

Exercise 6

IS-LM Model

- The IS-LM Model is a general equilibrium model, which means that.....
 There are.....markets, which are.....
 The price that clears these markets is.....
 The IS curve represents a.....relationship betweenand.....This is because.....

 The LM curve represents a.....relationship betweenand.....This is because.....

 Each point on the IS curve is an equilibrium in the.....market.
 Therefore, we have the equilibrium condition:
 Each point on the LM curve is an equilibrium in the.....market.
 Therefore, we have the equilibrium condition:

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

Variable	IS Curve	LM Curve
$i \uparrow$		
$G \downarrow$		
$T \downarrow$		
$G \& T \uparrow$ equally		
$M \downarrow$		
$P \downarrow$		

- 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:

$$\begin{array}{llll}
 C = C_0 + C_1(Y - T) & I = I_0 - I_1 \cdot i & G = G_0 & T = T_0 \\
 L(i, Y) = L_Y \cdot Y - L_i \cdot i & M = M_0 & P = P_0 &
 \end{array}$$

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.

(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.)

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.)

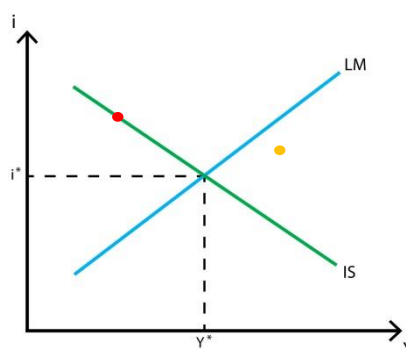
5. From Question 4.4, we can see that the slope of IS curve depends on two factors. Explain how each of these factors affects the slope of the IS curve. We also can see that the slope of LM curve depends on two factors. Explain how each of these factors affects the slope of the LM curve.

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.

Answer

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

that there exists a common "price" that clears two or more markets.

There are 2 markets, which are G & S market, money market

The price that clears these markets is the interest rate

The IS curve represents a negative relationship between

i and Y (G&S). This is because higher interest rates discourage investors from investing.

The LM curve represents a positive relationship between

i and Y (M). This is because higher level of Y (people have more income) , people have more demand for money to buy G & S. Higher demand of money $\uparrow$ i.

Each point on the IS curve is an equilibrium in the G & S market.

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

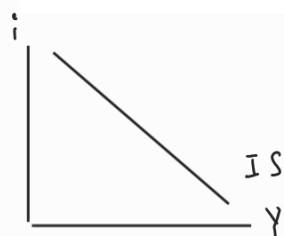
Each point on the LM curve is an equilibrium in the money market.

Therefore, we have the equilibrium condition: $M_d = M_s$

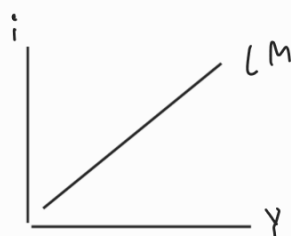
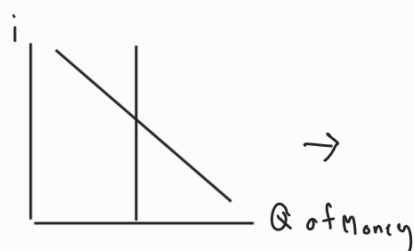
2. Ceteris Paribus (other things equal), how will each variable affect each curve – shift (to which direction?) or movement?

Variable	IS Curve	LM Curve
$i \uparrow$	movement	movement
$G \downarrow$	shift to the left	movement
$T \downarrow$	shift to the right	movement
$G \& T \uparrow$ equally	shift to the right	movement
$M \downarrow$	movement	shift up/ to the left
$P \downarrow$	movement	Shift down/ to the 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.



IS curve is a locus point that each point is an eqbm in Keynesian cross



LM curve is eqbm condition in the money market
 $M_d = M_s$

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.

4.1) $I_1 \rightarrow$ Slope of the investment function.

$L_Y \rightarrow$ Sensitivity of M_d to ΔY

$L_i \rightarrow$ Sensitivity of M_d to Δi

4.2) Both I_1 and L_i have a negative relationship with interest rate.

If there is increase in i , the investment and the money demand will be decreased.

