

3. National Income and Equilibrium Determination

EE 212

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

2016

- ➊ Introduction
- ➋ Composition of desired aggregate expenditure (DAE)
 - 2.1 Desired aggregate consumption expenditures and consumption theories
 - 2.2 Desired aggregate investment expenditure
 - 2.3 Desired aggregate government expenditure
 - 2.4 Desired aggregate net exports
 - 2.5 Desired aggregate expenditure
- ➌ Equilibrium national Income
- ➍ Changes in equilibrium national income and the multiplier
- ➎ Paradox of Thrift
- ➏ Inflationary and Deflationary Gap

1. Introduction

- Leakages :
 - Injections :
 - Expenditure Approach : $GDP = \dots\dots\dots$
 - (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 categories.

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

2.1 Desired aggregate consumption and consumption theories (C)

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

Outline

2.1.1 Consumption theories

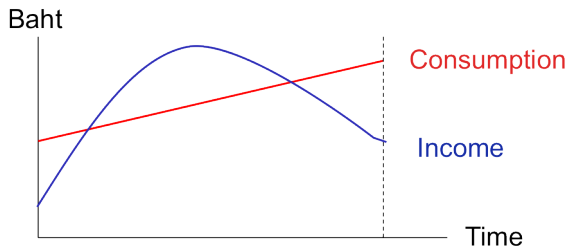
2.1.2 The Absolute Income Theory : Consumption Function and Saving Function

2.1.3 The Absolute Income Theory : APC, MPC, MPS, APS Relationship

2.1.4 Move Along vs. Shift in Consumption and Saving Curve

2.1.1 Consumption Theories

- The absolute income theory
- The relative income theory
- The permanent income theory : developed by Milton Friedman
 - $Y = \text{Permanent Income} + \text{Temporary Income}$
 - $C = \text{Permanent Consumption} + \text{Temporary Consumption}$
- The life-cycle theory



2.1.2 Consumption Function and Saving Function

The Absolute Income Theory, Keynes Consumption Theory :

- Disposable Income (.....) ;=.....
- Households will divide 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

- $C = f(Y_d, \text{other factors determining aggregate consumption})$
- $S = \dots\dots\dots$
- Relationship between Consumption and Income
 - $Y_d \uparrow, C \uparrow$
 - As $Y_d \uparrow$ by 1 unit, $C \uparrow$ by $\dots\dots\dots$ 1 unit.
 - $Y_d \uparrow$, proportion of consumption to disposable income
 $\left(\frac{C}{Y_d}\right) \dots\dots\dots$

- 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

..... is

..... is marginal propensity to (.....)

APS = Average Propensity to Save =

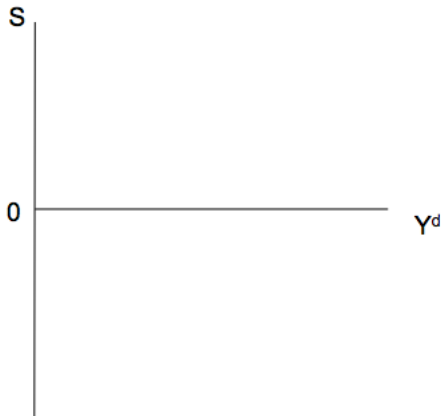
Example : Consumption function, $C = 100 + 0.6Y_d$

- MPC
- APC



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

- Example : Saving function, $C = 100 + 0.6Y_d$,
 $S = \dots\dots\dots$
- MPS
- APS



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

2.1.3 APC, MPC, MPS, APS Relationship

1. Relationship between APC and APS

$$Y_d = \dots + \dots$$

Therefore, $APC + APS = \dots$ always.

At $Y_d = Y_d^*$	$C \dots Y_d$	APC $\dots 1$	APS $\dots 0$
At $Y_d > Y_d^*$	$C \dots Y_d$	.0.....APC $\dots 1$	.0.....APS $\dots 1$
At $Y_d < Y_d^*$	$C \dots Y_d$	APC $\dots 1$	APS $\dots 0$

2. Relationship between MPC and MPS

$$Y_d = \dots + \dots$$

Therefore, $MPC + MPS = \dots$ always.

