3. National Income and Equilibrium Determination

EE 212 : Case & Fair, ch. 8; LCR, ch. 23-24

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Contents

1 Introduction

- Leakages : .....
- Injections : .....
- Expenditure Approach : GDP = ...
- (Assuming no depreciation, no indirect tax : GNP = NNP = NI)
- Real GDP VS. Nominal GDP

- Assumption : Price is constant
- Y = C + I + G + (X-M)
- Potential Y = the total output that can be produced when all productive resources - labour and capital equipment in particular- are being used at their normal capacity
- Actual Y is not always equal to Potential Y.
- Output Gap = Actual output - Potential output
- Economic Activities $\rightarrow$ Employment, $\rightarrow$ National Income (Y)
  (C,I,G,(X-M)) Production
  $\uparrow$
  factors determining
- What are the factors determining Y ?
- How is the equilibrium Y determined?
- Y = C+I+G+(X-M)
- The theory of national income : Desired Aggregate Expenditure (DAE)
- DAE = C+I+G+(X-M)
- "Desired" , "Planned" does not refer to what people would like to do under imaginary circumstances; it refers to what people would like to spend out of resources that are at their command

- National Income Accounts measure ..... expenditures in each of the four categories.
- National Income Theory deals with ..... expenditures in each of the four catergories.

- "Actual" output may not be equal to "Desired" expenditure $\rightarrow \Delta inventories \rightarrow adjustment$

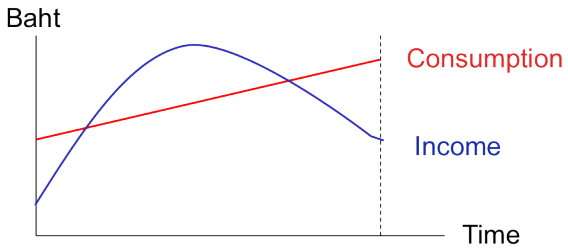
2 Composition of desired aggregate exdentiure (DAE)

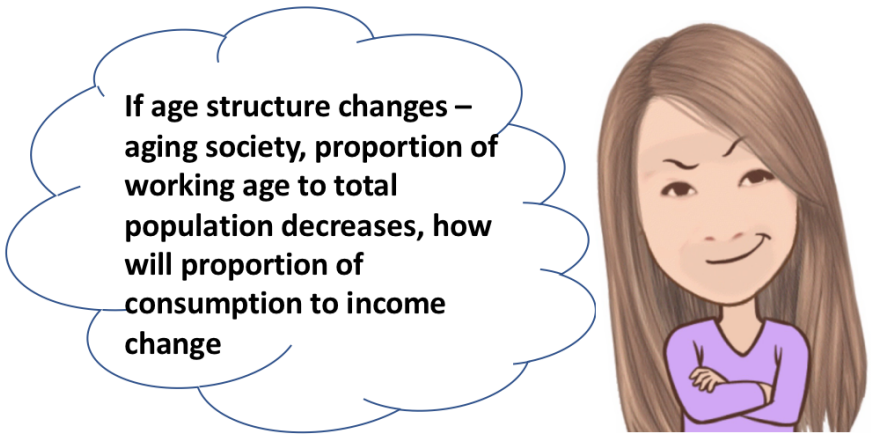
2.1 Desired aggregate consumption and consumption theories (C)

Desired consumption expenditures (C) : the expense households paid to consume goods and services

2.1.1 Consumption theories

- The absolute income theory
- The relative income theory
- The permanent income theory : developed by Milton Friedman
  - Y = Permanent Income + Temporary Income
  - C = Permanent Consumption + Temporry Consumption
- The life-cycle theory





2.1.2 The Absolute Income Theory :

Consumption Function and Saving Function

The Absolute Income Theory, Keynes Consumption Theory :

- Disposable Income (.....) ; .....=.....
- Households will devide their disposable income into two parts ; ..... and .....
- Factors determining aggregate consumption
  - **Disposable Income** (.....)
  - Consumer Credit and Interest Rate
  - Consumer's Wealth
  - Consumer's Debt
  - Consumer's Expectation
  - Consumer's Taste
  - The number of Population and Age Structure
  - Income Distribution
  - Others ; for example, education
- $C = f(Y_d, \text{other factors determinging aggregate consumption})$
- $S =$ .....
- Relationship between Consumption and Income
  - $Y_d \uparrow$, C $\uparrow$
  - As $Y_d \uparrow$ by 1 unit, $C\uparrow$ by ..... 1 unit.
  - $Y_d \uparrow$, proportion of consumption to disposable income $\left(\frac{C}{Y_d}\right)$ .....
- Consumption function

$$C = C_0 + bY_d,$$

where

C_0 is autonomous consumption expenditure
b is marginal propensity to consume (MPC)
Y_d is disposable income

