Exercise 4
Keynesian Cross and Fiscal Policy

1. Answer the following questions.
   1.1 Suppose Govt Multiplier is 5 and $\Delta G = 5$. Find ΔY.
   1.2 Suppose Tax Multiplier is -3 and $\Delta Y = -9$. Find ΔT.
   1.3 Suppose $\Delta Y = 10$ and $\Delta I = 2$. Find Investment Multiplier.

2. From $Y = C + I + G$ where $C = C_0 + C_1(Y - T)$, find
   2.1 Equilibrium Output Y*
   2.2 $\Delta Y/\Delta I$
   2.3 $\Delta Y/\Delta G$
   2.4 $\Delta Y/\Delta T$
   2.5 Balanced-Budget Multiplier (BBM)
   2.6 Explain what the BBM is.

3. Assume a closed economy with government. The country has the following components of aggregate expenditure.

$C = 300 + 0.75(Yd)$	$I = 50$
$G = 50$	$T = 50$ (lump-sum tax)

   3.1 Use the Y = AE (standard) approach to find the equilibrium output.
   3.2 Draw the Keynesian Cross, and find the intercept on the vertical axis and the slope of the AE schedule.
   3.3 Use the Leakage = Injection (or saving/investment) approach to find the equilibrium level of output.
   (Hint: the equilibrium condition is $S + T = I + G$, with $Yd= Y - T = C + S$)
   3.4 Draw the saving/investment curve to show the equilibrium.
   3.5 Suppose that the government decides to build more roads, raising government spending by 50 units, but this project is to be financed by the increase in net taxes of 50 units. Use the Y = AE (standard) approach to find the new equilibrium output.
   3.6 Use the Balanced-Budget Multiplier (BBM) derived from Question 2.5 to find the new equilibrium output.

1. 1.1) Gov. multiplier $= \frac{\Delta Y}{\Delta G} = 5$

$\rightarrow \Delta G = 5$

$\therefore \Delta Y = \frac{\Delta Y}{5} = 5$

$\Delta Y = 25$ //

1.2) find ΔT ; Tax multiplier $= -3$

; $\Delta Y = -9$

$\therefore$ tax multiplier $= \frac{\Delta Y}{\Delta T} = -3$

$\frac{-9}{\Delta T} = -3$

$\Delta T = 3$ //

1.3) find investment multiplier $\frac{\Delta Y}{\Delta I}$

Given $\Delta Y = 10$, $\Delta I = 2$

$\therefore$ investment multiplier $= \frac{10}{2} = 5$ //

② 2.1)

$$AE = C + I + G$$
$$Y = AE$$
$$Y = C + I + G$$
$$= C + C_0 + C_1(Y - T) + I + G$$
$$= C + C_0 + C_1 Y - C_1 T + I + G$$

$$Y - C_1 Y = C + C_0 - C_1 T + I + G$$
$$Y(1 - C_1) = C + C_0 - C_1 T + I + G$$
$$Y = \frac{C + C_0 - C_1 T + I + G}{1 - C_1}$$

2.2)

$$AE = C + I + G$$

$$AE = C_0 + C_1(Y - T) + I + G$$
$$= C_0 + C_1 Y - C_1 T + I + G$$
$$= (C_0 + C_1 T + I + G) + \underline{C_1 Y}$$

↳ Slope of AE

$$\therefore \frac{\Delta Y}{\Delta I} = \frac{1}{1 - \text{Slope of AE}}$$

2.3)

$$AE = C + I + G$$

$$AE = C_0 + C_1(Y - T) + I + G$$
$$= C_0 + C_1 Y - C_1 T + I + G$$
$$= (C_0 + C_1 T + I + G) + \underline{C_1 Y}$$

↳ Slope of AE

$$\therefore \frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{Slope of AE}}$$

2.4) $AE = C + I + G$

$$AE = C_0 + C_1(Y-T) + I + G$$
$$= C_0 + C_1Y - C_1T + I + G$$
$$= (C_0 + C_1T + I + G) + \underline{C_1Y}$$

↳ Slope of AE

$$\therefore \frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - \text{Slope of AE}}$$

2.5) BBM $\frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} = \frac{1 - C_1}{1 - C_1}$

