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.

   $C = 300 + 0.75(Yd)$ $\quad\quad$ $I = 50$

   $G = 50$ $\quad\quad$ $T = 50$ (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.

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.

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

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

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.

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.

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.

1.1) $\frac{\Delta Y^*}{\Delta G} = \frac{\Delta Y^*}{5} = 5$

$\Delta Y^* = 25$

1.2) $\frac{\Delta Y^*}{\Delta T} = \frac{-9}{\Delta T} = -3$

$\Delta T = 3$

1.3) investment Multiplier $= \frac{\Delta Y^*}{\Delta I} = \frac{10}{2} = 5$

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.

2.1) $AE = C + I + G$

$Y = AE$

$Y = C + I + G$

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

$Y - C_1 Y = C_0 - C_1 T + I + G$

$(1 - C_1) Y = C_0 - C_1 T + T + G$

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

2.2) $\frac{\Delta Y}{\Delta I} = \frac{1}{1 - \text{slope of AE}} = \frac{1}{1 - C_1}$

2.3) $\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{slope of AE}} = \frac{1}{1 - C_1}$

2.4) $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - \text{slope of AE}} = \frac{-C_1}{1 - C_1}$

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

BBM is how output increase when government increase G, T / change in aggregate output when both G, T increase 1 unit

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.

3.1)

$AE = C + I + G$

$AE = 300 + 0.75(Y - 50) + 50 + 50$

$AE = 0.75Y + 362.5$

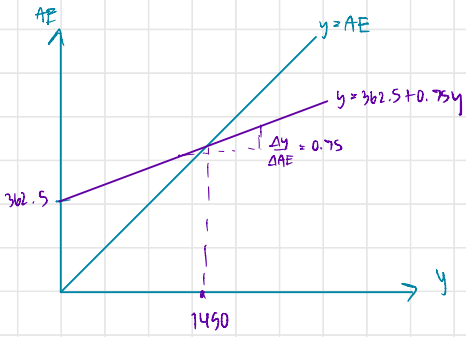
$y = AE$

$y = 0.75y + 362.5$

$y^* = \frac{362.5}{0.25}$

$y^* = 1450$

3.2)



3.3)

$Yd = Y - T = C + S$

leakage = Injection

$S + T = I + G$

$Y - C = T + S$

$Y - C = I + G$

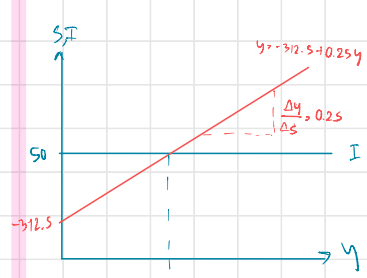
$Y = 100 + 300 + 0.75(Y - 50)$

$Y = 362.5 + 0.75Y$

$y^* = \frac{362.5}{0.25}$

$y^* = 1450$

3.4)



Saving function

$= Yd = C + S$

$Y - 50 = 300 + 0.75(Y - 50) + S$

$-S = 312.5 - 0.25Y$

$S = -312.5 + 0.25Y$

3.5) $T = 100$

$G = 100$

$Y = AE$

$AE = C + I + G$

$= 200 + 0.75(Y - 100) + 50 + 100$

$Y = 375 + 0.75Y$

$Y^* = 1500$ ✱

3.6) $BBM = \frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} = \frac{1 - c_1}{1 - c_1} = 1$

if govt increase T, G 1 so

equilibrium output increase 1 so

old $Y^* + 50 = 1450 + 50$

$= 1500$ ✱

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)

4.1) $Y = C + I + G + (X - M)$

$Y = C_0 + C_1 Y - C_1 T + I + G + X - M_0 - M_1 Y$

$Y - C_1 Y + M_1 Y = C_0 - C_1 T + I + G + X - M_0$

$(1 - C_1 + M_1) Y = C_0 - C_1 T + I + G - X - M_0$

$Y^* = \left(\frac{1}{1 - C_1 + M_1}\right)(C_0 - C_1 T + I + G - X - M_0)$

4.2) $\frac{\Delta Y}{\Delta I} = \frac{1}{1 - \text{slope of AE}} = \frac{1}{1 - C_1 + M_1}$

4.3) $\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{slope of AE}} = \frac{1}{1 - C_1 + M_1}$

4.4) $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - \text{slope of AE}} = \frac{-C_1}{1 - C_1 + M_1}$

4.5) $BBM = \frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} = \frac{1 - C_1}{1 - C_1 + M_1}$

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

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

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

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.

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

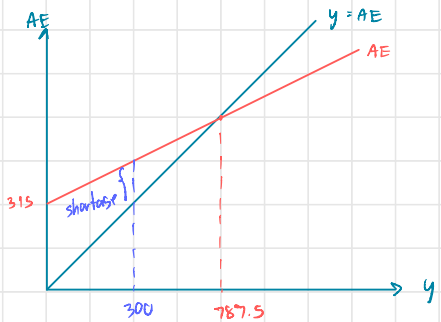
$= 200 + 0.7(Y - 50) + 75 + 75 + 50 - 50 - 0.1Y$

$AE = 315 + 0.6Y$

$y = AE$

$0.4y = 315$

$y = 787.5$



at $y = 300$, $y < AE$

that mean aggregate expenditure is more than aggregate output, the inventories decline signal firm to produce more to more to equilibrium at $y = 787.5$

