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Discussion 2 Session 1 (Chapter 3)

Solution Manual

PART A: LONG QUESTIONS

1) Consider an economy described by the following equations:

$$S = -a_0 + (1 - a_1)(Y - T)$$

$$T = t_0Y$$

$$I = cY - di + e$$

$$G = \bar{G}$$

$$X = \bar{X}$$

$$M = m_0 + m_1Y$$

Note: All parameters are positive.

a) Derive an expression for the goods market equilibrium.

Answer:

First Way

$$Y - T = Y_d \quad \rightarrow \quad S = -a_0 + (1 - a_1)Y_d$$

$$S + C = Y_d \quad \rightarrow \quad C = a_0 + a_1Y_d$$

$$C = a_0 + a_1(Y - tY)$$

$$C = a_0 + a_1Y - a_1tY$$

Demand for Goods – Aggregate Expenditure

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

$$Z = a_0 + a_1Y - a_1tY + cY - di + e + \bar{G} + \bar{X} - m_0 - m_1Y$$

$$Z = a_0 - di + e + \bar{G} + \bar{X} - m_0 + (a_1 - a_1t + c - m_1)Y$$

$$Z = \bar{A} + (a_1 - a_1t + c - m_1)Y$$

Let's say the slope of Aggregate Expenditure Line is k which is equal to $(a_1 - a_1t + c - m_1)$ and autonomous spending $\bar{A} = a_0 - di + e + \bar{G} + \bar{X} - m_0$ (which is the part of spending that does not change with income level) in this example.

$$Z = \bar{A} + kY$$

Goods Market Equilibrium: At equilibrium inventory investment is equal to zero, thus the goods market requires that production Y be equal to the demand for goods Z .

$$Y = Z$$

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

$$Y = a_0 + a_1Y - a_1tY + cY - di + e + \bar{G} + \bar{X} - m_0 - m_1Y$$

$$Y = a_0 - di + e + \bar{G} + \bar{X} - m_0 + (a_1 - a_1t + c - m_1)Y$$

$$Y[1 - a_1 + a_1t - c + m_1] = a_0 - di + e + \bar{G} + \bar{X} - m_0$$

$$Y^* = \frac{1}{1 - a_1(1 - t) - c + m_1} * [-a_0 - di + e + \bar{G} + \bar{X} - m_0]$$

We can write this as below since we defined $k = a_1(1 - t) - c + m_1$ and $\bar{A} = a_0 - di + e + \bar{G} + \bar{X} - m_0$

$$Y^* = \frac{1}{1 - k} * \bar{A}$$

Second Way

The equilibrium can be expressed as

$$S + T + M = I + G + X \text{ (Leakages and Injections)}$$

$$S = -a_0 + (1 - a_1)Y_d \Rightarrow S = -a_0 + Y - tY - a_1Y - a_1tY$$

$$S + T = I + G + X - M \Rightarrow -a_0 + Y - tY - a_1Y - a_1tY + tY = cY - di + e + \bar{G} + \bar{X} - m_0 - m_1Y$$

$$Y[1 - a_1 - a_1t - c + m_1] = -a_0 - di + e + \bar{G} + \bar{X} - m_0$$

$$Y^* = \frac{1}{1 - a_1(1 - t) - c + m_1} * [-a_0 - di + e + \bar{G} + \bar{X} - m_0]$$

(Both ways are correct)

- b) Consider an increase in investment as \$500. Derive and graph the shift in the aggregate demand accordingly. What are the first impact and equilibrium impact of the change in output?

Answer:

