$ $I \downarrow$ $Y \downarrow$

MM = $Y \downarrow$ $M_d \downarrow$ $i \downarrow$

GM = $i \uparrow$ $I \downarrow$ $Y \downarrow$

} and so until it reach Y^* and i^*

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.
 - 9.2 Investment is NOT sensitive to changes in interest rate.
 - 9.3 Money demand is very sensitive to changes in interest rate.
 - 9.4 Money demand is very sensitive to changes in income (Y).

9.1 High MPC $\rightarrow$ IS flat

$\therefore$ monetary should be used it is more effective

9.2 Investment is not sensitive to change in interest rate $\Rightarrow$ IS steep

$\therefore$ monetary should

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

Answer the following questions.

10.1 Derive the IS equation.

10.2 Derive the LM equation.

10.3 Find the general equilibrium output and interest rate.

10.1 IS equation

$$Y = C + I + G$$

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

$$Y = 100 + 0.5(Y - 40) + 120 - 100i$$

$$Y = 920 + 0.5(Y - 40) + 100i$$

$$20 \times \frac{1}{2}$$

$$0.5Y = 200 + 100i$$

$$Y = 400 + 200i \quad \text{--- (1)}$$

10.2 MS = MD

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

$$\frac{400}{2} = 0.5Y - 200i$$

$$P$$

$$200 = 0.5Y - 200i$$

$$200 \times 2$$

$$\frac{200 + 200i}{0.5} = Y$$

$$400 + 400i = Y \quad \text{--- (2)}$$

10.3 (1) = (2)

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

$$-200i = 0$$

$$i = 0$$