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.

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, <u>increasing autonomous saving by 100</u>.

   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.

Ans

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

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

$\Delta Y = 25$ #

Investment multiplier $= \frac{\Delta Y}{\Delta I}$

$= \frac{10}{2} = 5$

1.2) Tax multiplier $= -3 = \frac{\Delta Y}{\Delta T}$

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

$\Delta T = 3$ #

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

2.1 Find Y^*

$AE = C + I + G$

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

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

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

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

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

2.2 Find $\Delta Y/\Delta I$

$AE = C + I + G$

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

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

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

↳ Slope of AE

as I is injection; $\frac{\Delta Y}{\Delta I} = \frac{1}{1 - \text{Slope AE}}$

2.3 $\Delta Y / \Delta G$

$$AE = C + I + G$$

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

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

↳ Slope of AE

As G is injection ; $\frac{\Delta Y}{\Delta G} = \frac{1}{1 - \text{Slope of AE}}$

2.4 Find $\frac{\Delta Y}{\Delta T}$

$$AE = C + I + G$$

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

as T is leakage ; $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - \text{slope of AE}}$

2.5 B.B.M

$$\frac{\Delta Y^*}{\Delta G} + \frac{\Delta Y^*}{\Delta T_0} = \frac{1 - C_1}{1 - C_1}$$

2.6 What is BBM

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

No X-M

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

$AE = C + I + G$

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

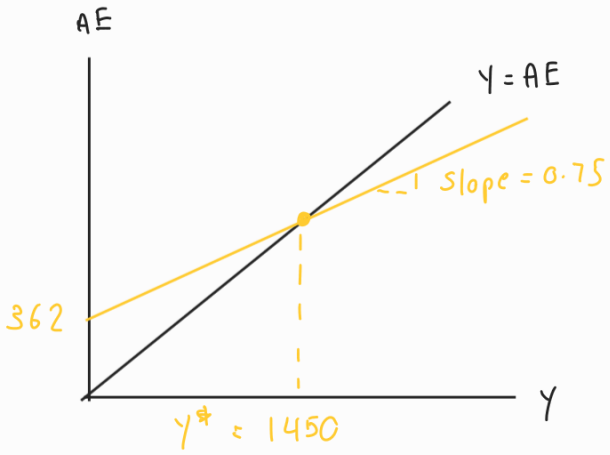
$Y^* = 300 + 0.75Y^* - 37.5 + 50 + 50$

$0.25Y^* = 362.5$

$Y^* = 1450$

$\therefore Y = 362 + 0.75Y$

3.2



3.3 $S + T = I + G$ ① leakage = injection

$Y - T = C + S$ ② saving function

$Y - C = T + S$

$Y - C = I + G$

$Y - C = 50 + 50$

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

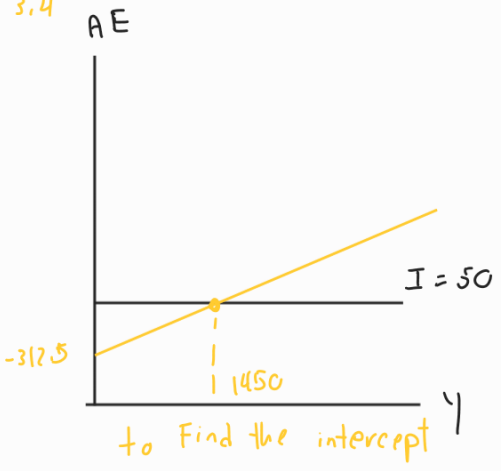
$Y - 300 - 0.75Y_d = 100$

$Y^* - 300 - 0.75(Y^* - 50) = 100$

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

$Y^* = 1450$

3.4



to Find the intercept

$Y_d = C + S$

$Y - T = C + S$

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

$S = -312.5 + 0.25Y$

3.5 Suppose G increase 50 and T increase 50

$G\uparrow = 50 + 50 = 100$

$T\uparrow = 50 + 50 = 100$

Find $y^* = ?$

$Y = AE$ } Equilibrium

$AE = C + I + G$

$Y = C + I + G$

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

$Y = 300 + 0.75Y - 75 + 50 + 100$

$Y = 375 + 0.75Y$

$y^* = \frac{375}{0.25} = 1500$

3.6. use Balanced-Budget multiplier (BBM) to find new Y^*

$\therefore BBM = \frac{\Delta Y^*}{\Delta G_0} + \frac{\Delta Y^*}{\Delta T_0} = \frac{1 - C_1}{1 - C_1} = 1$

When you sum $\frac{\Delta Y}{\Delta G}$ with $\frac{\Delta Y}{\Delta T}$, you will know how Y change

$\therefore$ If the government spending and lum-sum tax increase by 1, income will increase 1

$\therefore$ Therefore, in order to build more road, government increase their spending by 50, and lum-sum tax increase by 50. So the equilibrium output will increase 50

$\therefore$ = 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 $\Delta Y/\Delta G$

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4.5 Balanced-Budget Multiplier (BBM)

4.1 Equilibrium Output Y^*

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

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

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

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

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

4.2 $\Delta Y/\Delta I$

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

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

4.2 $\Delta Y/\Delta G$

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

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

4.3 $\Delta Y/\Delta T$

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

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

4.4 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.

