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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.

$$\text{govt multiplier} = \frac{\Delta Y^*}{\Delta G} = 5$$

$$\frac{\Delta Y^*}{5} = 5 \qquad \therefore \Delta Y^* = 25$$

1.2 Suppose Tax Multiplier is -3 and $\Delta Y = -9$. Find ΔT.

$$\text{tax multiplier} = \frac{\Delta Y^*}{\Delta T} = -3$$

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

1.3 Suppose $\Delta Y = 10$ and $\Delta I = 2$. Find Investment Multiplier.

$$\text{investment multiplier} = \frac{\Delta Y^*}{\Delta I} = \frac{10}{2} = 5$$

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)
$$Y = AE$$
$$Y = AE = C + I + G$$
$$Y = C_0 + C_1(Y - T) + I + G$$
$$Y = C_0 + C_1Y - C_1T + I + G$$
$$Y - C_1Y = C_0 - C_1T + I + G$$
$$Y(1 - C_1) = C_0 - C_1T + I + G$$
$$Y^* = \frac{1}{(1 - C_1)}(C_0 - C_1T + I + G)$$

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

injection

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

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

2.5) $\frac{\Delta Y^*}{\Delta G} + \frac{\Delta Y^*}{\Delta T} = \frac{1 - MPC}{1 - MPC}$

2.6) BBM is a change in output when G and T increase by 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.

$Y = AE$

$Y = C + I + G$

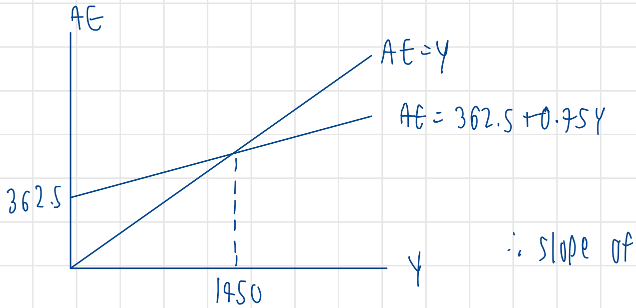
$Y = 300 + 0.75(Y - 50) + 50 + 50$

$Y = 362.5 + 0.75Y$

$\frac{1}{4}Y = 362.5$

$Y^* = 1450$ ✕✕

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



∴ slope of AE = 0.75

y-c

3.3 Use the Leakage = Injection (or saving/investment) approach to find the equilibrium level of output. y^*
(Hint: the equilibrium condition is S + T = I + G, with Yd= Y – T = C + S)

leakage = injection

$S + T = I + G$

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

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

$Y - 300 - 0.75Y + 37.5 = 100$

$Y = 362.5 + 0.75Y$

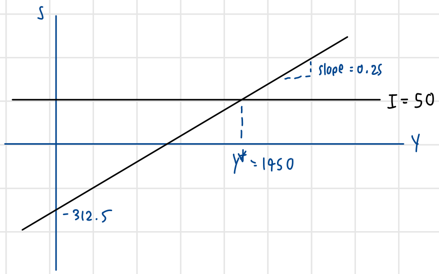
$\frac{1}{4}Y = 362.5$

Slope

$Y^* = 1450$

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

$S = Y - C$



intercept $\Rightarrow$ $Y_d = C + S$

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

$Y - 50 = 262.5 + 0.75Y + S$

$S = -312.5 + 0.25Y$

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.

$G\uparrow$ by 50

$T\uparrow$ by 50

$Y = AE$

$Y = C + I + G$

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

$Y = 450 + 0.75Y - 75$

$Y = 375 + 0.75Y$

$0.25Y = 375$

$Y^* = 1500$ #

When $G \uparrow 50$

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

$0.25Y = 412.5$

$Y = 1650$

When $T \uparrow 50$

$Y = 300 + 0.75Y - 75 + 100$

$0.25Y = 325$

$Y = 1300$

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

$\frac{200}{50} + \frac{-150}{50} = 1$

$\frac{\Delta Y^*}{\Delta G} + \frac{\Delta Y^*}{\Delta T} = \frac{1 - \cancel{c_1}}{1 - \cancel{c_1}} = 1$

G and T increase by 1, Y^* will increase by 1

G and T increase by 50, Y^* will increse by 50

$\therefore 1450 + 50 = 1500$

new $Y^* = 1500$ #

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)
$$Y = C_0 + C_1Y - C_1T + I + G + X - M_0 - M_1Y$$
$$Y - C_1Y + M_1Y = C_0 - C_1T + I + G + X - M_0$$
$$Y(1 - C_1 + M_1) = C_0 - C_1T + I + G + X - M_0$$
$$Y^* = \frac{1}{1 - C_1 + M_1}(C_0 - C_1T + I + G + X - M_0)$$

