

Exercise 6

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IS-LM Model

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- 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 the goods and 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 ($i \uparrow \rightarrow Y \downarrow$). 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 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: $M^d = M^s$.

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

Variable	IS Curve	LM Curve
$i \uparrow$	movement	movement
$G \downarrow$	shift left	movement
$T \downarrow$	shift left	movement
$G \& T \uparrow$ equally	shift right	movement
$M \downarrow$	movement	shift up / to the left
$P \downarrow$	movement	shift down / 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.
- Assume a closed economy with the government. The economy has the following parameters:
 $C = C_0 + C_1(Y - T)$ $I = I_0 - I_1 \cdot i$ $G = G_0$ $T = T_0$
 $L(i, Y) = L_Y \cdot Y - L_i \cdot i$ $M = M_0$ $P = P_0$

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.)

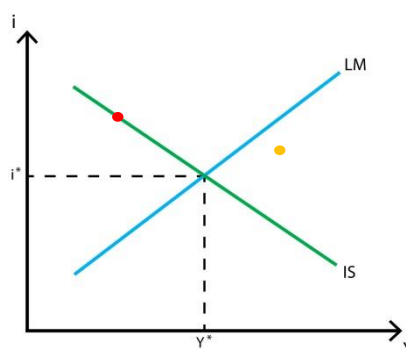
5. From Question 4.4, we can see that the slope of IS curve depends on two factors. Explain how each of these factors affects the slope of the IS curve. We also can see that the slope of LM curve depends on two factors. Explain how each of these factors affects the slope of the LM curve.

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:

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

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

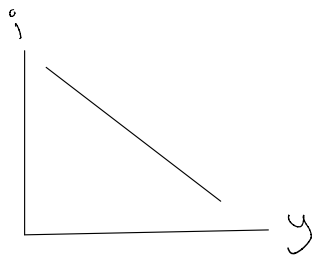
Answer the following questions.

10.1 Derive the IS equation.

10.2 Derive the LM equation.

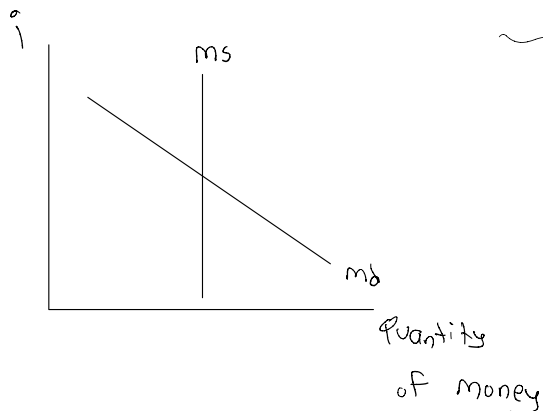
10.3 Find the general equilibrium output and interest rate.

3.



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

$$Y = AE$$



LM curve is equilibrium condition
in the money market.

$$m_d = m_s$$

4.

4.1 : I_1 = Slope of investment function

L_y = sensitivity of M_d to dy

L_i = sensitivity of M_d to Δi

4.2 : $I_1 = \frac{\partial I}{\partial i} = -I$ means when i increase one unit, I will decrease by I units.

L_i = when i increase, M_d decrease.

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

$$4.4 : Y = C(Y - T) + I(i) + G$$

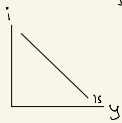
$$Y = CY - CT + I(i) + G$$

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

4.5 : $i \uparrow \rightarrow M_d \downarrow \rightarrow Y \uparrow \rightarrow M_d \uparrow \rightarrow M_d = M_s$

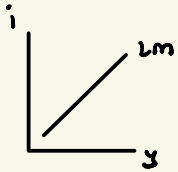
$$4.6 : \frac{L_y}{L_i}$$

5. Slope of IS curve = $-\frac{1}{\beta_1 m}$ $m = \frac{1}{1-c_1}$



when β_1 or m increase for 1 unit,
IS decrease to 1 unit

Slope of LM curve = $\frac{\beta_2}{\beta_1}$



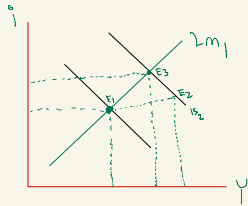
when β_1 increase for 1 unit,
 β_2 will increase for 1 unit.