APC = Average Propensity to Consume =

- Saving function

$$S = $$

$$= $$

$$= $$

where

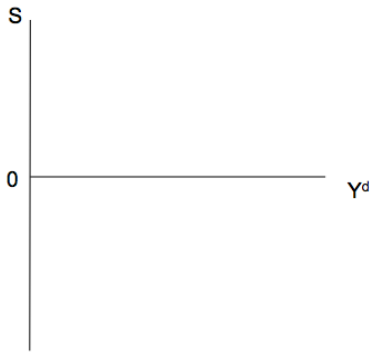
$-C_0$ is autonomous dissaving
$(1 - b)$ is marginal propensity to save (MPS)
APS = Average Propensity to Save =

Example : Consumption function, $C = 100 + 0.6Y_d$

- $C = 100 + 0.6Y_d$

  - When Y_d = C
    - Consumption line ..... 45° line
    - This implies that .....
    - Y_d at this point is called .....(.....)
  - When $Y_d <$ .....Y_d
    - Consumption line is ..... 45° line
    - C ..... Y_d
    - This is possible. How?
    - S 0
    - At $Y_d = 0$, C = ... which is .....
  - When $Y_d >$ .....Y_d
    - Consumption line is ..... 45° line
    - C ..... Y_d
    - S 0
- $Y_d \uparrow$, C ....., S .....

- S = ...



  - When S = 0 , $C =$ .....
    - It is the point where saving line ..... horizontal axis.
    - Y_d at this point is called .....(.....)
  - When $Y_d <$ .....Y_d
    - saving line is ..... horizontal axis
    - S 0
    - C ..... Y_d
    - This is possible. How?
    - At $Y_d = 0$, S = ...
  - When $Y_d >$ .....Y_d
    - saving line is ..... horizontal axis
    - S 0
    - C ..... Y_d

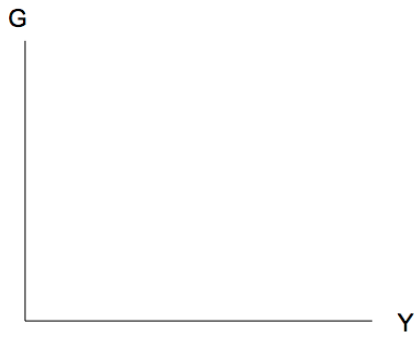
Example : Consider the following economy.

$$\begin{aligned} C &= 1920 + 0.8Y \\ T &= 200 \\ R &= 100 \end{aligned}$$

(a) Find $C(Y_d)$, $S(Y_d)$ and $S(Y)$. Plot all graphs.
(b) Suppose Tax increases from 200 to 600. Find $C(Y_d)$, $S(Y_d)$ and $S(Y)$. Plot all graphs. Compare the new functions with the original functions.

2.2 Desired Aggregare Government Expenditure (G)

- Factors determining desired aggregate government expenditure = government policy = fiscal policy
- Expansion fiscal policy : G .....
- Contraction fiscal policy : G .....
- Assuming that government expenditure does not depend on Y.
- $G = G_0$: for example, $G = 50$



- Shift and move along in government expenditure line

2.3 Desired aggregate net exports (X-M)

- Net export = Export - Import
- Factors determining

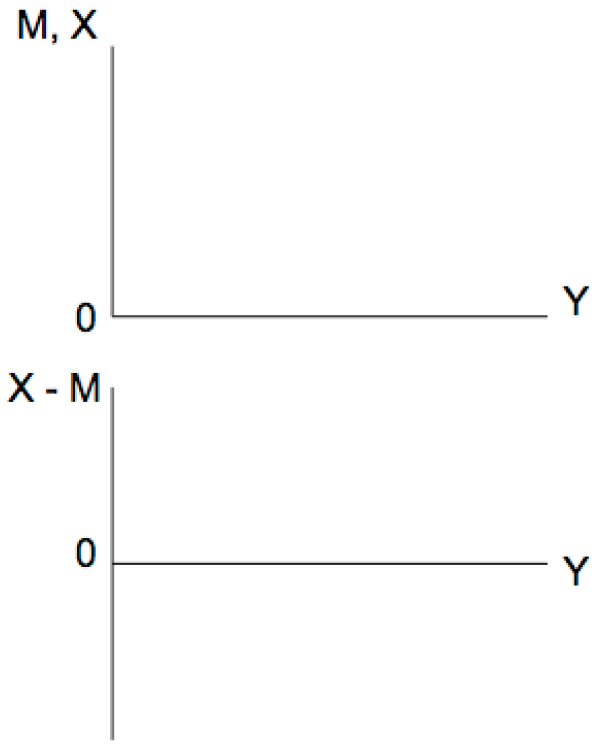
Export	Import
Income of ..... Demand from	Income of ..... Demand of .....
Price of ..... (compared with .....)	Price of ..... (compared with .....)
Exchange Rate	Exchange Rate
Others: Political and Economic Stability for example, government policy	Others: for example, government policy

