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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) paradox

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 Govt Multiplier $\Rightarrow \frac{\Delta Y^*}{\Delta G} = 5$

$\Delta Y^* = 5(5)$

$\Delta Y^* = 25$

1.2 Tax Multiplier $\Rightarrow \frac{\Delta Y^*}{\Delta T} = -3$

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

$\Delta T = 3$

1.3 Investment multiplier $\Rightarrow \frac{\Delta Y^*}{\Delta I} = \frac{10}{2} = 5$

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 $y = C + I + G$

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

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

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

$(1 - C_1) y = C_0 - C_1 T + I + G$

$y^* = \frac{C_0 - C_1 T + I + G}{1 - C_1}$

2.2 $\frac{\Delta y}{\Delta I} = \frac{MPy}{MPI} = \frac{1}{1 - C_1}$

2.3 $\frac{\Delta y}{\Delta G} = \frac{MPy}{MPG} = \frac{1}{1 - C_1}$

2.4 $\frac{\Delta Y}{\Delta T} = \frac{MPy}{MPT} = \frac{-C_1}{1 - C_1}$

2.5 $BBM = \frac{\Delta y}{\Delta G} + \frac{\Delta y}{\Delta I}$

or $\frac{1 - C_1}{1 - C_1} = 1$

2.6 Change in aggregate output when both G & T ↑ by 1 unit at the same time.

AE = C+I

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.

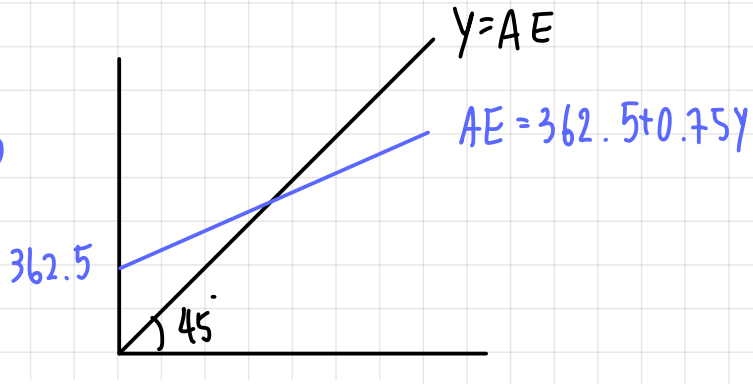
Y=AE

$AE = C + I$
$= 300 + 0.75(Y - 50) + 50 + 50$
$= 300 + 0.75Y - 37.5 + 100$
$= 400 + 0.75Y - 37.5$
$AE = 362.5 + 0.75Y$
$Y = 362.5 + 0.75Y$
$(1-0.25)Y = 362.5$
$Y^* = 1450$

3.2 Draw the Keynesian Cross, and find the intercept on the vertical axis and the slope of the AE schedule.

$AE = 362.5 + 0.75Y$

Intercept = 362.5 Slope = 0.75



S = I

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)