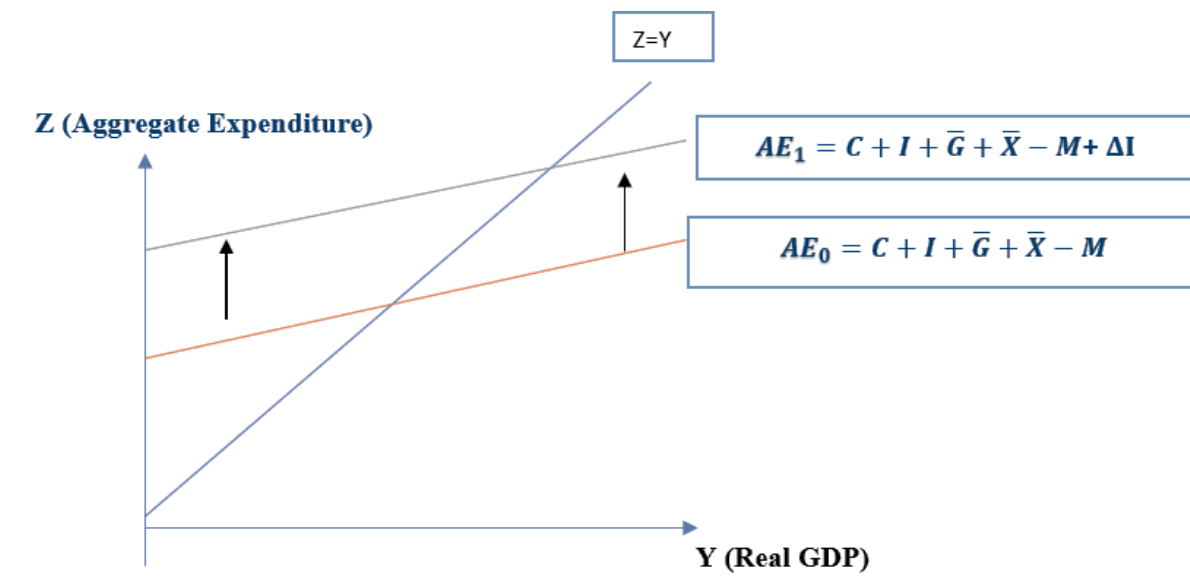
$$Y = C + I + G + X - M$$

First impact of the change in Investment on Output

$$\Delta Y = \Delta I$$

Final impact of the change in Investment on Equilibrium Output

$$\Delta Y^* = \frac{1}{1 - a_1(1 - t) - c + m_1} * \Delta I$$



- c) What is the relationship between interest rate (i) and income (Y)? Give an economic explanation. (Hint: you can start as commenting about positive or neg relationship)

Answer:

First of all, it is seen from the equation, there is negative relationship. As interest rate increases, national income falls.

Economically, the main reason why there is a negative relationship is caused by the relationship between investment and interest rate. Higher interest rates undermines the incentives towards making investment, since high interest rates increase the cost of borrowing (mainly the loans from banks or other financial institutions) and require investment to have a higher rate of return (profit) to cover all costs. Private investment is an increase in the capital stock such as buying a factory or machine

- d) What is the size of multiplier? Also, find the multipliers of each component of this open economy as m_T , m_I , m_G . Sort them ascendingly.

$$\text{Simple Fiscal Multiplier} \Rightarrow m_I = m_G = \frac{1}{1 - a_1 * (1 - t) - c + m_1}$$

$$\text{Tax Multiplier} \Rightarrow m_T = \frac{-a_1}{1 - a_1 * (1 - t) - c + m_1}$$

$$m_I = m_G > m_T$$

Note: Here the Tax multiplier actually is for the Autonomous Tax changes not for the change in tax rate. In this example model, there is no Autonomous Tax. But if there was, the effect of autonomous tax change would be as m_T calculated above. Change in tax rate would have change the slope of the ZZ line and so multiplier itself, would not change the autonomous spending.

- 2) Suppose that the economy is characterized by the following behavioural equations:

$$C = 500 +$$

$$0.5Y_D \quad I =$$

$$100$$

$$T = 80$$

$$G = 200$$

- a. Find the equilibrium level GDP (Y), disposable income (Y_D) and consumption spending (C).