- Export function $X =$..... .
- Import function : $M =$.....
- where

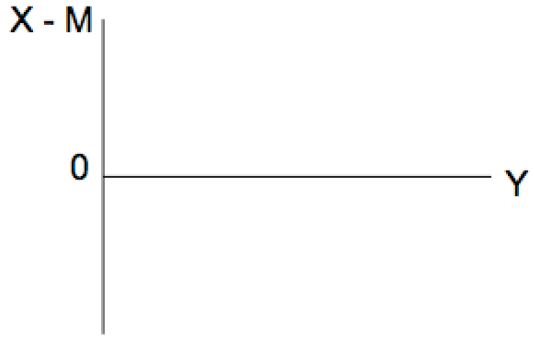
  X_a = autonomous export

  M_a = autonomous import

  m = marginal propensity to import



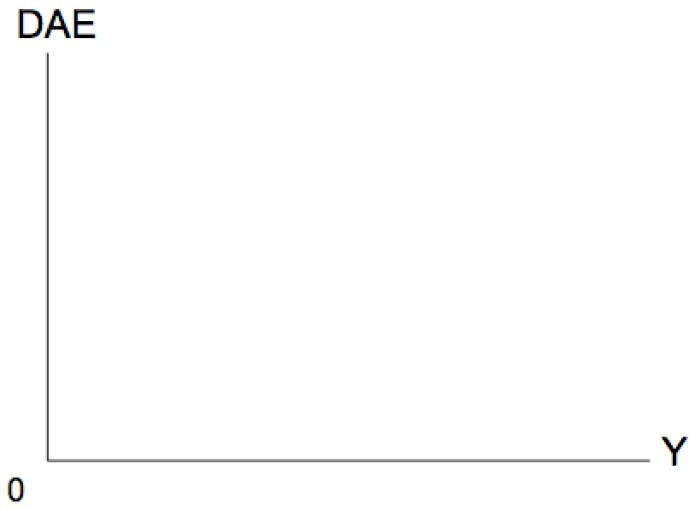
- Shift and move along in Net Export line
- Government export promotion policy
- Demand from foreign country ↓



2.4 Desired Aggregate Expenditure (DAE)

- DAE =

- Plot DAE on (Y, DAE) plane.
- Equation:
- Slope .....
- Marginal Propensity to Spend ; between 0 and 1
- vertical axis intercept =.....



3 Equilibrium National Income

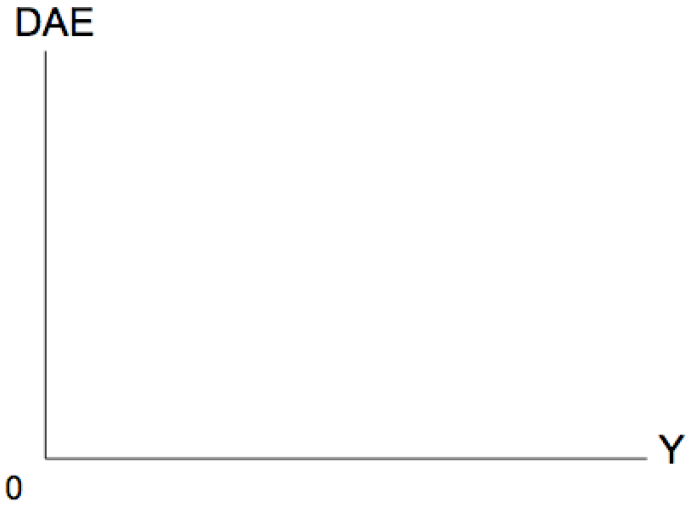
- Meaning :
  Equilibrium is .....
  A position of balance. A position from which there is no inherent tendency to move away.
- Equilibrium National Income is .....
- Equilibrium conditions : any conditions that are required for something to be in equilibrium

- Two methods

1. Income - Expenditure Approach : .....
2. Withdrawal(Leakage) - Injection Approach : .....

3.1 Income-Expenditure Approach

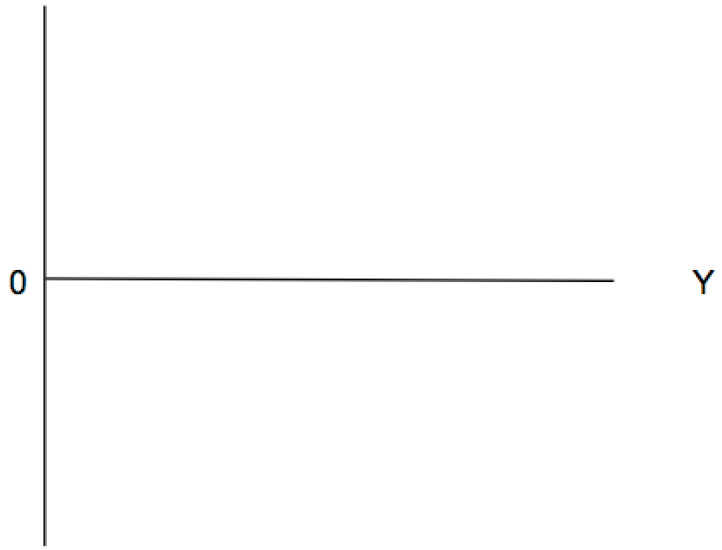
- Example : $C = 200 + 0.8Y$, $I = 400$, What is equilibrium Y? Calculation