MPC and MPS are assumed to be

For all levels of Y , Y_d , $MPC = \dots$ and $MPS = \dots$

Hence, Consumption and Saving function are

3. Relationship between APC and MPC

MPC		$0 \dots \dots MPC \dots \dots 1$ $Y_d \uparrow MPC \dots \dots \dots$
APC		$APC = MPC +$ $Y_d < Y_d^* : APC \dots \dots \dots$ $Y_d = Y_d^* : APC \dots \dots \dots$ $Y_d > Y_d^* : APC \dots \dots \dots$ $Y_d \uparrow APC \dots \dots \dots$

APC MPC

4. Relationship between APS and MPS

MPS		$0 \dots \dots \text{MPS} \dots \dots 1$ $Y_d \uparrow \text{MPC} \dots \dots \dots$
APS		$\text{APS} = \text{MPS} -$ $Y_d < Y_d^* : \text{APS} \dots \dots \dots$ $Y_d = Y_d^* : \text{APS} \dots \dots \dots$ $Y_d > Y_d^* : \text{APS} \dots \dots \dots$ $Y_d \uparrow \text{APS} \dots \dots \dots$

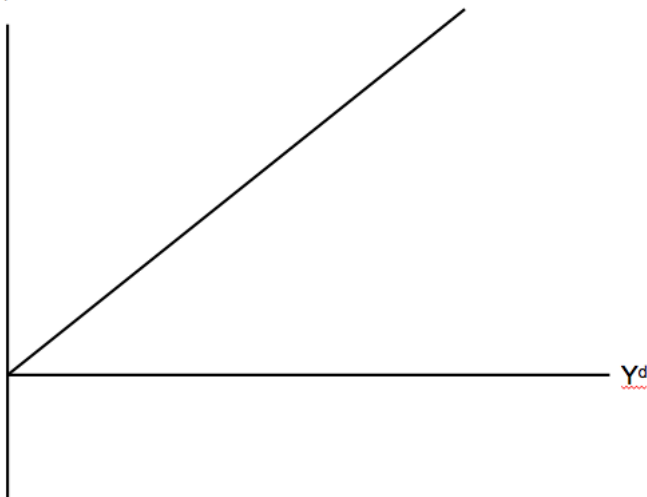
APS MPS

2.1.4 Move Along vs. Shift in Consumption and Saving Curve

- Consumption and Saving : $C = 100 + 0.8Y_d$,

$S = \dots\dots\dots$

C, S



- $Y_d \uparrow, C \dots \Rightarrow \dots$
- $Y_d \uparrow, S \dots \Rightarrow \dots$
- Change in any factors determining consumption (except Y_d)
 $\Rightarrow \dots$
- Change in any factors determining consumption (except Y_d)
 $\Rightarrow \dots$

- Suppose
 - interest rate for consumption loan ↓
 - expect disposable income to ↓

- $C = a + bY_d$
- $S = \dots\dots\dots$

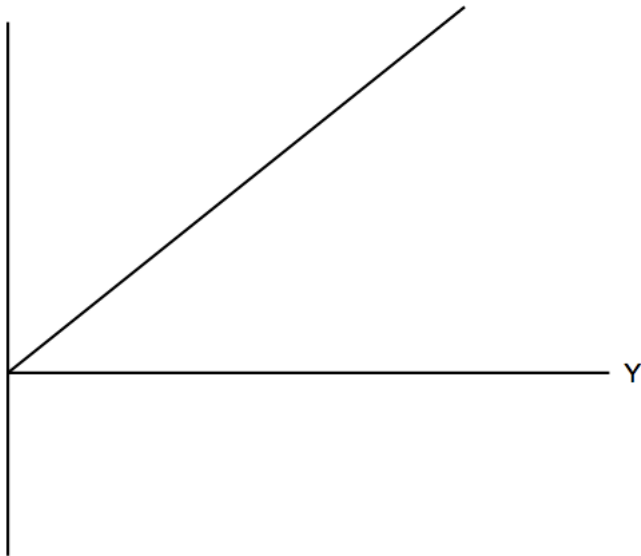
	$Y_d < Y_d^*$	$Y_d = Y_d^*$	$Y_d > Y_d^*$
C	$C \dots Y_d$	$C \dots Y_d$	$C \dots Y_d$
S	$S \dots 0$	$S \dots 0$	$S \dots 0$
APC	$APC \dots 1$	$APC \dots 1$	$APC \dots 1$
MPC	$MPC \dots b$	$MPC \dots b$	$MPC \dots b$
APS	$APS \dots 0$	$APS \dots 0$	$APS \dots 0$
MPS	$MPS \dots (1-b)$	$MPS \dots (1-b)$	$MPS \dots (1-b)$