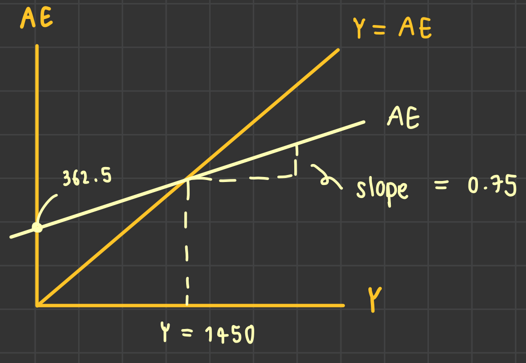
2.6) BBM is a change in aggregate output when both G, T increase by 1 unit.

③ 3.1) $Y = AE$

$$AE = C + I + G \qquad Y - T = Y - 50$$
$$= 300 + 0.75(Yd) + 50 + 50$$
$$= 300 + 0.75(Y - 50) + 50 + 50$$
$$Y = 300 + 0.75Y - 37.5 + 50 + 50$$

$$Y - 0.75Y = 362.5$$
$$0.25Y = 362.5$$
$$Y = 1450$$

3.2)



3.3)

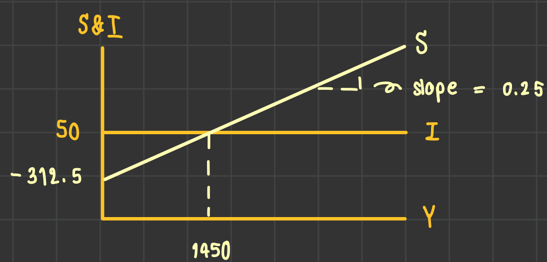
$S + T = I + G$ —— ① leakage = injection

$\hookrightarrow S = I$

$Y - T = C + S$ —— ② saving function

$$
\begin{aligned}
Y - C &= S + T \\
Y - C &= I + G \\
Y - C &= 50 + 50 \\
Y - C &= 100 \\
Y - (300 + 0.75Yd) &= 100 \\
Y - (300 + 0.75(Y - 50)) &= 100 \\
Y - (300 + 0.75Y - 37.5) &= 100 \\
Y - 300 - 0.75Y + 37.5 &= 100 \\
0.25Y &= 362.5 \\
Y &= 1450
\end{aligned}
$$

3.4)



find the intercept

Saving function ; $Yd = C + S$

$$
\begin{aligned}
Y - T &= C + S \\
Y - 50 &= 300 + 0.75Y - 37.5 + S \\
S &= -300 - 0.75Y + 37.5 + Y - 50 \\
S &= -312.5 + 0.25Y
\end{aligned}
$$

3.5) $G \uparrow = 50 + 50 = 100$

$T \uparrow = 50 + 50 = 100$

new $Y^* = ?$

$$
\begin{aligned}
Y &= AE \\
&= C + I + G \\
&= 300 + 0.75(Y - 100) + 50 + 100 \\
&= 300 + 0.75Y - 75 + 150 \\
Y &= 375 + 0.75Y \\
0.25Y &= 375 \\
Y &= 1500
\end{aligned}
$$

3.6) use BBM to find new Y^*

$$BBM = \frac{\Delta Y^*}{\Delta G_0} + \frac{\Delta Y^*}{\Delta T_0} = \frac{1 - c_1}{1 - c_1} = 1$$

interpret BBM ; G , T increase by 1 unit , income will increase by 1

$\therefore$ $G, T \uparrow 50$, $Y \uparrow 50 = 1{,}450 + 50$

$= 1{,}500$

4. From $Y = C + I + G + (X - M)$
where $C = C_0 + C_1(Y - T)$ and $M = M_0 + M_1(Y)$, find

4.1 Equilibrium Output Y^*

4.2 $\Delta Y/\Delta I$

4.3 $\Delta Y/\Delta G$

4.4 $\Delta Y/\Delta T$

4.5 Balanced-Budget Multiplier (BBM)

5. Assume an open economy with government. The country has the following components of aggregate expenditure.

$C = 200 + 0.7(Yd)$ $\quad I = 75$ $\quad G = 75$

$T = 50$ $\quad X = 50$ $\quad M = 50 + 0.1Y$

5.1 Use the $Y = AE$ approach to find the equilibrium. Is $Y = 300$ an equilibrium? If it is not, explain the adjustment process towards equilibrium.

