Exercise 6

IS-LM Model

1. The IS-LM Model is a <u>general equilibrium model</u>, which means that there is a common price that clears to two or more market.
   There are 2 markets, which are The goods & services market, The money market.
   The price that clears these markets is interest
   The IS curve represents a negative relationship between i and Y. This is because when investment increase, Y will fall, (i↑, Y↓)
   The LM curve represents a positive relationship between i and Y. This is because when investment increase, Y will increase, too.
   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. Cetaris Paribus (other things equal), how will each variable affect each curve – shift (to which direction?) or movement?

Variable	IS Curve	LM Curve
i↑	movement	movement
G↓	shift left	-
T↓	shift left	-
G&T↑ equally	shift right	-
M↓	-	shift left
P↓	-	shift right

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

Exam!

4. Assume a closed economy with the government. The economy has the following parameters:
   $C = C_0 + C_1(Y - T)$ $I = I_0 - I_1 \cdot i$ $G = G_0$ $T = T_0$
   $L(i, Y) = L_Y \cdot Y - L_i \cdot i$ $M = M_0$ $P = P_0$
   <u>Answer the following questions.</u>
   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.

(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 Md = Ms. Then, substitute relevant variables into the expression. Lastly, rearrange i to the LHS and everything else on the RHS.)

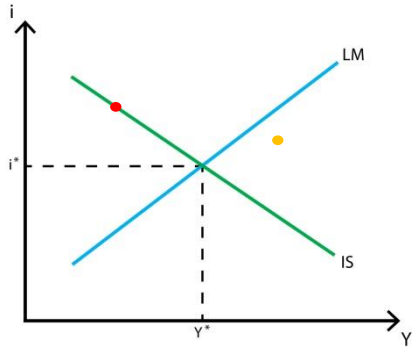
4.6 Find the slope of the LM curve.
(Hint: The coefficient before Y is the slope of LM.)

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:

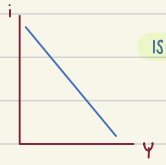
$C = 100 + 0.5(Yd)$ $I = 80 - 100(i)$ $G = 40$ $T = 40$

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

Answer the following questions.

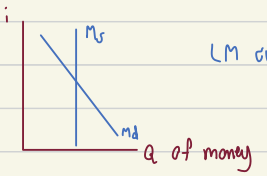
   10.1 Derive the IS equation.
   10.2 Derive the LM equation.
   10.3 Find the general equilibrium output and interest rate.

3.



IS curve is a Locus of point that each point is an eqbm in Keynesian Cross

$Y = AE$



LM curve is eqbm condition in the Money market

$Md = Ms$

4.

1.) What are I_1, L_y, L_i ? : I_1 = slope of the investment function

L_y = sensitivity of Md to ΔY

L_i = sensitivity of Md to Δi

2.) Why I_1 and L_i negative? : $I_1 \rightarrow \frac{dI}{di} = -I_1$, meaning that when i ↑ 1 unit, I will decrease by I_1 units

$L_i \rightarrow$ when $i \uparrow \rightarrow Md \downarrow$

3.) Derive the IS equation that show how i, Y are related. : $i \downarrow \rightarrow I \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$ (Negative relationship)

4.) Find the slope of IS curve. : $Y = C(Y-T) + I(i) + G$

$Y = CY - CT + I(i) + G$

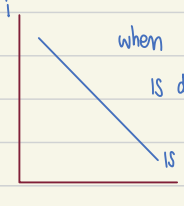
$I(i) = Y - CY + CT - G$

5.) Derive the LM equation that shows how i and Y are relate : $i \uparrow \rightarrow Md \downarrow \rightarrow Y \uparrow \rightarrow Md \uparrow \rightarrow Md = Ms$

6.) Find the slope of LM curve : L_y / L_i

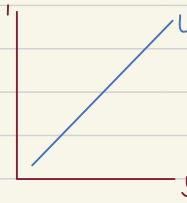
5.