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?

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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?

5.1 $Y = AE$

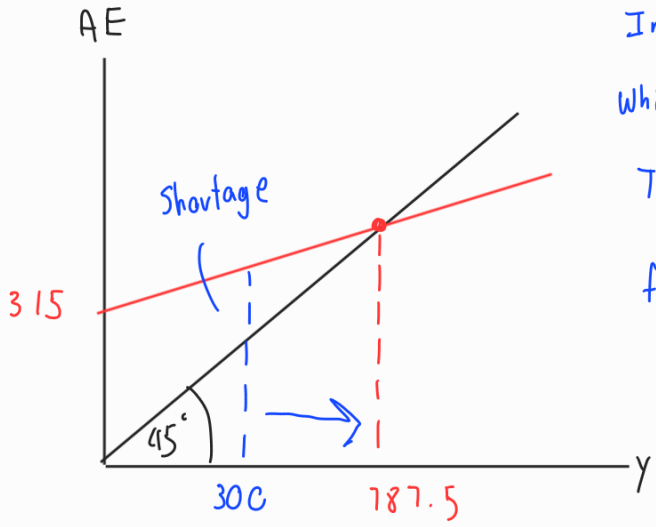
$AE = C + I + G + (X - M)$

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

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

$Y + 0.1Y - 0.7Y = 315$

$Y^* = 787.5$



In this case, at $y = 300$, $Y < C + I$

Which mean AE is more than aggregate output.

To clarify, the inventories decline, encourage firm increase in production to move to equilibrium at $Y = 787.5$

5.2 $AE = C + I + G + (X - M)$

$C = 200 + \underset{MPC}{0.7}(Y_d)$

$M = 50 + \underset{MPM}{0.1}Y$

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

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

$AE = 0.8Y + 75$

↳ Slope of AE = MPC + MPM

$\frac{\Delta Y^*}{\Delta I} = \frac{1}{1 - c_1 + M_1} = \frac{1}{1 - 0.7 + 0.1} = 2.5$

$\frac{\Delta Y^*}{\Delta T} = \frac{-c}{1 - c_1 + M_1} = \frac{-0.7}{1 - 0.7 + 0.1} = -1.75$

$\frac{\Delta Y^*}{\Delta G} = \frac{1}{1 - c_1 + M_1} = \frac{1}{1 - 0.7 + 0.1} = 2.5$

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

Or

Injection Multiplier

- Government spending multiplier (and Investment multiplier) $= \frac{1}{1 - \underset{MPC + MPM}{\text{Slope of AE}}}$

$= \frac{1}{1 - 0.7 + 0.1} = 2.5$ #

- Tax multiplier $= \frac{-MPC}{1 - \text{Slope of AE}}$

$= \frac{-0.7}{1 - 0.7 + 0.1} = -1.75$ #

5.3

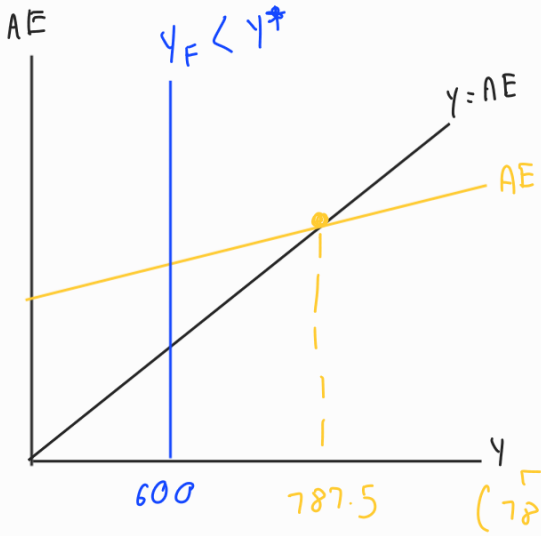
$\frac{\Delta Y^*}{\Delta I}$: When investment increase by 1 unit, output will increase by 2.5

$\frac{\Delta Y^*}{\Delta G}$: When government spending increase by 1 unit, output will increase by 2.5

$\frac{\Delta Y^*}{\Delta T}$: When tax increase by 1 unit, output will decrease by 1.75 unit.