- Y > DAE ⇒ Actual output ..... Desired aggregate expenditure ⇒
  Actual Δ Inventory ..... Intended Δ Inventory , Actual Investment ..... Desired Investment , produce ..... next year, Y .....
- Y < DAE ⇒ Actual output ..... Desired aggregate expenditure ⇒
  Actual Δ Inventory ..... Intended Δ Inventory , Actual Investment ..... Desired Investment , produce ..... next year, Y .....
- Hence, at Y=DAE, Actual output ..... Desired aggregate expenditure ⇒
  Actual Δ Inventory ..... Intended Δ Inventory , Actual Investment ..... Desired Investment , produce ..... next year, Y .....
- There is no inherent tendency to move away. (Except when .....?)

3.2 Leakage - Injection Approach

- Example : $C = 200 + 0.8Y$, $I = 400$, What is equilibrium Y? : Calculation



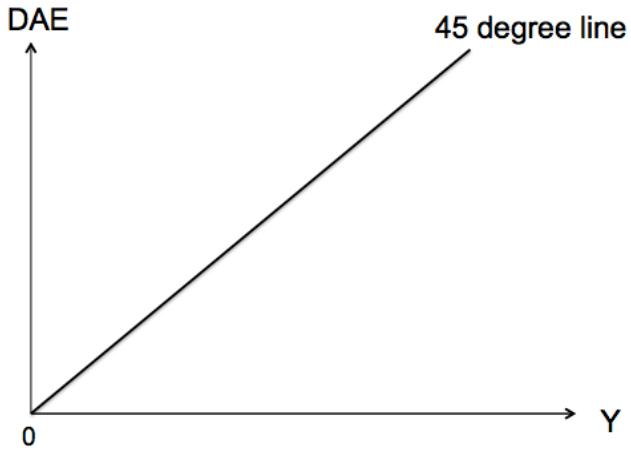
- S > I , leakage.....Injection⇒ Actual output ..... Desired aggregate expenditure ⇒ (same explanation as Y=DAE approach) , produce ..... next year, Y .....
- S< I , leakage.....Injection ⇒ Actual output ..... Desired aggregate expenditure ⇒ (same explanation as Y=DAE approach) , produce ..... next year, Y .....
- S = I , leakage = Injection ⇒ Actual output ..... Desired aggregate expenditure ⇒ (same explanation as Y=DAE approach)

	Y=DAE	Leakage = Injection
Closed Economy without Government		
Closed Economy with Government		
Open Economy		

- Example

$$\begin{aligned} C &= 200 + 0.8Y \\ I &= 400 \\ S &= -200 + 0.2Y \end{aligned}$$

Y	C	S	I	DAE	difference	Adjust-ment
2,000					Y.... DAE	
3,000					Y.... DAE	
4,000					Y.... DAE	



From the graph,

- Equilibrium national income is that level of national income where .....
  which is the same level of national income where .....
  At this equilibrium national income, Y ..... DAE and S ..... I, Leakages ..... Injections

- If actual national income is below the equilibrium national income,

  DAE ..... 45 degree line, which means that Y..... DAE
  S line ..... I line, which means that S I
  Actual Δ Inventory ..... Intended Δ Inventory , Actual Investment ..... Desired Investment, produce ..... next year, Y .....

- If actual national income is above the equilibrium national income,

  DAE ..... 45 degree line, which means that Y..... DAE
  S line ..... I line, which means that S I
  Actual Δ Inventory ..... Intended Δ Inventory , Actual Investment ..... Desired Investment , produce ..... next year, Y .....

- This is also used to explain "adjustment to the new equilibrium".

- Example: Given the following specifications

$$\begin{aligned} C &= 60 + 0.8Y^d \\ I &= 35 \\ G &= 15 \\ T &= 20 + 0.2Y \\ X &= 36 \\ M &= 10 + 0.24Y \end{aligned}$$

a. Find equilibrium national income using injection = leakage approach

b. Draw the graph showing the equilibrium national income based on the solution from question (a)

c. Find equilibrium national income using Y = DAE approach

d. Draw the graph showing the equilibrium national income based on the solution from question (c)

