Exercise 6

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1. The IS-LM Model is a <u>general equilibrium model</u>, which means that……there exists a common price that clears two or more market

   There are…2……markets, which are…goods and services market and money market

   The price that clears these markets is…interest rate……………

   The IS curve represents a…negative……relationship between interest rate (i)……and real output (Y)… This is because…higher interest rates……… discourage investors from investing………………………………

   The LM curve represents a…positive……relationship between ↗ (ppl have more income) interest rate (i)……and real output (Y)…… This is because…at higher level of Y, people have more demand for money to buy G & S. Higher demand for money drives up interest rate.

   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: …MD = Ms…………

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 up	movement up
G↓	shift left	not related
T↓	shift right	not related
G&T↑ equally	shift right	not related
M↓	not related	shift left
P↓	not related	shift right

other factors except i change : IS shift

i change ⇒ both IS & LM movement

OR

Md change : mm. LM (Y, income ↑, ↓)

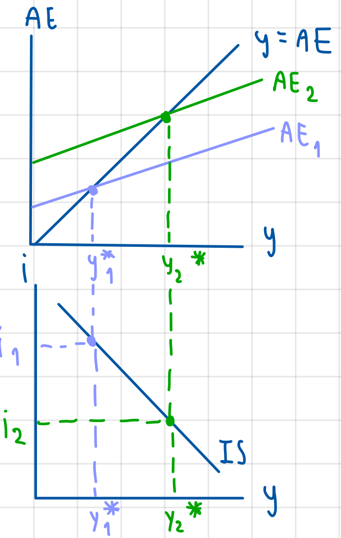
}(Ms change : LM shift)

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.

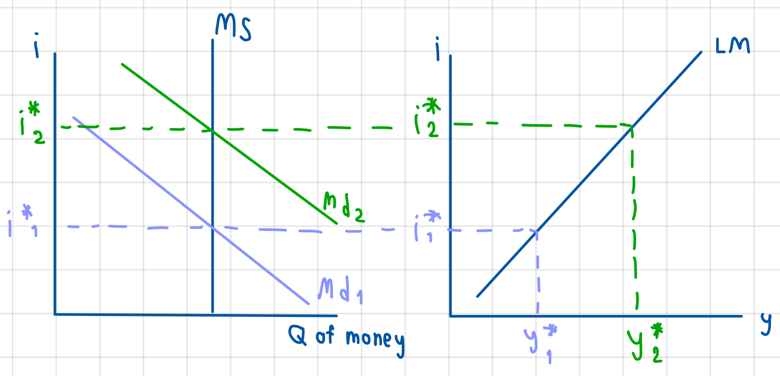
Each point on IS curve is an eqbm. in G & S market (Keynesian Cross) ⇒ Y = AE

Each point on LM curve is an eqbm. in money market ⇒ Md = Ms

derive IS :



derive LM =



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

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

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

<u>Answer the following questions.</u>

4.1 What are I_1, L_Y, and L_i?

I_1 is slope of investment function, and the sensitivity of investment to changes in interest rate, i

L_y is a sensitivity of Md to Δ in income, y

L_i is a sensitivity of Md to Δ in interest rate, i

4.2 Why are I_1 and L_i negative?

I_1 is negative because it represents a negative relationship between investment & interest rate (when $i \uparrow$, $I \downarrow$)

L_i is negative because it represents a negative relationship between money demand & interestrate (when $i \uparrow$, Md $\downarrow$)

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.)

$$Y = AE$$
$$Y = C + I + G$$
$$Y = C_0 + C_1(Y-T) + I_0 - I_1 \cdot i + G_0$$
$$Y = C_0 + C_1Y - C_1T + I_0 - I_1 \cdot i + G_0$$
$$\frac{Y - C_1Y - C_0 + C_1T - I_0 - G_0}{-I_1} = i$$
$$\frac{(1 - C_1)Y - C_0 + C_1T - I_0 - G_0}{-I_1} = i$$

4.4 Find the slope of the IS curve.

(Hint: The coefficient before Y is the slope of IS.)

$\therefore$ Slope of IS is $\frac{1 - C_1}{-I_1}$ or $\frac{C_1 - 1}{I_1}$

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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.)

$$Md = Ms$$

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

$$L_y \cdot Y - L_i \cdot i = \frac{M_0}{P_0}$$

$$L_y Y - \frac{M_0}{P_0} = L_i \cdot i$$

$$i = \frac{L_y Y - M_0 / P_0}{L_i} \quad \text{or} \quad i = \left(\frac{L_y}{L_i}\right) Y - \left(\frac{1}{L_i}\right)\left(\frac{M_0}{P_0}\right)$$

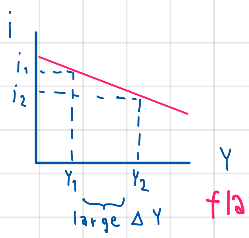
4.6 Find the slope of the LM curve.
(Hint: The coefficient before Y is the slope of LM.)