· slope of IS curve = $\frac{-1}{I_1 m}$ $\quad m = \frac{1}{1-C_1}$



when I_1 or m increase for 1 unit, IS decrease fo 1 unit

· slope of LM curve = $\frac{L_y}{L_i}$



when L_i increase for 1 unit, L_y will increase for 1 unit

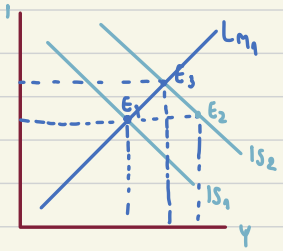
6. Crowding - Out effect : public sector spending (G) reduces or eliminates private sector spending (I)

Expansionary fiscal policy : when G↑ or T↓ or both G&T↑

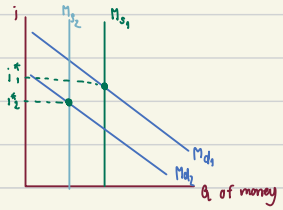
1.) GM : G↑ → AE↑ → Y↑ [GM at E_2 but MM is at E_1]

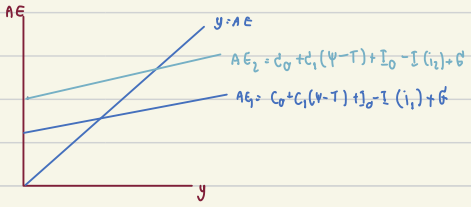
2.) MM : Y↑ → M_d↑ → i↑ [MM at E_3 but GM is at E_2]

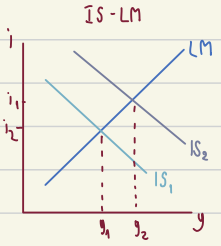
3.) GM : i↑ → I↓ → Y↓ [GM & MM are in eqbm at E_3] (crowding - out effect)



7.) CB decrease M_S (Money market) — Contractionary monetary policy (Goods Market)



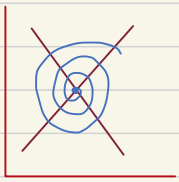




Note : Contrationary monetary policy
GM : $i \downarrow \rightarrow I \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$
MM : $Y \uparrow \rightarrow M_d \uparrow \rightarrow M \downarrow$

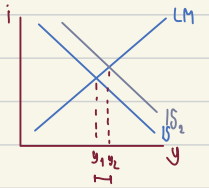
When the CB use contractionary monetary policy, the interest will be decrease. So ppl demand more cash → that reduce more supply. In Goods market, when interest rate decrease, Investment will be increase and effect expenditure higher so income and output become increase

8. 1) In red point, Y = AE in Goods market. However that's not money market eqbm
2.) At orange point, if you want adjust into eqbm, use those diagram



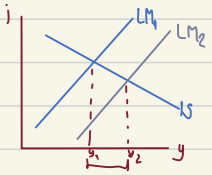
9. 1.) Higher MPC → multiplier is increasing

fiscal policy (G↑) → not effectively



Small change in Y, so it's not effective b/c crowding-out effect

Monetary Policy → effective



large ΔY, so it's effective

2.) I isn't sensitive to change i

Fiscal Policy

$AE : Y = C_0 + C_1(Y-T) + I_0 - I_1(i) + G$

∴ Investment sensitive to change i

Monetary policy

$M_S = M_d$

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

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

∴ Investment doesn't effect to monetary policy

3.) Monetary Policy

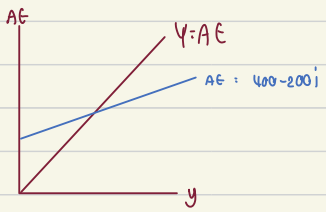
4.) Monetary Policy

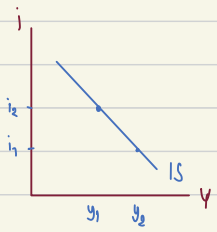
10. 1.) Derive the IS equation

$$AE = Y = C_0 + C_1(Y - \bar{T}) + I_0 - I_1(i) + \bar{G}$$

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

$$Y = 400 - 200i$$





2.) Derive LM curve

$$M_S = M_d$$

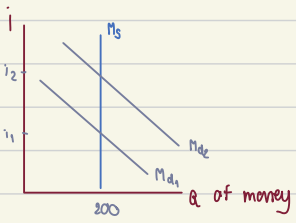
$$M/P = L(Y, i)$$

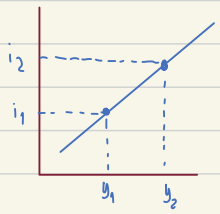
$$400/2 = L_y Y - L_i i$$

$$400/2 = 0.5(Y) - 200(i)$$

$$400 = Y - 400i$$

$$Y = 400 + 400i$$





3.) Find general eqbm output & interest rate

IS = LM

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

$$i = 0$$