5.2 Based on what you have derived in Question 4, calculate the investment, government spending, tax, and balanced-budget multipliers.

5.3 Interpret the value of each of the multipliers.

Suppose that the full-employment output (Y_F) is 600;

5.4 What type of output gap is the economy currently experiencing?

5.5 Draw the Keynesian Cross. Identify its slope and intercept. Also, illustrate the output gap.

Now, government wants to correct the output gap by moving the economy to the full-employment level, and is considering different policies.
(Hint: use the multipliers from Question 5.2 to answer the following questions)

5.6 If the government wants to adjust **only its spending (G)**, how much G should be changed?

5.7 If the government wants to adjust **only its net taxes (T)**, how much T should be changed?

5.8 If the government wants to boost **only investment (I)**, how much I should be changed?

5.9 If the government wants to implement a balanced-budget policy, what should the government do with G and T?

6. Explain the role of Import as an automatic stabilizer. If the government wants to further stabilize the economy, is there anything that the government can do with its tax system? Explain.

5.1 $AE = C + I + G + X - M$

$Yd = Y - T$

$= 200 + 0.7Yd + 75 + 75 + 50 - (50 + 0.1Y)$

$= 200 + 0.7(Y - 50) + 150 - 0.1Y$

$= 200 + 0.7Y - 35 + 150 - 0.1Y$

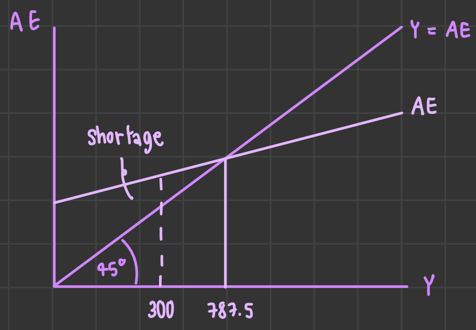
$AE = 315 + 0.6Y$

$AE = Y$

$Y = 315 + 0.6Y$

$0.4Y = 315$

$Y = 787.5$ $\therefore$ Equilibrium Aggregate output, $Y = 787.5$



At $Y = 300$, $Y < C + I$, which mean that aggregate output is less than AE. When we have shortage (what we produce < demand) → inventories declined → encourage firm to increase in production to move to eqbm at $Y = 787.5$

5.2) $C = 200 + \underbrace{0.7}_{MPC}(Yd)$, $M = 50 + \underbrace{0.1}_{MPM}Y$, $AE = \underbrace{0.6}_{\text{slope of AE}}Y + 75$ = MPC + MPM

$$\frac{\Delta Y}{\Delta I} = \frac{1}{1 - MPC + MPM} = \frac{1}{1 - 0.7 + 0.1} = 2.5$$

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - MPC + MPM} = \frac{1}{1 - 0.7 + 0.1} = 2.5$$

$$\frac{\Delta Y}{\Delta G} = \frac{-C}{1 - MPC + MPM} = \frac{-0.7}{1 - 0.7 + 0.1} = -1.75$$

$$BBM = \frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} = 2.5 - 1.75 = 0.75$$

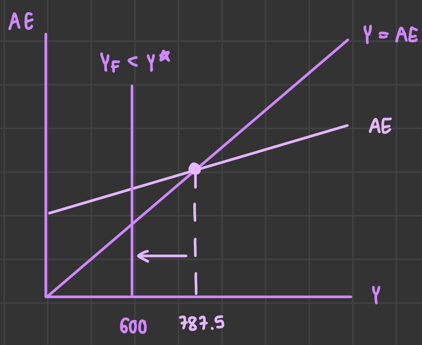
5.3) $\frac{\Delta Y}{\Delta I}$ = when I ↑ 1 unit, Y will ↑ by 2.5 units

$\frac{\Delta Y}{\Delta G}$ = when G ↑ 1 unit, Y will ↑ by 2.5 units

$\frac{\Delta Y}{\Delta T}$ = when T ↑ 1 unit, Y will ↓ by 1.75 units

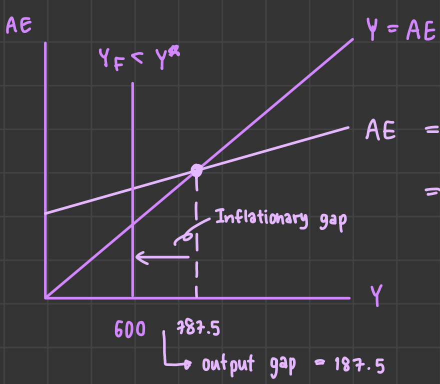
BBM = when G, T ↑ equally 1 unit, Y will ↑ by 0.75 units.