4.3) $i \downarrow \rightarrow I \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$ (Have a negative relationship)

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

4.4 Find the slope of the IS curve.

$$Y = AE$$

$$Y = C + I + G$$

$$Y = C_Y - C_T + I(i) + G$$

$$0 = (c-1)Y - C_T + I(i) + G$$

$\therefore$ Slope of IS curve = $c-1$

4.5 Derive the LM equation that shows how i and Y are related.

$$i \uparrow \Rightarrow M_d \downarrow \Rightarrow Y \uparrow \Rightarrow M_d \uparrow \Rightarrow M_d = M_s$$

4.6 Find the slope of the LM curve.

$$\frac{M}{P} = L_y Y - L_i i$$

$$i = \frac{L_y}{L_i} Y - \left(\frac{M}{P}\right) \left(\frac{1}{L_i}\right)$$

$$L_i \cdot i = L_y Y - \frac{M}{P}$$

$\therefore$ Slope of LM curve is $= \frac{L_y}{L_i}$

5. From Question 4.4, we can see that the slope of IS curve depends on two factors.

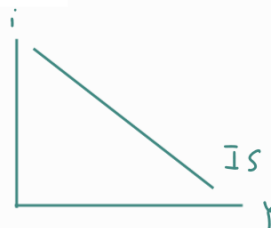
Explain how each of these factors affects the slope of the IS curve. We also can see that the slope of LM curve depends on two factors. Explain how each of these factors affects the slope of the LM curve.

2 factor affect on IS curve

1) Investment $\rightarrow$ if I_1 is sensitive to $\Delta i \rightarrow i \downarrow \rightarrow Y \downarrow$ a lot

2) Multiplier $\rightarrow$ if I multiplier large $\rightarrow Y \uparrow$ a lot

$\therefore$ When I_1 or m increase for 1 unit, IS decrease to 1 unit.

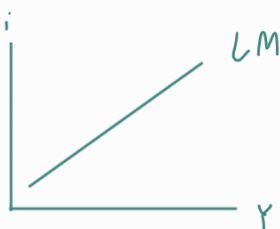


2 factor affect on LM curve

1) L_y (How much M_d changes when Y changes) $\rightarrow$ If L_y is large $\rightarrow Y \uparrow$ a little $\rightarrow M_d \uparrow$ a lot... $\rightarrow i \uparrow$ a lot $\rightarrow M_d \downarrow$ a lot $\therefore M_d = M_s$ (eq)

2) L_i (How much M_d change when i change) $\rightarrow$ If L_i is small $\rightarrow i \uparrow$ a lot $\rightarrow M_d \downarrow$ a little... $\rightarrow Y \uparrow$ a little $\rightarrow M_d \uparrow$ a little $\therefore M_d = M_s$ (eq)

$\therefore$ When L_i increase for 1 unit, L_y will increase for 1 unit.

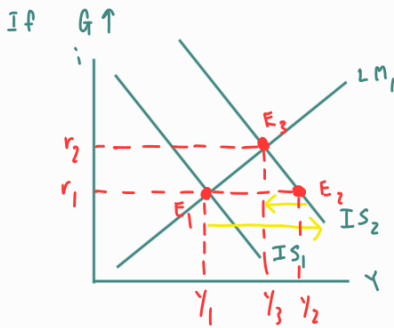


6. What is the Crowding-Out Effect?

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.

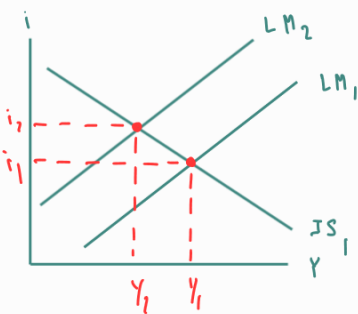
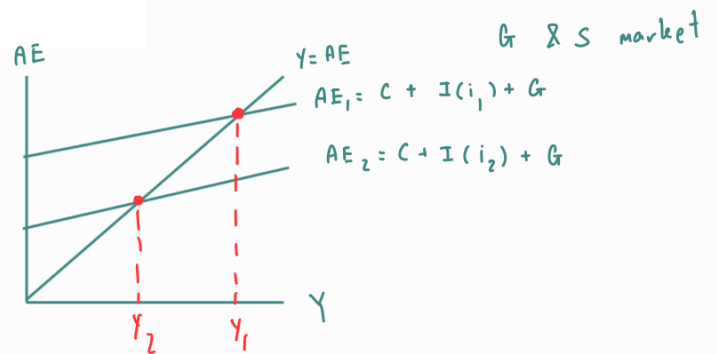
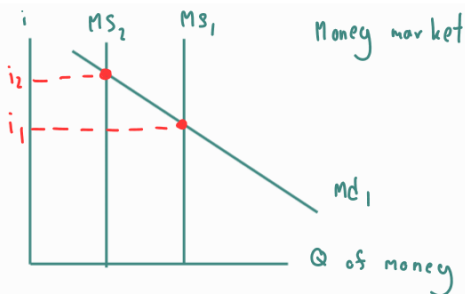
Crowding effect is one of the weakness of Fiscal policy.