6.

Crowding-out effect is public sector spending (G)
redres or eliminates private sector spending (I)

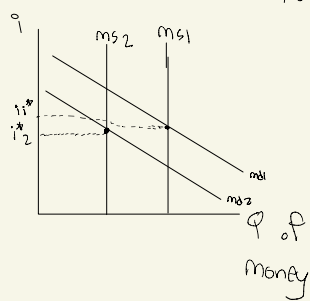
Expansionary fiscal policy : when $G \uparrow$ or $T \downarrow$ or both $G \uparrow$ $T \downarrow$

1. $GM : G \uparrow \rightarrow AE \uparrow \rightarrow Y \uparrow$ (GM at E_2 but MM at E_1)
2. $MM : Y \uparrow \rightarrow m_d \uparrow \rightarrow i \uparrow$ (MM at E_3 but GM at E_2)
3. $GM : i \uparrow \rightarrow I \downarrow \rightarrow Y \downarrow$ (GM & MM are in eqbm at E_1) (crowding-out effect)

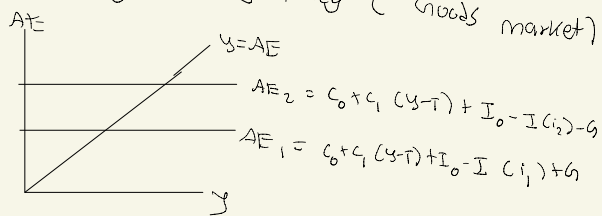


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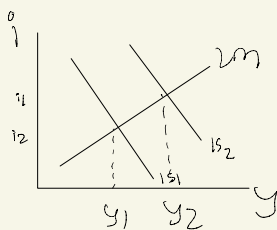
CB decrease m_s (money market)



Contractionary monetary Policy (Goods market)



IS-LM

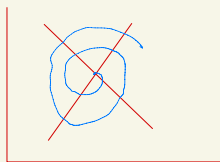


When the CB use Contractionary monetary policy, the interest will decrease. So people demand more cash that reduce more money supply.

In goods market, when interest rate decrease, Investment will increase and effect expenditure higher so income and output increase.

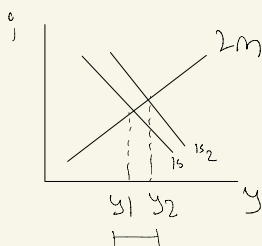
8.

1. In red point, 45° AE in goods market. However that's not money market eqbm.
2. At orange point, if you want to adjust into eqbm, use phase diagram.



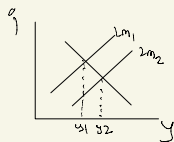
9.

1. Higher $mpe \rightarrow$ multiplier is increasing
fiscal policy (up) $\rightarrow$ not effectively



= small change in y ,
so its not effective
because crowding-out effect.

monetary policy $\rightarrow$ effective



= large Δy , so its 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

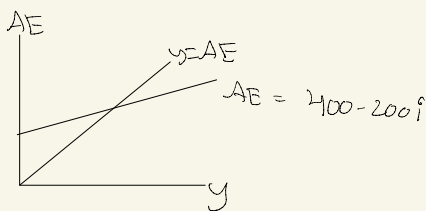
4. monetary policy

10.

$$1. AE = Y = C_0 + C_1 (Y - T) + I_0 - I_1 (i) + G$$

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

$$Y = 400 - 200i$$



$$2. ms = md$$

$$m/p = 2(Y, i)$$

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

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

$$800 = Y - 400i$$

$$Y = 400 + 400i$$

$$3. \quad 1s = 2m$$

$$2400 - 200i = 2400 + 400i$$

$$i = 0$$

