

1. The IS-LM Model is a general equilibrium model, which means that exists a common price that clears two or more markets

There are 2 markets, which are 1) Goods and services market 2) Money market

The price that clears these markets is interest rate

The IS curve represents a negative relationship between interest rate and Output. This is because higher interest rate discourage inve vs from investing (b/c they are cost of borrowing)

The LM curve represents a positive relationship between Money demand and Money supply. This is because higher level of Y, people have have more demand for money to buy GSS, higher demand for money drives up interest rate

Each point on the IS curve is an equilibrium in the Good & service market.

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

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

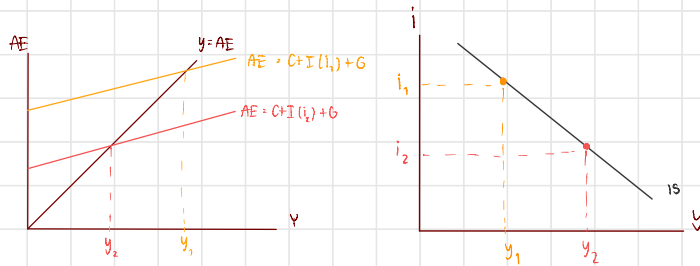
Therefore, we have the equilibrium condition:  $M_d = M_s$

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

Variable	IS Curve	LM Curve
$i \uparrow$	$I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$ : movement	$I \uparrow \rightarrow M_d \downarrow$ : movement
$G \downarrow$	shifts to the left	-
$T \downarrow$	shifts to the right	-
$G \& T \uparrow$ equally	shifts to the right	-
$M \downarrow$	-	shifts to the left
$P \downarrow$	-	shifts to the right

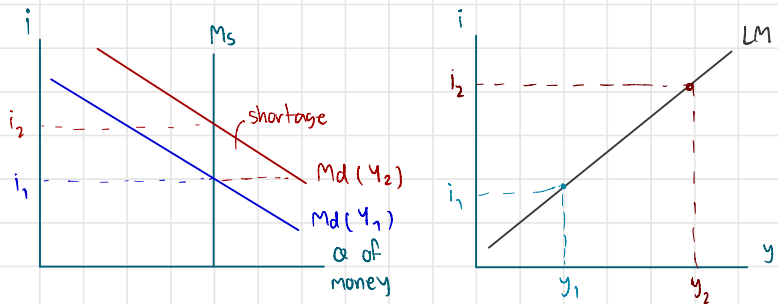
3. Explain, together with diagrams, how we can derive the IS curve from Keynesian Cross, and how we can derive the LM curve from the money market.

### The IS Curve



Movement along the IS curve due to change in  $i$ , higher  $i$  discourage investors ( $i \uparrow \rightarrow I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$ )  
 when  $i$  increase from  $i_2$  to  $i_1$ , its discourage  $I$  and reduces  $AE$   
 $Y$  also falls from  $y_2$  to  $y_1$ , (negative relationship)  
 on the other hand, if lower interest rate,  $AE$  and  $Y$  increase.

### The LM Curve



At higher level of  $Y$  (more income), people have more demand for money and drives up interest rate. example  $Md \uparrow$  it mean people hold more cash that cause inflation, interest rate will increase to reduce inflation to maintain  $Md$  equal to the fixed money supply

$\therefore Y \uparrow \rightarrow Md \uparrow \rightarrow i \uparrow \rightarrow Md \downarrow \gg Md = Ms$

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

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

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

4.1 What are  $I_1$ ,  $L_Y$ , and  $L_i$ ?

$I_1$  : slope of the investment function

$L_Y$  : the sensitivity of  $M_d$  to changes in  $Y$

$L_i$  : the sensitivity of  $M_d$  to changes in  $i$

4.2 Why are  $I_1$  and  $L_i$  negative?

Because when interest rate increase, investment will decrease ( $-I_1$ )  
and when  $i$  increase, Money demand will decrease ( $-L_i$ )

4.3 Derive the IS equation that shows how  $i$  and  $Y$  are related.

$$Y = AE$$

$$Y = C + I + G$$

$$Y = C_0 + C_1(Y - T_0) + (I_0 - I_1 i) + G_0$$

$$Y = C_0 + C_1 Y - C_1 T_0 + I_0 - I_1 i + G_0$$

$$I_1 i = C_0 + C_1 Y - C_1 T_0 + I_0 + G_0 - Y$$

$$i = \frac{C_0 + C_1 Y - C_1 T_0 + I_0 + G_0 - Y}{I_1}$$

4.4 Find the slope of the IS curve.

$$i = mY + c$$

$$i = \frac{C_0 + C_1 Y - C_1 T_0 + I_0 + G_0 - Y}{I_1}$$

$$\therefore \text{slope} = \frac{(C_1 - 1)}{I_1}$$

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

$$M_d = M_s$$

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

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

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

4.6 Find the slope of the LM curve.

$$\text{slope of LM curve} = \frac{L_Y}{L_i}$$

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.

$$\text{Slope of IS Curve} = \frac{(C_1 - 1)}{I_1} \quad \text{note multiplier} = \frac{1}{MPC} = \frac{1}{1 - c_1}$$

$I_1$  cause by change in interest rate. meaning when  $i$  decrease  $\rightarrow I$  will increase a lot and the slope of IS curve will be FLAT