↳ Ex: G increase $\Rightarrow$ borrowing. The large borrowing can lead to substantial rises in i
 $\therefore I \downarrow \Rightarrow AE \downarrow \Rightarrow Y \downarrow$



1. When G increase, $Y_1 \rightarrow Y_2$ (at E_2)
2. However, because of higher i (at E_3), investments fall.
3. Y_2 decrease to Y_3

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.



* Contraction monetary policy

MM: $M_s \downarrow \rightarrow i \uparrow$

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

When using contraction monetary policy

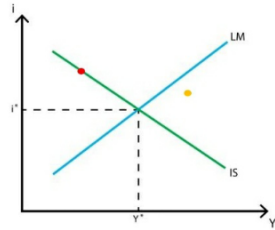
1) CB will $\downarrow M$

2) $\therefore M \downarrow \rightarrow i \uparrow$ (money market)

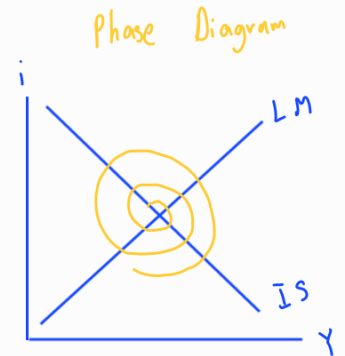
3) $\therefore i \uparrow \rightarrow I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$ (G & S market)

4) New eq. from $M \downarrow$: Lower Y , higher i

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^*).



8.1) At the red point G&S market is in eq, but money market is not.

8.2) Currently orange point is on the right side of both LM & IS curve there is excess supply and interest rate is below eq.

Thus, phase diagram will be used to adjust toward the general eqbm.

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) $MPC \uparrow \rightarrow IS$ curve steep $\rightarrow$ Use Fiscal Policy will be more effective $\therefore$ f.p. will provide more change in Y

9.2) investment is not sensitive to $\Delta i \rightarrow$ Use Fiscal Policy will be more effective $\therefore$ f.p. will provide more change in Y

9.3) M_d is sensitive to Δi ^(LM flat) $\rightarrow$ Use Monetary Fiscal will be more effective $\therefore$ f.p. will provide more change in Y

9.4) M_d is sensitive to ΔY ^(LM steep) $\rightarrow$ Use Monetary Policy will be more effective $\therefore$ M.p. will provide more change in Y

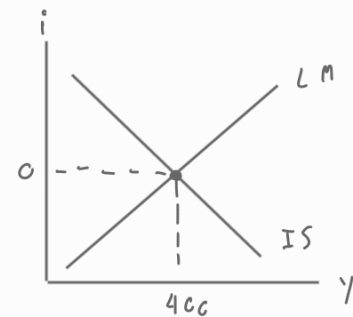
10. Assume a closed economy with the government. The economy has the following parameters:

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

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

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.



10.1) IS equation

$$Y = AE$$

$$Y = C + I + G$$

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

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

$$100i = 200 - 0.5Y$$

$$i = 2 - \frac{1}{200}Y$$

4.3) Find eqbm.

$$IS = LM$$

$$2 - \frac{1}{200}Y = \frac{1}{400}Y - 1$$

$$3 = \frac{1}{400}Y + \frac{1}{200}Y$$

$$3 = \frac{3}{400}Y$$

$$Y^* = 400$$

$$\therefore i^* = \frac{1}{400}(400) - 1 = 0 \quad \#$$

10.2) LM equation

$$M_s = M_d$$

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

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

$$200 = 0.5Y - 200i$$

$$200i = 0.5Y - 200$$

$$i = \frac{1}{400}Y - 1$$