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

investment multiplier $= \frac{\Delta y}{\Delta I} = \frac{1}{1 - \text{slope of AE}} = \frac{1}{0.4} = 2.5$

government spending multiplier $= \frac{\Delta y}{\Delta G} = \frac{1}{1 - \text{slope of AE}} = 2.5$

tax multiplier $= \frac{\Delta y}{\Delta T} = \frac{-MPC}{1 - \text{slope of AE}} = \frac{-0.7}{0.4} = -1.75$

balance budget multiplier $= \frac{\Delta y}{\Delta G} + \frac{\Delta y}{\Delta T} = 2.5 - 1.75 = 0.75$

5.3 Interpret the value of each of the multipliers.
Suppose that the full-employment output (Y_F) is 600;

$\frac{\Delta y^*}{\Delta I}$ → when I increase by 1 unit, aggregate output increase 2.5 unit

$\frac{\Delta y^*}{\Delta G}$ → when G increase by 1 unit, aggregate output increase 2.5 unit

$\frac{\Delta y}{\Delta T}$ → when T increase by 1 unit, aggregate output decrease 1.75 unit

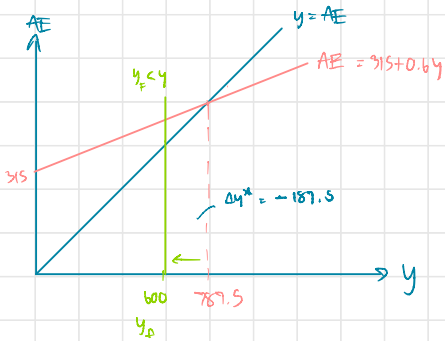
BBM → when T & G increase 1 unit, output will increase 0.75 unit

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

$y = 787.5$ → $y > y_f$ → inflationary gap

$y_f = 600$

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



$y > y_F$, so we are in inflationary gap
that mean economy growing fast, over-employed
→ we use contractionary fiscal policy
(G↓, T↑) to slow down the economy

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?

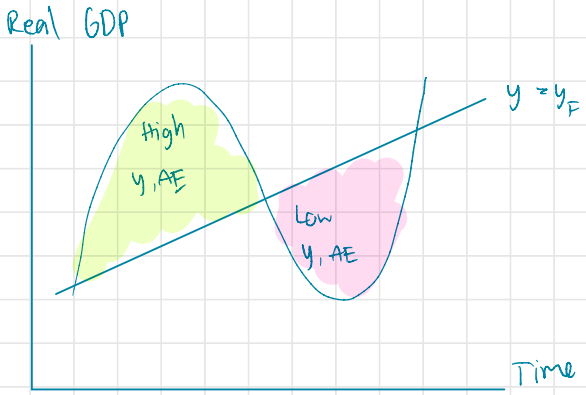
5.6) $\frac{\Delta Y}{\Delta G} = 2.5$ ∴ y^* decrease 2.5 unit, G decrease 1 unit
y^* ⟵ 187.5 unit, G ↓ 75 unit
∴ decrease G 75 unit

5.7) $\frac{\Delta Y}{\Delta T} = -1.75$ y^* ↓ 1.75, T ↑ 1
y^* ↓ 187.5, T ↑ 107.14
∴ increase T 107.14 unit

5.8) $\frac{\Delta Y}{\Delta I} = 2.5$ y^* ↓ 2.5, I ↓ 1 unit
y^* ↓ 187.5, I ↓ 75 unit
∴ decrease I 75 unit

5.9) BBM = 0.75 y^* ↓ 0.75, G&T ↓ 1 unit
y^* ↓ 187.5, G&T ↓ 250 unit
∴ decrease both G&T 250 unit

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.



high AE → raise tax and import to reduce income (Y)
to slow down the economy during peak time

Low AE → reduce tax and import to increase income
to boost the economy during 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.

7.1) $S = I$

$-200 + 0.5Y = 50$

$Y^* = \frac{250}{0.5} = 500$

7.2) equilibrium saving

$S = -200 + 0.5Y^*$

$S = -200 + 0.5(500)$

$S = 250 - 200$

$S^* = 50$ ※

7.3) (new) $S = -100 + 0.5Y$

$S = I$

$-100 + 0.5Y = 50$

$Y^* = \frac{150}{0.5} = 300$ ※

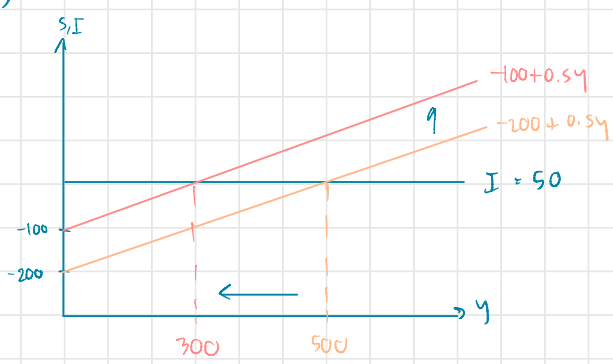
7.4)

$S = -100 + 0.5Y$

$= -100 + 0.5(300)$

$S^* = 50$

7.5)



due to less money change hand in economy

paradox of thrift : save more but income slow down

↓

less income to ppl (Y↓)

ppl save more by 100

→ output decrease 500 → 300