a) Total demand : $Z \equiv C + I + G$

in eqm: $Y = Z$

$$\Rightarrow Y = C + I + G$$

$$Y = 500 + 0.5 \underbrace{Y_D}_{Y-T} + 100 + 200$$

$$Y = 500 + 0.5(Y - 80) + 100 + 200$$

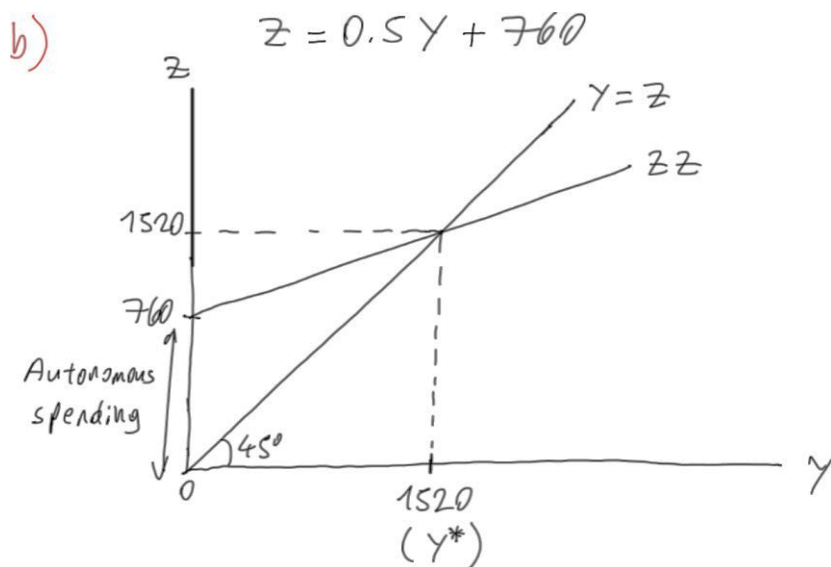
$$Y = 0.5Y + 760$$

$$Y = 1520 //$$

$$\text{then, } Y_D = Y - T = 1520 - 80 = 1440 //$$

$$C = 500 + 0.5(1440) = 1220$$

b. Show the equilibrium on a graph.



c. Calculate the level of private saving and public saving. Is the total saving equal to the investment?

c) Private saving: $S = Y_D - C = 1440 - 1220 = 220$
 Public saving: $T - G = 80 - 200 = -120$ (Budget deficit)
 total saving $= S + (T - G) = 220 - 120 = 100 = I //$

d. What is the value of marginal propensity to consume? What does it mean? What is the value of propensity to save?

Marginal propensity to consume gives the effect of an additional dollar of disposable income on consumption. For example, if $mpc = c_1 = 0.3$, this means that \$0.30 of an additional \$1 of disposable income will be consumed, and \$0.70 will be saved. In this problem, $mpc = c_1 =$

0.5. For every additional \$1 disposable income increase, \$0.50 will be consumed. Marginal propensity to save gives the effect of an additional dollar of disposable income on saving, mps

$$= (1 - mpc) = (1 - 0.5) = 0.5$$

e. Find the multiplier and autonomous spending. Explain what they mean.

e) eqm: $Y = C + I + G$

$$Y = c_0 + c_1(Y - T) + I + G$$

$$(1 - c_1)Y = c_0 - c_1T + I + G$$

$$Y = \frac{1}{1 - c_1} [c_0 - c_1T + I + G]$$

Multiplier: $\frac{1}{1 - c_1} = \frac{1}{1 - 0.5} = 2 //$

Autonomous spending: $[c_0 - c_1T + I + G] = [500 - 0.5(80) + 100 + 200]$
 $= 760 //$

f. By how much does Y increase when G increases by 20 unit? By how much does Y increase when T decreases by 20 unit? Why the effects of these two actions are different?

f) $Y = \frac{1}{1 - c_1} [c_0 - c_1T + I + G]$

if $\Delta G = 20 \Rightarrow \Delta Y = \frac{1}{1 - c_1} \Delta G = 2(20) = 40$

if $\Delta T = -20 \Rightarrow \Delta Y = -\frac{c_1}{1 - c_1} \Delta T = -\frac{0.5}{1 - 0.5} (-20) = 20$

The effects differ because the government spending affects demand directly, but taxes affect demand indirectly through consumption, and the propensity to consume is less than one.

3) Glasgow is an imaginary country with the following equations:

$$C = 280 + 0.4Y_d$$

$$I = 56$$

$$T = 110$$

$$G = 180$$

$$X = 100$$

$$M = 200$$

- a) Solve for goods market equilibrium. Graph Y and Z.

$$Z = AE = C + I + G + NX$$

$$Z = 280 + 0.4(Y - T) + I + G + X - M$$

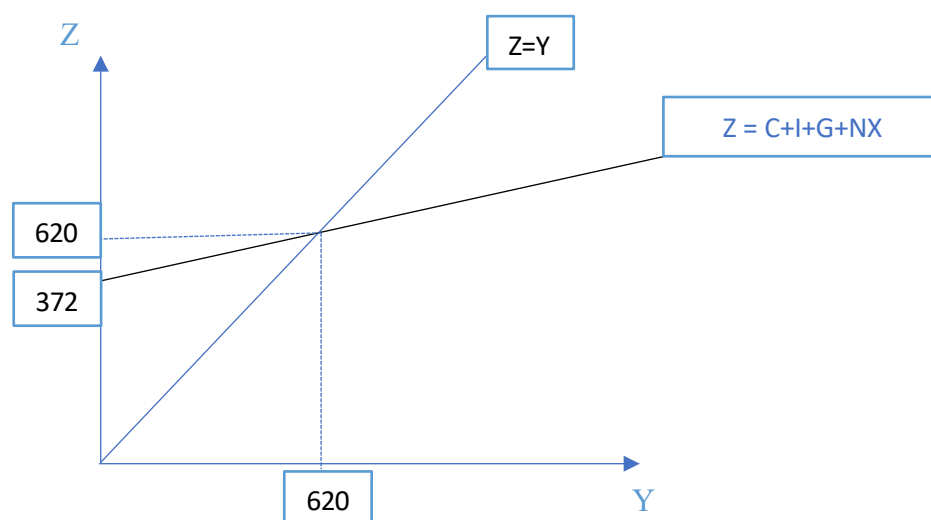
$$Z = 280 + 0.4Y - (0.4 \cdot 110) + 56 + 180 + 100 - 200$$