BBM: When government and tax are increased equally by 1 unit, output will increase by 0.75

5.4

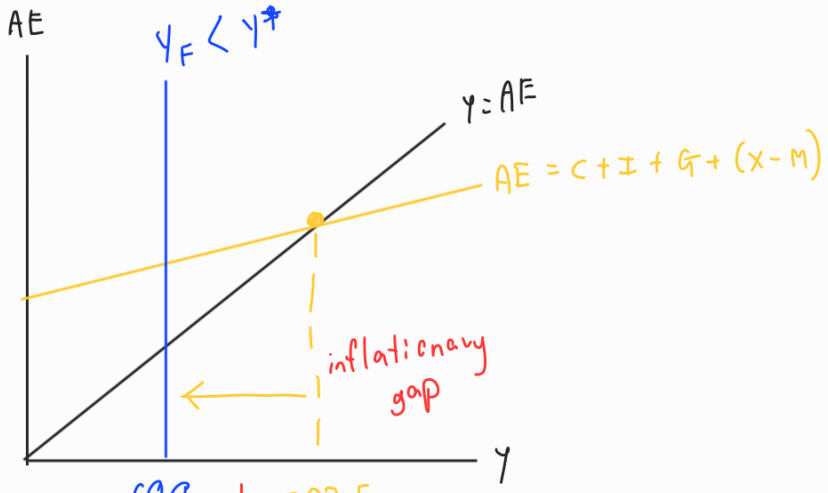


Unemployment rate is below the natural rate of unemployment, which mean we are in inflationary gap. In this time, the economy is growing to fast and over employed So that the policy solution is to raise tax and cut government spending to be $Y = Y_F$

Over Capacity
(787.5 ผลิตได้มากกว่า → Y < CUN)

5.5

demand มากไป large aggregate expenditure



Output gap = 187.5

$\Delta Y = -187.5$ (ลด Output)

5.6 $\frac{\Delta Y^*}{\Delta G} = 2.5$

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

5.7 $\frac{\Delta Y^*}{\Delta T} = -1.75$

$\Delta T = \frac{-187.5}{-1.75}$

$= 107.1412$ #

5.8 $\frac{\Delta Y^*}{\Delta I_0} = 2.5$

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

5.9 $\frac{\Delta Y^*}{\Delta G} + \frac{\Delta Y^*}{\Delta T} = 0.75$

$\frac{-187.5}{0.75}$ = ΔG and ΔT

$= -250$

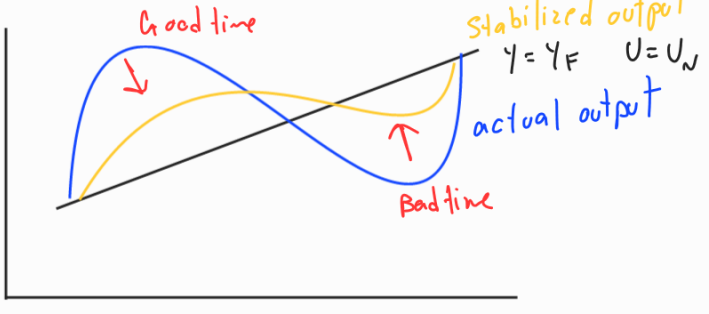
L ลดอย่างละ

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.

Automatic stabilizer → component in AE to stabilize the GDP

Import/income-tax are automatic stabilizer

Role of automatic stabilizer is reduce the the fluctuation of economy.



if it is fluctuate, people can't adjust their behavior quickly.

During good time → High Y, AE

so the government raise tax (T) and import (M) to reduce people income (Y) which helps to slow down the economy during peak times.

During bad time → Low Y, AE

so the government reduce tax (T) and import (M) to increase people income (Y) which helps to boost down the economy during economics 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 At equilibrium

leakage = Injection

saving = investment

$-200 + 0.5Y = 50$

$Y^* = 500$

7.2 Equilibrium of saving

Saving $= -200 + 0.5Y^*$

$S^* = 50$

7.3 People save more money by 100

So, saving $+100$ = new saving

New saving $= -200 + 0.5Y + 100$

$= -100 + 0.5Y$

Due to $S = I$

$-100 + 0.5Y = 50$

$\frac{1}{2}Y = 150$

$Y^* = 300$

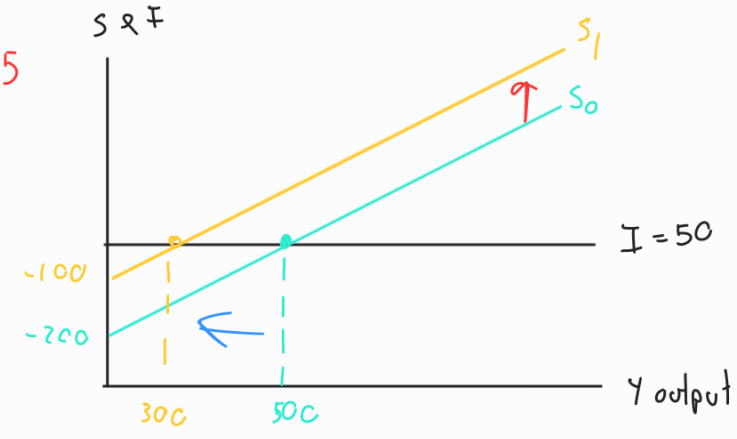
7.4 New equilibrium saving

Saving $= -100 + 0.5Y^*$

$= -100 + 0.5(300)$

$S^* = 50$

7.5



Paradox of thrift: People save more ⇒ Economy slowdown ⇒ Less income to people (Y↓)

↳ Due to less money change hand in economy

People save more by 100 ($S_0 \rightarrow S_1$)

Out put decrease by 200 (500 → 300)