**Multiplier** if multiplier is large ( $\frac{\Delta Y^*}{\Delta I}$  is large) that mean increase in  $I$  cause Large increase in  $y^*$   
So, slope of IS will be FLAT

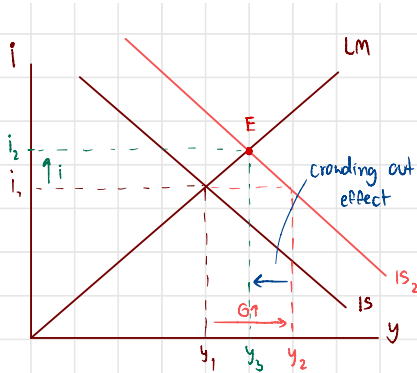
$$\text{Slope of LM Curve} = \frac{L_y}{L_i}$$

$L_y$  when  $L_y$  increase cause  $M_d$  increase a lot  
slope of LM will steep when  $L_y$  is large.

$L_i$  when  $i$  increase a lot (to equate  $M_d = M_s$ )  $M_d$  will decrease a lot  
if  $L_i$  is small, slope of LM is steep.

## 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.



Expansionary Fiscal Policy - consider when  $G \uparrow$

①  $GM : G \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow (y_1 \rightarrow y_2)$

$MM$  still the same

②  $MM : Y \uparrow \rightarrow M_d \uparrow \rightarrow i \uparrow$

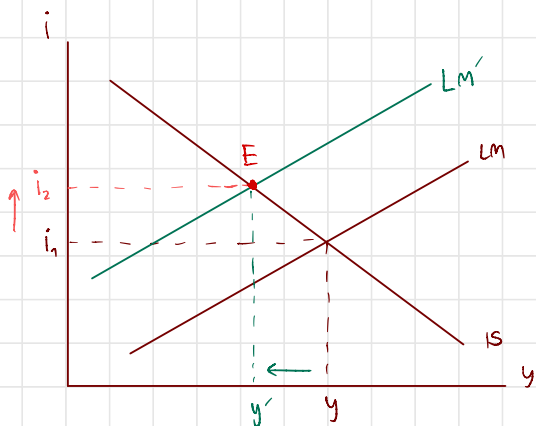
③  $GM : i \uparrow \rightarrow I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$

$E$  : new equilibrium from  $G \uparrow$

Crowding out effect : Government spending reduces private sector spending ( $I$ )

Explanation when government increase spending ( $G \uparrow$ ), it raise Aggregate expenditure and firms will produce more to supply the higher demand. So, this raise  $Y$  represent by IS curve shifting rightward. Then people have more income this raise the money demand and raise interest rate ( $i_1 \rightarrow i_2$ ). However higher interest rate will discourage investment, lower investment lead to output fall ( $y_2 \rightarrow y_3$ ) this show crowding out effect  
 $\therefore$  new equilibrium has higher  $Y$  and  $i$

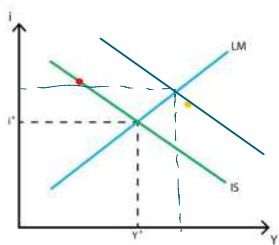
7. Suppose the central bank decreases its money supply, i.e. contractionary monetary policy. Use the IS-LM diagram to explain how the economy moves to the new general equilibrium.



$M_s \downarrow \rightarrow i \uparrow$   
 $i \uparrow \rightarrow I \downarrow \rightarrow AE \downarrow \rightarrow Y \downarrow$   
 E: new equilibrium from  $M_s \downarrow$

From the graph, when central bank decrease money supply that lead interest rate increase. Then LM curve shift leftward ( $LM \rightarrow LM'$ ). At higher interest rate firms decrease investment that reduce AE and firms produce less ( $y \rightarrow y'$ )  
 $\therefore$  new equilibrium has higher  $i$  but lower  $y$

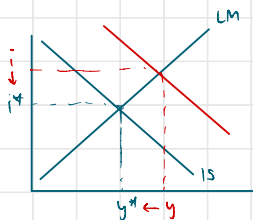
8. Use the graph below to answer the following questions.



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

Good and service market is in equilibrium and money market isn't in equilibrium at red point

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



$G \downarrow \rightarrow AE \downarrow \rightarrow y \downarrow$   
 $y \downarrow \rightarrow M_d \downarrow \rightarrow i \downarrow$

Use contractionary Fiscal Policy to decrease  $G$  and output will fall lead to decrease in Money demand and interest rate will decrease. IS curve will shift left toward general equilibrium.

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.

IS Flat  $\rightarrow$  Monetary Policy

9.2 Investment is NOT sensitive to changes in interest rate.

IS Steep  $\rightarrow$  Fiscal Policy is effective

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

LM Flat  $\rightarrow$  Fiscal Policy

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

LM Steep  $\rightarrow$  Monetary Policy

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

$$Y = AE$$

$$= C + I + G$$

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

$$0.5Y = 200 - 100i$$

$$i = \frac{200 - 0.5Y}{100}$$

10.2) LM equation

$$M_s = M_d$$

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

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

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

10.3) IS = LM

$$\frac{200 - 0.5Y}{100} = \frac{0.5Y - 200}{200}$$

$$400 - Y = 0.5Y - 200$$

$$600 = 1.5Y$$

$$Y = 400 \quad \times$$

$$i = \frac{200 - 0.5(400)}{100}$$

$$i = 0$$

$$\therefore Y = 400$$

$$i = 0 \quad \times$$