$$Z = 0.4Y + 372$$

At Eqm.

$$0.6 \cdot Y_{eq} = 280 - 44 + 56 + 180 + 100 - 200 = 372$$

$$Y_{eq} = 372 / 0.6 = 620$$



- b) Solve for private & public savings.

$$S + (T - G) = I + X - M$$

$$\text{Private savings} = S = I - (T - G) + NX = 26$$

$$\text{Public savings} = T - G = 110 - 180 = -70$$

- c) Glasgow gets invaded by another country and government decides to increase its spending by 300 to support the victims of this event. What is the final equilibrium?

$$m_G = 1 / (1 - 0.4) = 10/6$$

$$Y' = 620 + 10/6 \cdot (300) = 1120$$

- d) After the implementation of government expenditures officials are not satisfied by its results. They wanted to find out what would have been the final equilibrium if they decrease taxes by 300 instead of increasing government expenditures. How does the final equilibrium change now? Which one of the policies resulted best for Glasgow.

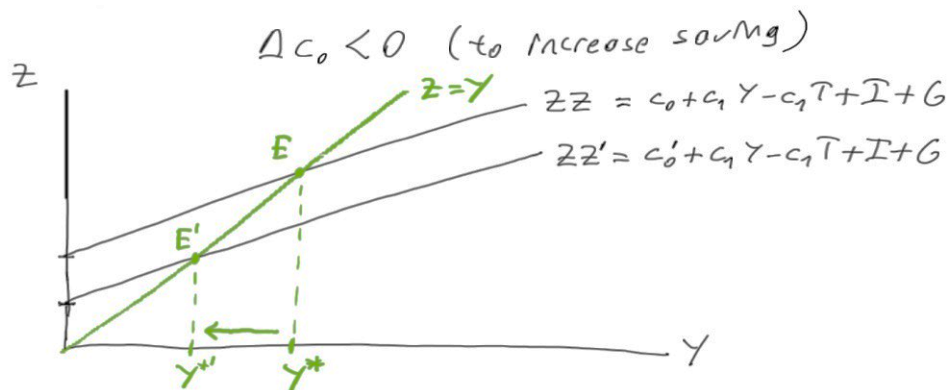
$$m_T = (-0.4) / (1 - 0.4) = -4/6$$

$$Y'' = 620 - (-4/6 \cdot 300) = 820$$

Since $m_G > m_T$, increasing government spending by 300 is a more effective policy.

4) Let $C = c_0 + c_1(Y - T)$

The Paradox of Thrift refers to a case that people's increased inclination to save causes a fall in output. Explain, using the goods market diagram, the shift from the old equilibrium to the new equilibrium when c_0 falls. Why must the fall in equilibrium output be precisely equal to what is necessary to exactly offset the initial increase in the desire to save?



eqm: $Y = C + I + G$

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

$\underbrace{Y - T - C}_{S} = \underbrace{I + G - T}_{\substack{\text{fixed} \\ \text{fixed}}} \Rightarrow S = I + G - T \Rightarrow \Delta S = 0$

focus on $S = Y - T - c_0 - c_1 Y - c_1 T$

$S = \underbrace{(1 - c_1)Y}_{\downarrow} - \underbrace{c_0}_{\downarrow \Delta c_0 < 0 \text{ (initial increase in the desire to save)}} - (1 + c_1)T$
 $\Rightarrow \Delta S = 0$

* for S to remain unchanged, the fall in eqm. output must be precisely equal to what is necessary to exactly offset the initial increase in the desire to save.