$APC + APS = \dots\dots\dots$	$Y_d \uparrow \Rightarrow APC \dots\dots\dots$
$MPC + MPS = \dots\dots\dots$	$Y_d \uparrow \Rightarrow APS \dots\dots\dots$

$APC = MPC + \dots\dots\dots$	$APC \dots\dots MPC$
$APS = MPS + \dots\dots\dots$	$APS \dots\dots MPS$

• $C = a + bY_d$

C, S



2.2 Desired aggregate investment expenditure (I)

- Investment : spending on
- Desired aggregate investment expenditure includes
 - ☐ Buildings (new)
 - ☐ Machines (new)
 - ☐ Δ inventories
 - ☐ Residential investment
 - ☐ Financial investment; example, investment in stocks, bonds

- Factor determining investment

- ① **Real Interest Rate**

- NPV, MEC,

- ② **National Income**

- Accelerator principle

- ③ **Change in Technology**

- ④ **Government Policy**

- ⑤ **Economic Stability**

- ⑥ **Others, for example, availability of bank credit**

- Investment function :
 $I = f(Y, \text{other factors determining investment})$
- $I = I_0 + dY,$
- where
 I_0 is autonomous investment
 d is marginal propensity to invest
 dY is induced investment

- For example, $I = 100 + 0.2Y$



- Move along and shift in Investment curve
- An increase in Y
- An increase in real interest rate (r)

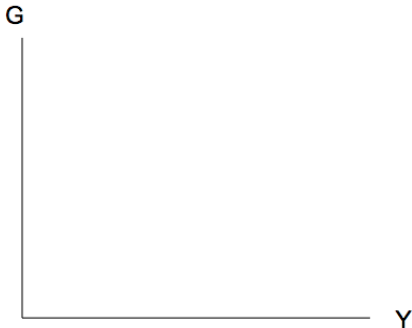


2.3 Desired Aggregate Government Expenditure (G)

- 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

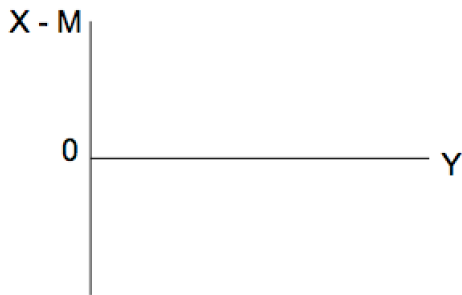


2.4 Desired aggregate net exports (X-M)

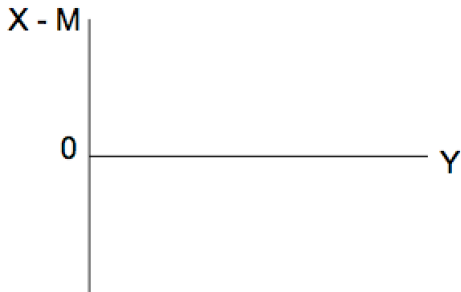
- Net export = Export - Import
- Factors determining

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

- Export function $X = \dots\dots\dots$.
- Import function : $M = \dots\dots\dots$
- where
 - X_a = autonomous export
 - M_a = autonomous import
 - m = marginal propensity to import



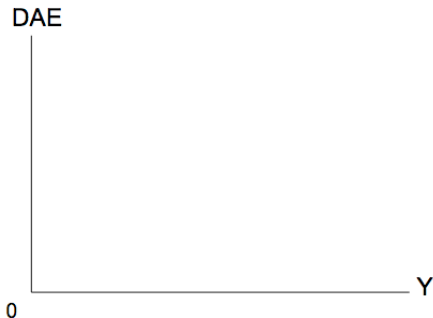
- Shift and move along in Net Export line
- Government export promotion policy
- Demand from foreign country ↓



2.5 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 :

.....