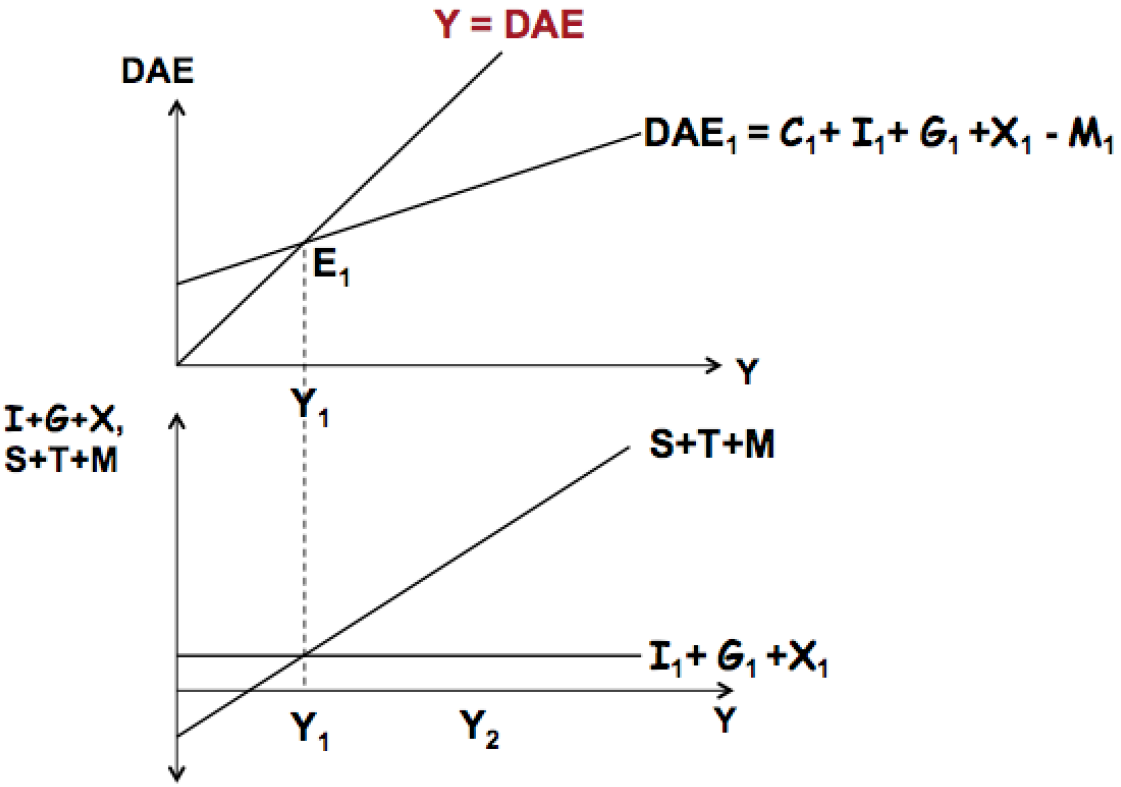
e. Find term of trade at the equilibrium national income

f. Find government fiscal budget balance at equilibrium national income.

4 Changes in equilibrium national income and the multiplier

4.1 Changes in equilibrium national income

- Changes in equilibrium take place when?
- Graphically Illustration



- Using the previous example.

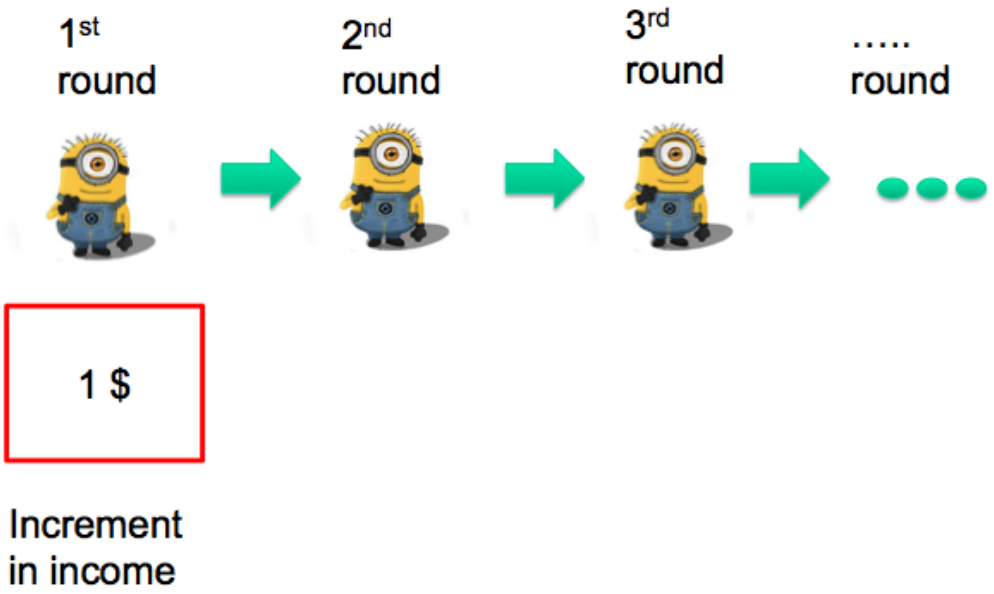
$$\begin{aligned} C &= 60 + 0.8Y^d \\ I &= 35 \\ G &= 15 \\ T &= 20 + 0.2Y \\ X &= 36 \\ M &= 10 + 0.24Y \end{aligned}$$

- $Y^* =$ .....
- What is new Y^* if I_0 (autonomous investment) is increased from 35 to 45?
- Explain "adjustment to the new equilibrium".