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

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

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

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

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

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

$T = 50 \quad X = 50 \quad M = 50 + 0.1Y$ (MPM)

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.

$$Y = AE$$
$$= C + I + G + (X - M)$$
$$= 200 + 0.7(Y - 50) + 75 + 75 + 50 - 50 - 0.1Y$$
$$Y = 200 + 0.7Y - 35 + 75 + 75 - 0.1Y$$
$$Y = 315 + 0.6Y$$
$$0.4Y = 315$$
$$Y^* = 787.5$$

∴ if y = 300, there are a shortage. therefore, we need to adjust towards equilibrium which equal to 787.5 by increase in production and resale inventories

MPC = 0.7 / MPM = 0.1

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

Investment multiplier ; $\frac{\Delta Y^*}{\Delta I} = \frac{1}{1-\text{slope}} = \frac{1}{1-0.6} = \frac{1}{0.4} = 2.5$

government spending multiplier ; $\frac{\Delta Y^*}{\Delta G} = \frac{1}{1-0.6} = \frac{1}{0.4} = 2.5$

tax multiplier ; $\frac{\Delta Y^*}{\Delta T} = \frac{-c_1}{1-0.6} = \frac{-0.7}{0.4} = -1.75$

BBM ; $\frac{\Delta Y^*}{\Delta T} + \frac{\Delta Y^*}{\Delta G} = \frac{1-c_1}{1-c_1+m_1} = \frac{1-0.7}{0.4} = \frac{0.3}{0.4} = 0.75$

5.3 Interpret the value of each of the multipliers.

investment multiplier - when I increase by 1, Y* (output) increases by 2.5

government spending multiplier - when G increases by 1, Y* increases by 2.5

tax multiplier - when T increases by 1, Y* decrease by 1.75

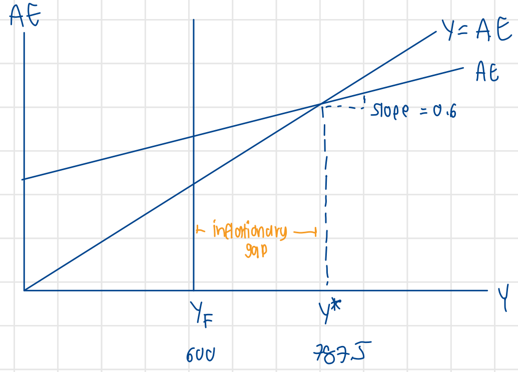
balance-budget multiplie - when T and G increases by 1, Y* increases by 0.75

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

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

inflationary gap

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



output gap is 187.5 = ΔY^* = 187.5

Now, government wants to correct the output gap by moving the economy to the full-employment level, and is considering different policies. $\downarrow G$ $\uparrow T$
(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?

$Y = 2.5$ $\quad G = 1$

$Y^* \rightarrow Y_F = -187.5$ $\quad \frac{187.5}{2.5} = -75$

$\Delta G = -75$

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

$\Delta G = \frac{-187.5}{2.5} = -75$

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

$\Delta Y^* = -187.5$ $\quad \frac{-187.5}{\Delta T} = -1.75 \Rightarrow \Delta T = 107.14$

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

$\Delta T = 107.14$

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

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

$\Delta I = \frac{-187.5}{2.5}$ $\quad \therefore \Delta I = -75$

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

$0.75 \quad 1$

$-187.5 \quad \frac{-187.5}{0.75} = -250$

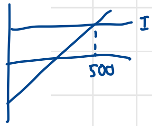
$\therefore$ G and T decrease by 250

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

leakage = injection

S=I

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) $S = I$

$-200 + 0.5Y = 50$

$0.5Y = 250$

$Y^* = 500$

7.2) $S = -200 + 0.5(500)$

$S^* = 50$ ✱

7.3) $S = -100 + 0.5Y$

find new equilibrium ; $S = I$

$-100 + 0.5Y = 50$

$0.5Y = 150$

$Y^* = 300$ ✱

7.4) new equilibrium saving (S^*)

$S = -100 + 0.5Y$

$= -100 + 0.5(300)$

$S^* = 50$

7.4) as paradox of thrift theory, when people save more it means they will spend less and income in economy will decrease which means people will receive lower income. therefore, less goods are produced (from 500 to 300)