$S + T = I + G$
$S + 50 = 50 + 50$
$S = 50$

$Y - T = C + S$
$Y - 50 = 300 + 0.75(Y - 50) + 50$
$Y = 300 + 0.75Y - 37.5 + 100$
$Y = 362.5 + 0.75$
$Y^* = 1450$

3.4 Draw the saving/investment curve to show the equilibrium.

$S = Y - C$

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

$S = -337.5 + 0.25Y$

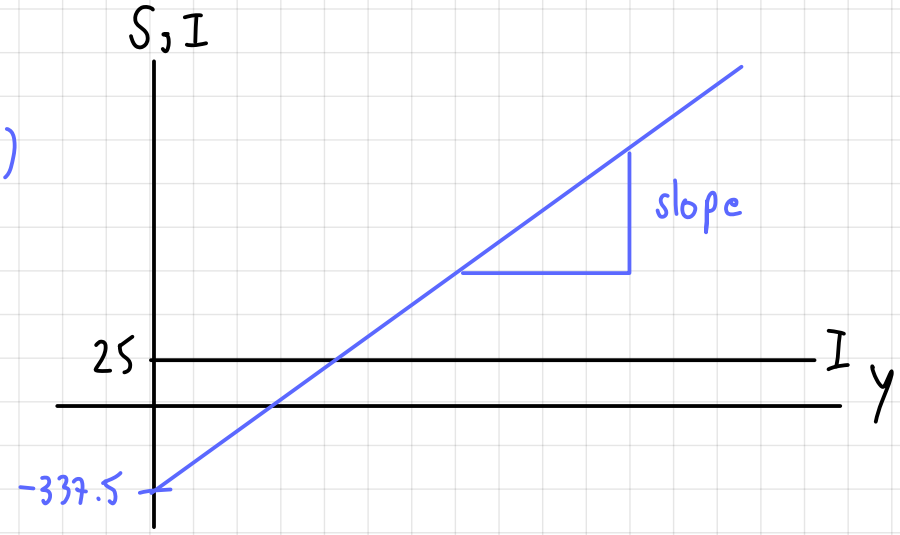
saving function

$Y_d = C + S$

$Y - T = C + S$

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

$S = -312.5 + 0.25Y$



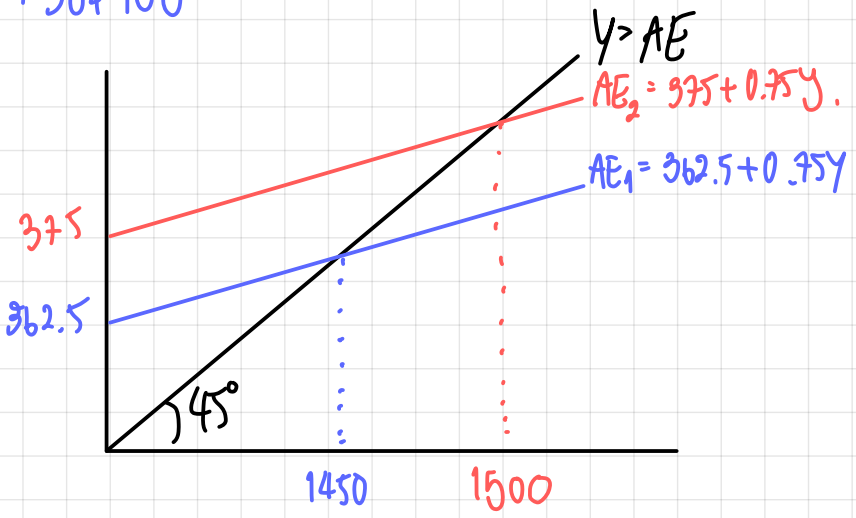
3.5 Suppose that the government decides to build more roads, raising government spending by 50 units, but this project is to be financed by the increase in net taxes of 50 units. Use the Y = AE (standard) approach to find the new equilibrium output.

$Y = C + I + G$

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

$0.25Y = 375$

$Y^* = 1500$



3.6 Use the Balanced-Budget Multiplier (BBM) derived from Question 2.5 to find the new equilibrium output.

$$\frac{\Delta Y}{\Delta G} + \frac{\Delta Y}{\Delta T} = \frac{0.25}{1} + \frac{0.25}{1} = 0.5$$

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)

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4.1 $Y = C_0 + C_1(Y-T) + I + G + X - (M_0 + M_1 Y)$ (import)

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

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

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

4.2 $$\frac{\Delta Y}{\Delta I} = \frac{1}{1 - C_1 + M_1}$$

4.3 $$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - C_1 + M_1}$$

4.4 $$\frac{\Delta Y}{\Delta T} = \frac{-C_1}{1 - C_1 + M_1}$$

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

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.

$C + I + G + X - M$

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

$= 200 + 0.7Y - 35 + 75 + 75 + 50 - 50 - 0.1Y$

$AE = 315 + 0.6Y$

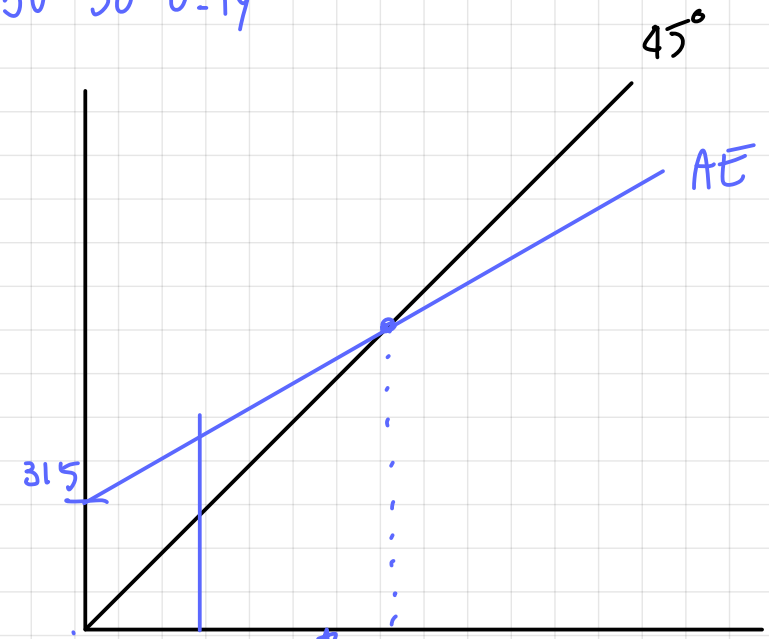
$Y = 315 + 0.6Y$

$Y - 0.6Y = 315$

$Y = 315 / 1 - 0.6$

$Y^* = 787.5$ #

∴ Y = 300 is not an equilibrium



* So there will be a shortage when Y = 300 because AE > Y. Because of the shortage, the inventories rise so it signals the firm to increase the production to adjust toward 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.