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

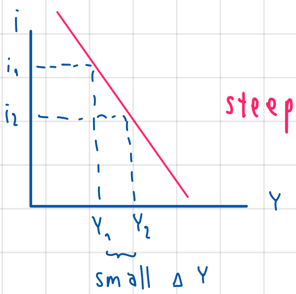
5. From Question 4.4, we can see that the slope of IS curve depends on two factors. Explain how each of these factors affects the slope of the IS curve. We also can see that the slope of LM curve depends on two factors. Explain how each of these factors affects the slope of the LM curve.

Slope of IS depends on 1.) the sensitivity of investment to changes in interest rate
2.) the investment multiplier

$\Rightarrow$ If investment is sensitive to changes in interest rate, then a decrease in interest rate causes a LARGE increase in investment (and also output). That is, IS will be flat.

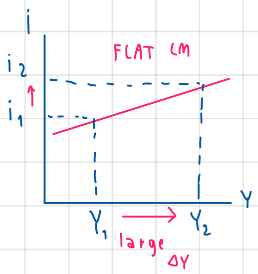


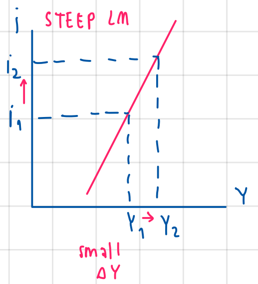
OR the another case



Slope of LM depends on 1.) L_y (sensitivity of Md to changes in Y)
2.) L_i (sensitivity of Md to changes in i)

$\Rightarrow$ If L_y is small or L_i is large $\Rightarrow$ FLAT LM
If L_y is large or L_i is small $\Rightarrow$ STEEP LM





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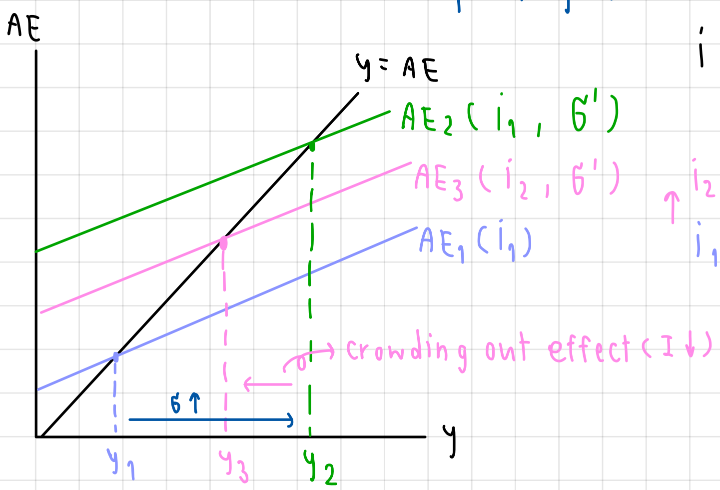
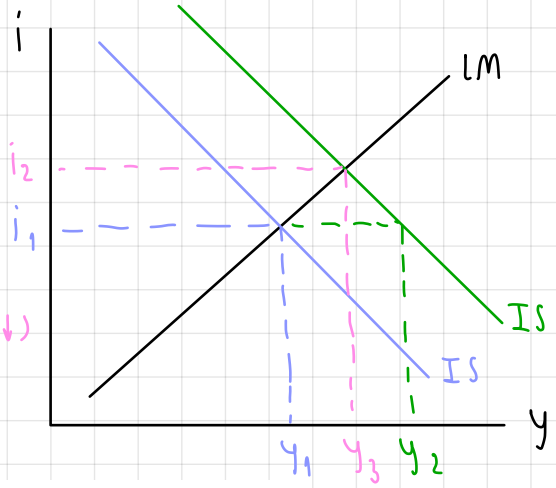
GM

