

Exercise 6

IS-LM Model

1. The IS-LM Model is a general equilibrium model, which means that *money market and product market are in equilibrium*. There are *2* markets, which are *money market and goods and service market*. The price that clears these markets is *real interest rate*. The IS curve represents a *negative* relationship between *output* and *interest rate*. This is because *higher interest rates discourage investors from investing → AE ↓ → Y ↓*. The LM curve represents a *positive* relationship between *i* and *Y*. This is because *higher Y = people have more income = more demand for money to buy G&S → higher interest rate*. Each point on the IS curve is an equilibrium in the *output* market. Therefore, we have the equilibrium condition: *AE = Y*. Each point on the LM curve is an equilibrium in the *money* market. Therefore, we have the equilibrium condition: *Md = Ms*.

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>no shift</i>
$G \downarrow$	<i>left</i>	
$T \downarrow$	<i>right</i>	
$G \& T \uparrow$ equally	<i>right</i>	
$M \downarrow$		<i>left</i>
$P \downarrow$		<i>right</i>

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.

IS curve is derived from a closed economy Keynesian cross, i.e. $Y = C + I + G$

- Investment depends on interest rate

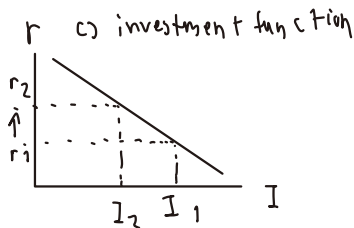
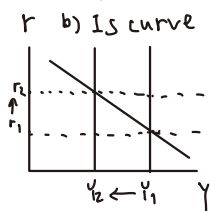
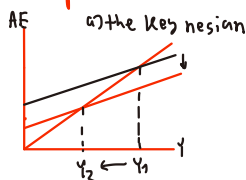
- higher i discourage investors from investing

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

- suppose i increases from i_1 to i_2 . Higher i discourages investors and hence reduces AE

As a result, when AE falls, Y also falls from Y_1 to Y_2

This negative relationship between i and Y is depicted in the IS curve.



LM curve

- Real money demand (M_d) = real money supply (M_s)
- M_s is given by M/P (real amount of money)
where M = nominal amount, P = price level

- The equilibrium of the money market

$$M_s = M_d$$

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

- Use the equilibrium condition of the money market $M/P = L(Y, i)$ to draw the LM
- When i changes, Y has to change too in order for the equality to hold.
- So whenever i goes up, Y has to go up as well as
 - when $i \uparrow \Rightarrow M_d \downarrow$ and $Y \uparrow \Rightarrow M_d \uparrow$
- Here, the two changes in M_d cancel each other, so M_d remains the same and equal to M_s
- The LM curve is drawn from this positive relationship between i and Y .

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 = the sensitivity of investment to changes in i

L_i = the sensitivity of M_d to changes in i

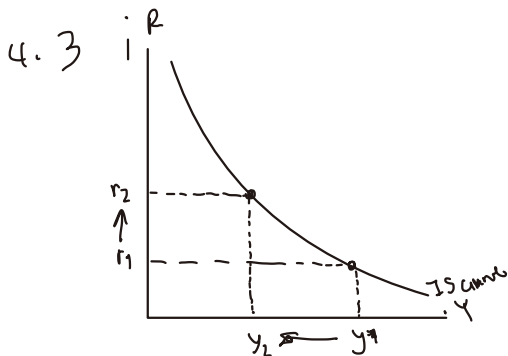
L_Y = sensitivity of M_d to changes in Y

4.2 For L_i

When interest is higher, people don't want to borrow money. So the demand is decrease

For I_1

When the interest rate goes up, people don't want to invest, so the investment will fall.



4.4 Find the slope of IS curve

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

$$Y = C(Y - [T + I(i)] + G$$

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

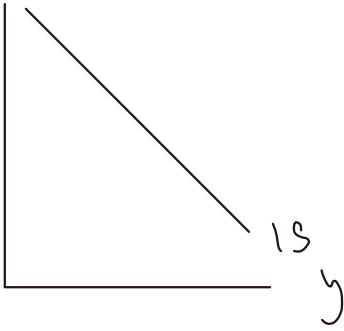
4.5 Derive the LM equation that shows how i and Y are related

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

4.6. Find the slope of LM curve

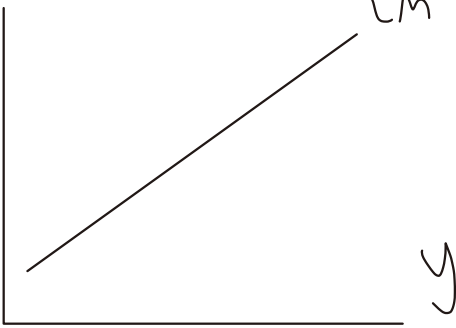
$$: \frac{L_y}{L_i}$$

5. slope of IS curve $= \frac{-1}{I, M}$ $M = \frac{1}{1-c_1}$



When I , or M increase for 1 unit, IS decrease for 1 unit.