Investment multiplier = $\frac{1}{1 - \text{slope of AE}} = \frac{1}{1 - 0.6} = 2.5$ ∴ when I ↑ by 1, Y* ↑ by 2.5

Gov. spending multiplier = $\frac{1}{1 - \text{slope of AE}} = \frac{1}{1 - 0.6} = 2.5$ ∴ when G ↑ by 1, Y* ↑ by 2.5

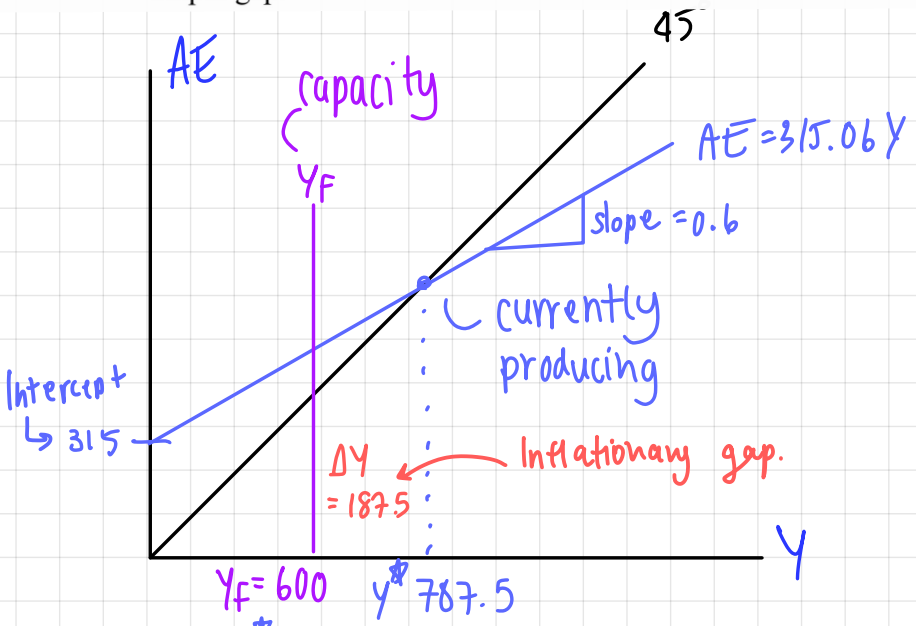
Tax Multiplier = $\frac{-MPC}{1 - \text{slope of AE}} = \frac{-0.7}{1 - 0.6} = -1.75$ ∴ when T ↑ by 1, Y* ↓ by 1.75

Balanced Budget multiplier = $\frac{1 - MPC}{1 - \text{slope of AE}} = \frac{1 - 0.7}{1 - 0.6} = 0.75$ ∴ when both T & G ↑ by 1, Y* ↑ by 0.75

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.



∴ $Y_F < Y^*$, having inflationary gap.

* To adjust toward Y_f, the only way is to reduce AE
we shift AE down so we get new equilibrium by G↓, T↑
to slown down economy (contractionary fiscal policy)

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?

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

$$\Delta G = -75$$

∴ G should be decreases 75 when y decreases 187.5

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

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

$$\Delta T = 107.14$$

∴ T should be increases by 107.14 when y decreases 187.5

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

$$\frac{\Delta Y^*}{\Delta I} = 2.5 \Rightarrow \frac{-187.5}{\Delta I} = 2.5 \quad \Delta I = -75$$

∴ I should be decrease by 75

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

$BBM = 0.75$

$\frac{\Delta Y^*}{\Delta G,T} = 0.75$

$\frac{-187.5}{\Delta G,T} = 0.75$

$\Delta G,T = -250$

∴ Gov. should decrease G & T by 250

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.

6) To stabilize economy, Gov can use expansionary policy by reduce tax and increasing spending to boost the economy during recession or use contractionary policy by increase tax and cut spending to slow down the economy during inflation.
Stabilize will reduce the fluctuate in business cycle.

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

$S = I$

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

$-200 + 0.5y = 50$

$0.5y = 250$

$y^* = 500$

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

$S^* = -200 + 0.5(500)$

$S^* = 50$

Suppose people decide to save more, <u>increasing autonomous saving by 100</u>.

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

$S = -100 + 0.5(Y)$

$S = I$

$-100 + 0.5Y = 50$

$0.5Y = 150$

$y^* = 300$

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

$S^* = -100 + 0.5(300)$

$S^* = 50$

7.5 Comment on your result.

As a result, the equilibrium savings are equal eventhough the autonomous saving increased by 100. Due to the Paradox of Thrift, when people try to save more money, it leads to the decrease in consumption and income. That makes the amount of spending decrease.