4.2 Multiplier

4.2.1 Multiplier : meaning

- "a multiplier" is a factor that measures how much an endogenous variable changes in response to a change in some exogenous variables.
- In DAE model, it is .....
- From the example, the multiplier for autonomous investment or "investment multiplier" is ..... 1.
- $DAE =$ .....+.....Y
- $\Delta Y_E =$ ..... $\times$ .....
- $multiplier \quad =$
- multiplier 1
- Basically, this is because ....



4.2.2 Multiplier : closed versus open economy

- Let's assume $I = I_0 + iY$

$$\begin{aligned}
DAE &= C + I + G + (X - M) \\
&= (C_0 + bY_d) + (I_0 + iY) + G_0 + X_0 - (M_0 + m.Y) \\
&= (C_0 + b(Y - T_0 + R_0)) + (I_0 + iY) + G_0 + X_0 - (M_0 + m.Y) \\
&= (C_0 + bY - bT_0 + bR_0)) + (I_0 + iY) + G_0 + X_0 - (M_0 + m.Y) \\
DAE &= C_0 - bT_0 + bR_0 + I_0 + G_0 + X_0 - M_0 + (b + i - m)Y \\
Y_E &= C_0 - bT_0 + bR_0 + I_0 + G_0 + X_0 - M_0 + (b + i - m)Y_E \\
[1 - (b + i - m)]Y_E &= [C_0 - bT_0 + bR_0 + I_0 + G_0 + X_0 - M_0] \\
Y_E &= \left[\frac{1}{\qquad\qquad}\right][C_0 - bT_0 + bR_0 + I_0 + G_0 + X_0 - M_0]
\end{aligned}$$

- close economy's income multiplier is $= \left[\frac{1}{\qquad\qquad\qquad\qquad}\right]$

- open economy's income multiplier is $= \left[\frac{1}{\qquad\qquad\qquad\qquad}\right]$

- Open economy multiplier is ..... closed economy multiplier.

- Marginal propensity to spend in open economy is ..... that for closed economy.

4.2.3 Balanced Budget Multiplier

- **Balanced budget multiplier** : $\Delta G = \Delta T$
- Let ΔB be a balanced-budget change in government spending. Government increases its spending(G) by ΔG units balancing it by an increase in taxes (T) by ΔT units. $\Delta G = \Delta T$. How does this affect Y^*?
- Balanced budget multiplier in **Closed Economy**

  $\frac{\Delta Y}{\Delta G_0} =$, $\frac{\Delta Y}{\Delta T_0} =$

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

  $\frac{\Delta Y}{\Delta B}$ is called "balanced budget muliplier".

- Meaning : When the government increases (decreases) its expenditure by 1 unit at the same time it increases (decreases) the tax by 1 unit, equilibrium national income will increase (decrease) by "$\frac{\Delta Y}{\Delta B}$ = balance budget multiplier " units.

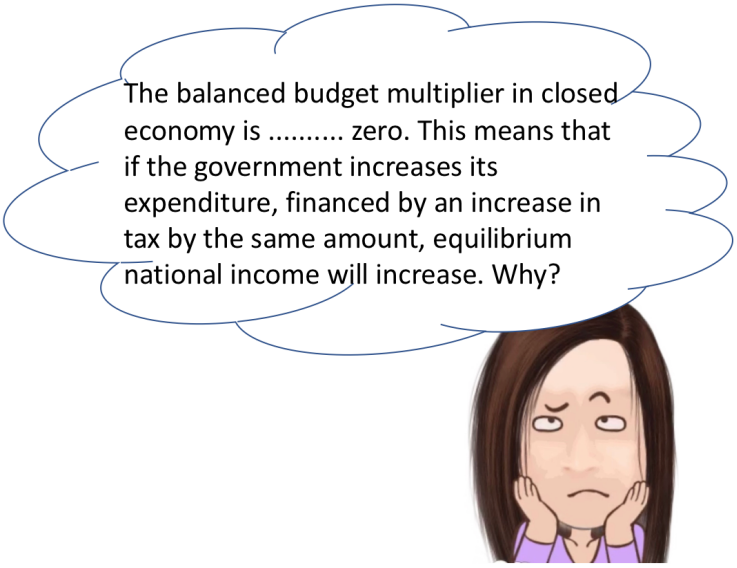
- Balanced budget multiplier in Opened Economy