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



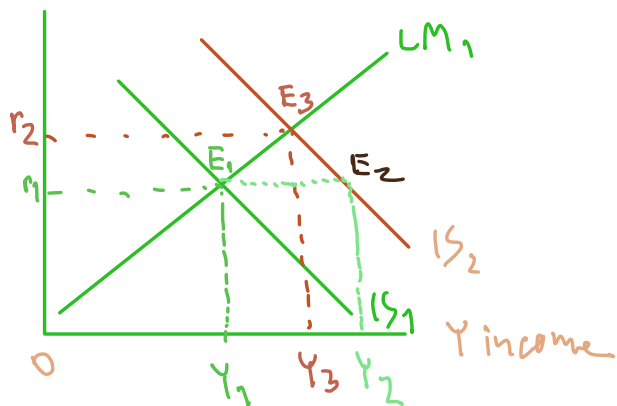
When L_i increase for 1 unit, L_y will increase for 1 unit.

6. 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.

. When G increases, this raises demand in the economy (AE). Firms produce more
→ output increases → income increases.
As people have more income they want to buy more goods. Leading to an increase in money demand (M_d), which causes the i to rise.

However, higher i discourages investment
: with lower I → output falls (Y)



When G increases Y_1 increases to Y_2 (at E_2)

However, because of higher i (at E_3), investment falls.

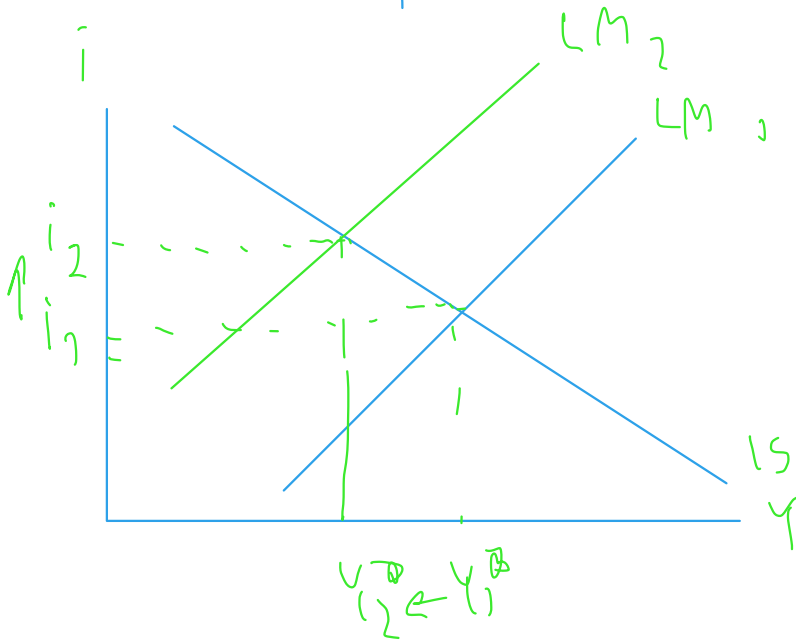
As a result Y_2 decreases to Y_3

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.

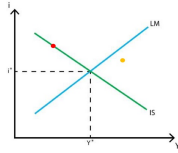
$MS \downarrow \rightarrow i \uparrow$

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

$AE \downarrow \rightarrow Y \downarrow$



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 product market is in equilibrium
money market is not in equilibrium

8.2 Product market: the orange point is above IS curve
meaning that planned saving
excess planned investment
therefore, the output will
decrease.

money market; the orange point is
under LM curve, meaning that
money demand excess money
supply
therefore, the interest rate will increase

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. *Fiscal*

9.2 Investment is NOT sensitive to changes in interest rate. *Monetary*

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

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

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.

$$10.1 \text{ IS: } Y = C + I + G + X - IM$$

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

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

$$Y = 200 + 0.5Y - 100i$$

$$0.5Y = 200 - 100i$$

$$Y = 400 - 200i$$

$$10.2 \text{ LM: } \frac{M}{P} = L$$

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

$$200 = 0.5Y - 200i$$

$$Y = 400 + 400i$$

$$10.3 \text{ IS} = \text{LM}$$

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

$$i = 0$$

$$Y = 400$$