PART B: MULTIPLE CHOICE

- 1) An economy is assumed to be closed and simple when:
 - A) $C=S$, $G=T$
 - B) $X=M=0$, $G=0$**
 - C) $G=T$
 - D) $S=I=0$
 - E) $Y=Z$, $G=0$
- 2) Disposable income equals:
 - A) income minus both saving and taxes.
 - B) income minus saving.
 - C) consumption minus taxes.
 - D) the sum of consumption and saving**
 - E) none of the above
- 3) Fayoum is a country with an open economy which has the equations of:
Government expenditure = 100
Investment = 20
Consumption = 80
If aggregate demand of Fayoum is smaller than 200, which one of the conditions must be true?
 - A) $X>M$
 - B) $M>X$**
 - C) $S>50$
 - D) $M=X=0$
 - E) None of them
- 4) The sum of consumption and savings (disposable income) is also equals to:
 - A) $Y-T$**
 - B) $I-(S+T)$
 - C) $I-S$
 - D) $C-T$
 - E) none of the above
- 5) The marginal propensity to save represents:
 - A) the change in saving caused by a one-unit change in disposable income**
 - B) the change in output caused by a one-unit change in autonomous demand.
 - C) the ratio of total consumption to disposable income.
 - D) the level of consumption that occurs if disposable income is zero.
 - E) total income minus total taxes.

- 6) Let the consumption function be represented by the following equation: $C = c_0 + c_1 \cdot Y_d$. For this equation, we assume that c_1 is:
- A) Different at different levels of income
 - B) Negative
 - C) Larger than c_0
 - D) Marginal Propensity to consume.**
 - E) None of them
- 7) Wakanda is a closed economy and has a consumption function of $C = C_0 + C_1 \cdot Y_d$. Thanks to the great recent technological improvements, The Wakanda government decreases its taxes. If marginal propensity to consume and autonomous consumption didn't change, which one of the following is expected?
- A) decrease in disposable income.
 - B) Increase in consumption.**
 - C) Decrease in consumption.
 - D) decrease in aggregate demand.
 - E) Consumption will not change.
- 8) Suppose that the consumption function is represented by the following equation: $C = 9650 + 0.60Y_d$. If there are no other endogenous variable in the economy, the size of multiplier is:
- A) 5
 - B) 2.5**
 - C) 1.66
 - D) 2
 - E) 1.25
- 9) Suppose as unrealistic as this might be, that disposable income is zero for a country. Given this information, we know that:
- A) the marginal propensity to consume must be zero.
 - B) consumption must be zero.
 - C) saving must be positive.
 - D) saving is negative.**
 - E) saving must be zero.
- 10) Which option would cause an increase in investment?
- A) Increase in private savings
 - B) Increase in public savings
 - C) Decrease in government spending
 - D) Increase in national savings
 - E) All of the options**

From IS equation:

$$S + (T - G) = I$$

$$\text{Private savings}(S) + \text{public savings}(T - G) = \text{Investment}$$

11) Aswan is a country with an open economy which has the equations of:

$$\text{Consumption} = 2200 + 0.2 \cdot Y_d$$

$$\text{Tax} = 110$$

$$\text{Government expenditure} = 106$$

$$\text{Investment} = 33$$

$$\text{Imports} = 157$$

$$\text{Exports} = 280$$

Which one is false for Aswan?

- A) Net exports equal to 123
- B) Private savings is 152.
- C) Disposable income is 2940.
- D) National savings is 40.**
- E) Equilibrium output is 3050.

PART C: TRUE/FALSE (Explain if it is necessary)

- 1) If investment is less than national savings, there is an increasing budget deficit.

False. According to the equation of $S + (T - G) = I$, if I is less than nat. savings, summation of public savings and private savings is greater than I . It is not possible to occur inc. budget def.

- 2) Consider the simple goods market model, where $Z = C + I + G$ and both I and G are fixed. Let the consumption function be $C = c_0 + c_1(Y - T)$. If c_1 rises, the private saving rate, defined as S/Y , increases.

False, if c_1 increases, the equilibrium output increases. On the other hand, private savings must be equal to investment minus public savings, which is fixed. Therefore, private savings are not affected (the savings paradox). If S is unchanged and Y goes up, then S/Y , decreases.

$$Z = Y = c_0 + c_1(Y - T) + I + G$$

I and G are fixed.

So, Y and Z is only affected by the changes in consumption function.

- 3) Increase in autonomous saving leads to an increase in aggregate demand and thus an increase in output.

False. Increase in saving eventually cause decrease in consumption and aggregate output because of the multiplier effect. (Paradox of Saving)