  $\frac{\Delta Y}{\Delta G_0} =$, $\frac{\Delta Y}{\Delta T_0} =$

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

- **A special case, which is mentioned often in literature :** $\Delta G = \Delta T : C = C_a + bY_d$, $I = I_a$, $G = G_a$, $T = T_a$,

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

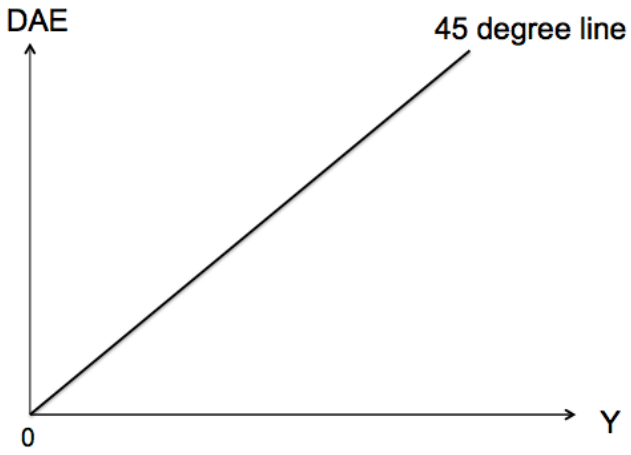


A Short Summary.

- $DAE =$ .....+ .....Y
- $Y^E =$ ..... $\times$ Autonomous Expenditure
- $multiplier \ =$
- multiplier 1
- marginal propensitiy to spend $\uparrow \Rightarrow$ slope of DAE ..... (DAE .....) $\Rightarrow$ multiplier .....
- multiplier : $C = C_a + bY_d$, $I = I_a + iY$, $G = G_a$, $T = T_a = tY$, $X = X_a$, $M = M_a + mY$

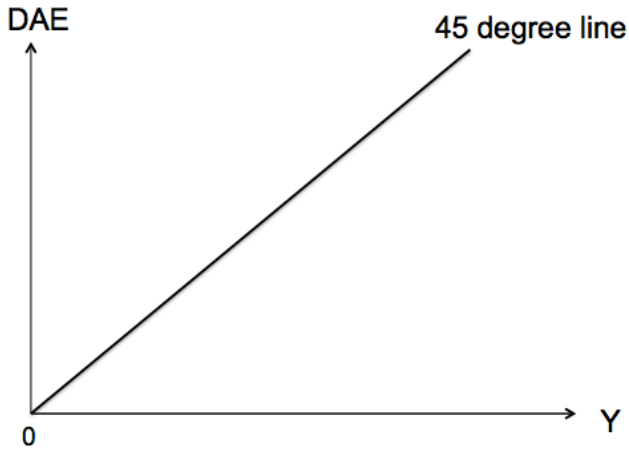
income multiplier	C, I, G,X mulitplier	T multiplier	M multiplier

5 Inflationay and deflationary gap



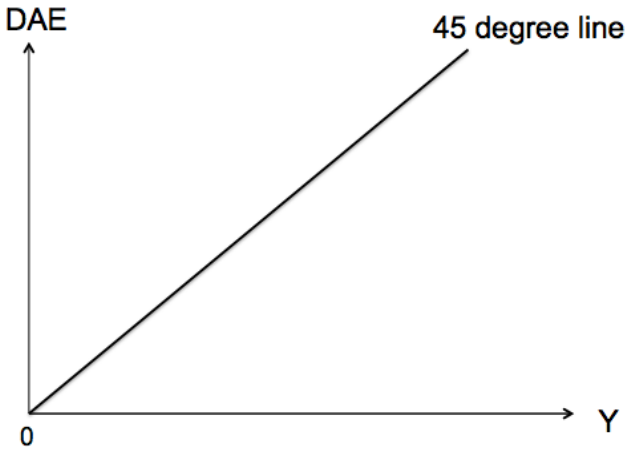
- Potential Output or Full Employment Output (natural output) = Y^F
- Output gap = ...
- We have to define where Y^F is.
- Graphically Illustration.

5.1 Inflationary Gap : $Y_E > Y_F$,



- When $Y^E > Y^F$, at Y^F, DAE is ..... 45 degree line.
- This means that DAE.....Y , at Y^F.
- When economy use all factors of production, gross output is still less than DAE .
- Government can reduce this inflationary gap by ..... DAE by ..... C, I, G or X-M