MM

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. : IS curve

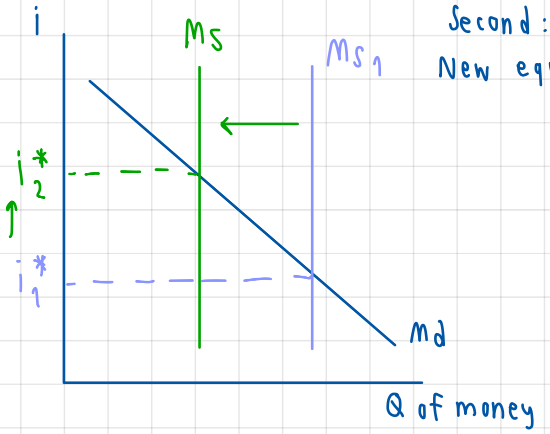
Crowding - Out Effect : public spending (G) reduces / eliminates private sector spending (I) $\rightsquigarrow$ G ↑ → AE ↑ → Y ↑ → Md ↑ → i ↑ → I ↓ → AE ↓ → Y ↓

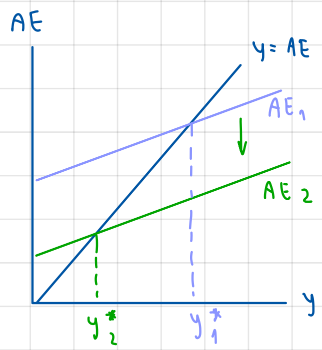


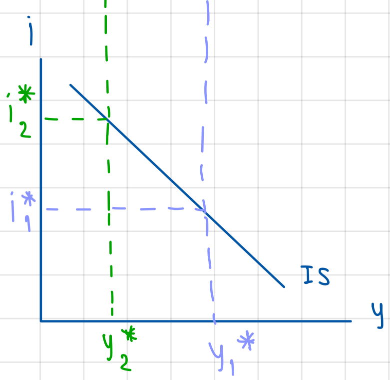


7. Suppose the central bank decreases its money supply, i.e. contractionary monetary policy. Use the IS-LM diagram to explain how the economy moves to the new general equilibrium.

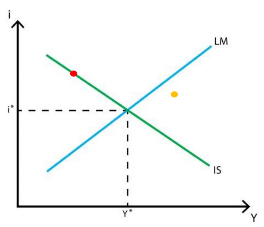
First : in MM , M_s ↓ → i ↑
Second : in GM , → i ↑ → I ↓ → AE ↓ → Y ↓
New equilibrium from Ms ↓ : Lower Y and higher i







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?

G & S market is in eqilibrium , but money market is not.

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

Orange point is at the right of IS curve, so there is excess supply for goods (Y > AE). When Y > AE, inventories accumulate. Therefore, producers will produce less to make Y falls back to the equilibrium.

Moreover, the orange point also at the right of LM curve, which means that interest rate is below the equilibrium rate ($i < i^*$). This leads to excess money demand. People will sell bond (the demand for bond will be low). Bond issuers will raise the interest rate to make people want to buy bonds. The market returns to 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.

   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).

which Fiscal Policy shift IS curve ONLY
Monetary " shift LM curve ONLY

Effective Policy : Shift the steep curve !! *

9.1) high MPC → LARGE money multiplier → when I ↑, Y ↑ A LOT → IS FLAT → Should use monetary policy.

9.2) I NOT sensitive to Δi (when i ↑, Y ↓ a little) → small crowding out effect → should use Fiscal Policy
& (e.g. G ↑ → AE ↑ → Y ↑ → Md ↑ → i ↑ → Y ↓ a little)

9.3) Li large → LM flat → Should use Fiscal Policy

9.4) Ly large → LM steep → Should use monetary policy

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

<u>Answer the following questions.</u>

10.1 Derive the IS equation.

10.2 Derive the LM equation.

10.3 Find the general equilibrium output and interest rate.

10.1)
$$Y = AE = C + I + G$$
$$Y = 100 + 0.5(Y - 40) + 80 - 100(i) + 40$$
$$Y = 100 + 0.5Y - 20 + 80 - 100i + 40$$
$$100i = 200 - 0.5Y$$
$$i = 2 - 0.005Y$$
$$0.005Y = 2 - i$$

10.2) Ms = Md
$$\frac{M}{P} = L(i, Y)$$
$$\frac{400}{2} = 0.5(Y) - 200i$$
$$200i = 0.5Y - 200$$
$$i = 0.0025Y - 1$$

10.3) find Y*
$$IS = LM$$
$$2 - 0.005Y = 0.0025Y - 1$$
$$3 = 0.0075Y$$
$$Y^* = 400$$

find i*
$$i = 0.0025(400) - 1$$
$$i = 1 - 1$$
$$i^* = 0\ \%$$