5.4)



Unemployment rate is below the natural rate of unemployment, which mean we are in inflationary gap. In this time, the economy is growing too fast and over employed. So that, the policy solution is to raise tax and cut gov. spending to Y^*

5.5)



MPC MPM

$AE = C + I + G + (X - M)$

$= 0.6Y + 315$

slope = 0.6 → MPC − MPM

5.6)

$$\frac{\Delta Y^*}{\Delta G} = \frac{1}{1 - MPC + MPM}$$

$$= \frac{1}{1 - 0.7 + 0.1}$$

$$= \frac{1}{0.4}$$

$$= 2.5$$

$$\frac{\Delta Y^*}{\Delta G} = \frac{-187.5}{2.5}$$

$$= -75$$

5.7)

$$\frac{\Delta Y^*}{\Delta T} = \frac{-MPC}{1 - MPC + MPM}$$

$$= \frac{-0.7}{0.4}$$

$$= -1.75$$

$$\frac{\Delta Y^*}{\Delta T} = \frac{-187.5}{-1.75}$$

$$= 107.14$$

5.8)

$$\frac{\Delta Y^*}{\Delta I} = \frac{1}{1 - MPC + MPM}$$

$$= \frac{1}{0.4}$$

$$= 2.5$$

$$\frac{\Delta Y^*}{\Delta I} = \frac{-187.5}{2.5}$$

$$= -75$$

5.9)

$$BBM = \frac{\Delta Y^*}{\Delta G} + \frac{\Delta Y^*}{\Delta T}$$

$$= 2.5 - 1.75$$

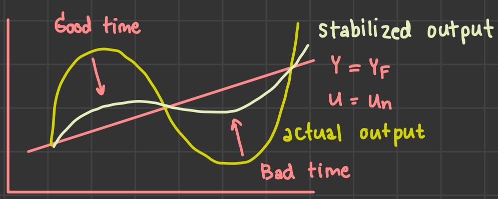
$$= 0.75$$

$$\frac{\Delta Y^*}{\Delta BBM} = \frac{-187.5}{0.75}$$

$$= -250$$

⑥ Automatic stabilizer ⟶ component in AE to stabilize the GDP
Import / income - tax are automatic stabilizer

Role at automatic stabilizer is reduce the fluctuation of economy



<u>During Good time</u>

So, the gov. raise tax (T) and import (M) to reduce people income (Y) which helps to slow down the economy during peak time.

<u>During Bad time</u>

So, the gov. reduce tax (T) and import (M) to increase people income (Y) which helps to boost the economy during the economic recession.

7. Let $S = -200 + 0.5Y$ and $I = 50$, be the saving function and investment.

7.1 Use the saving/investment approach to find the equilibrium output.

7.2 Find the equilibrium saving. (Hint: substitute Y^* into S)

Suppose people decide to save more, increasing autonomous saving by 100.

7.3 Use the saving/investment approach to find the new equilibrium output.

7.4 Find the new equilibrium saving. (Hint: substitute new Y^* into S)

7.5 Comment on your result.

7.

7.1)

$S = I$

$-200 + 0.5Y = 50$

$Y^* = 500$ //

7.2)

$\text{saving} = -200 + 0.5(Y)$

$= -200 + 0.5(500)$

$= -200 + 250$

$S^* = 50$ //

7.3)

PP save more by 100

So, saving + 100 = new saving

new saving $= -100 + 0.5Y$

Due to $S = I$

$-100 + 0.5Y = 50$

$0.5Y = 150$

$Y^* = 300$ //

7.4)

new Eqbm of saving $= -100 + 0.5Y^*$

$= -100 + 0.5(300)$

$= -100 + 150$

$S^* = 50$ //

7.5)