5.2 Deflationary gap:



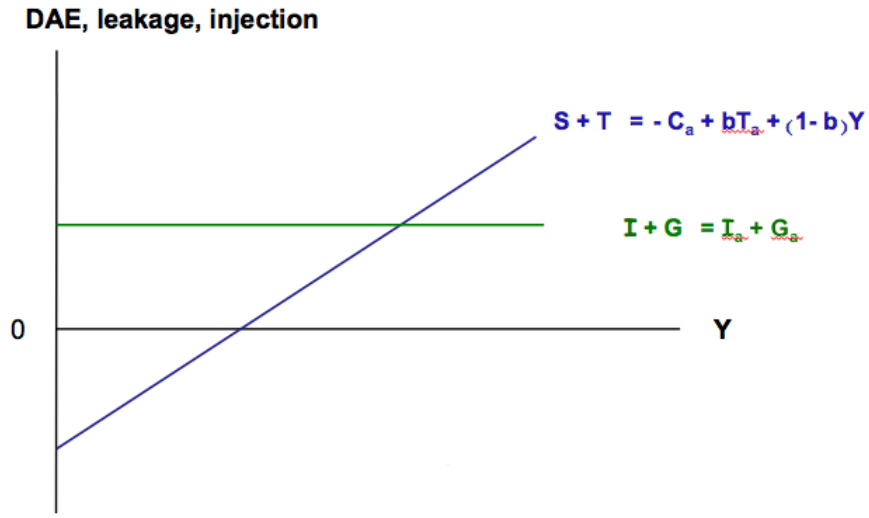
- When $Y^E < Y^F$, at Y^F, DAE is ..... 45 degree line.
- This means that DAE.....Y , at Y^F.
- When economy use all factors of production, gross output is more than DAE .
- Government can reduce this deflationary gap by ..... DAE by ..... C, I, G or X-M

6 Paradox of Thrift (Paradox of Saving)

- "John Maynard Keynes"
- **The fallacy of composition** arises when an individual assumes something is true of the whole just because it is true of some part of the whole.
- Saving (thrift) may be good for individual but it may not be good for the economy.

Closed Economy Case 1 : $C = C_0 + bY^d$, $I = I_0$, $G = G_0$, $T = T_0$

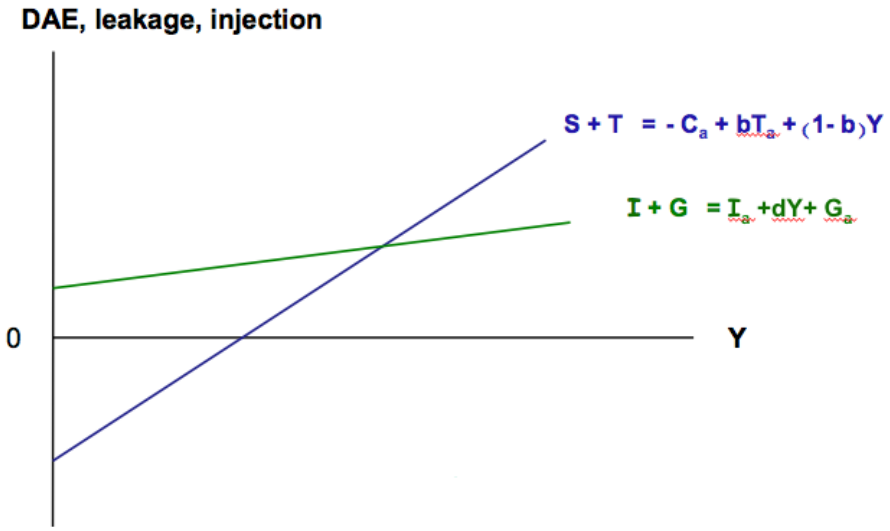
- Existing equilibrium : $S = S_1$, $I = I_0 = I_1$, $Y = Y_1$
- If people change their behaviour to save more, then (graphically illustration)



- Saving curve shift ..... from ..... to .....
- Y ..... from ..... to .....
- In short run if we want to stimulate economy we should $\downarrow S$ and $\uparrow C$.
- However, in the long run, we should .....S so that we would have more funds for future investment.
- Fallacy of composition : "arises when one infers that something is true of the whole from the fact that it is true of some part of the whole (or even of every proper part)"
- In this case, saving remain constant.

Closed Economy Case 2: $C = C_0 + bY^d$, $I = I_0 + dY$, $G = G_0$, $T = T_0$

- Existing equilibrium : $Y = Y_1$, $S = S_1$, $I = I_0 + dY_1 = I_1$,
  - If people change their behaviour to save more, then (graphically illustration)



- Saving curve shift ..... from ..... to .....
- Y ..... from ..... to .....
- New equilibrium : S = ... and I = ...
- $S \uparrow \Rightarrow Y \downarrow$
- $S \uparrow \Rightarrow \begin{matrix} C \downarrow \\ DAE \downarrow \end{matrix} \Rightarrow Y \downarrow \Rightarrow \begin{matrix} C.... \\ I..... \end{matrix} \Rightarrow DAE.... \Rightarrow Y..... \Rightarrow ...$
- When S↑, in the case of induced investment ↓ > the case of autonomous investment because there exists the effect from ↓ in I

Topics to review

- Break-even national income : ..... = ...
- Equilibrium national income
- Change in equilibrium national income
- Multipliers
- Balanced budget multiplier
- Inflationary gap and deflationary gap
- Paradox of Thrift