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

1. Income-Expenditure Approach

- Calculation

DAE

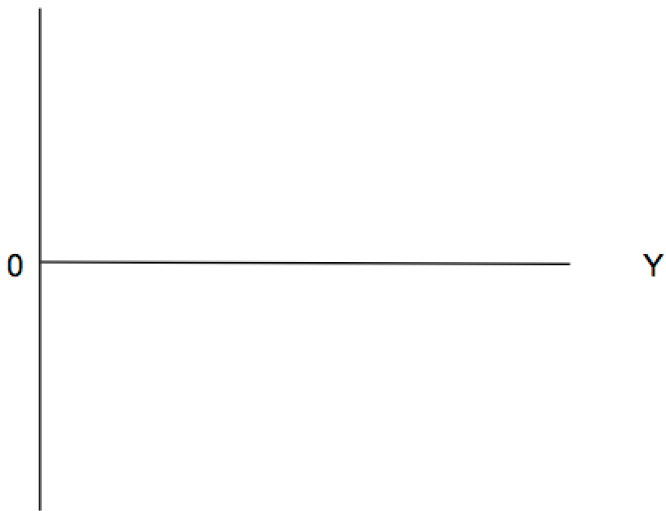
0

Y

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

2. Leakage - Injection Approach

- Calculation



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

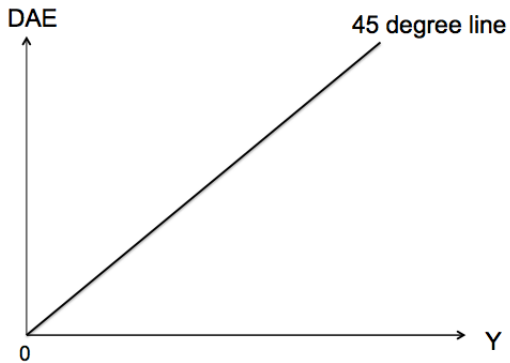
	$Y = DAE$	Leakage = Injection
Closed Economy without Government		
Closed Economy with Government		
Open Economy		

$$C = 200 + 0.8Y$$

$$I = 400$$

$$S = -200 + 0.2Y$$

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

Example: Given the following specifications

$$C = 60 + 0.8Y^d$$

$$I = 35$$

$$G = 15$$

$$T = 20 + 0.2Y$$

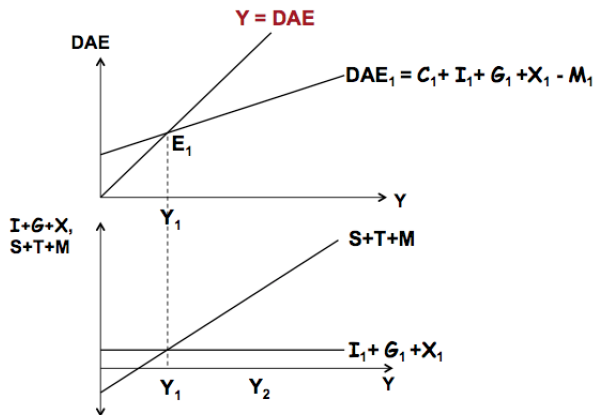
$$X = 36$$

$$M = 10 + 0.24Y$$

- Find equilibrium national income using injection = leakage approach
- Draw the graph showing the equilibrium national income based on the solution from question (a)
- Find equilibrium national income using $Y = DAE$ approach
- Draw the graph showing the equilibrium national income based on the solution from question (c)
- Find term of trade at the equilibrium national income
- Find government fiscal budget balance at equilibrium national income.

4. Changes in equilibrium national income and the multiplier

- Changes in equilibrium take place when?
- Graphically Illustration



- Using the previous example.

$$C = 60 + 0.8Y^d$$

$$I = 35$$

$$G = 15$$

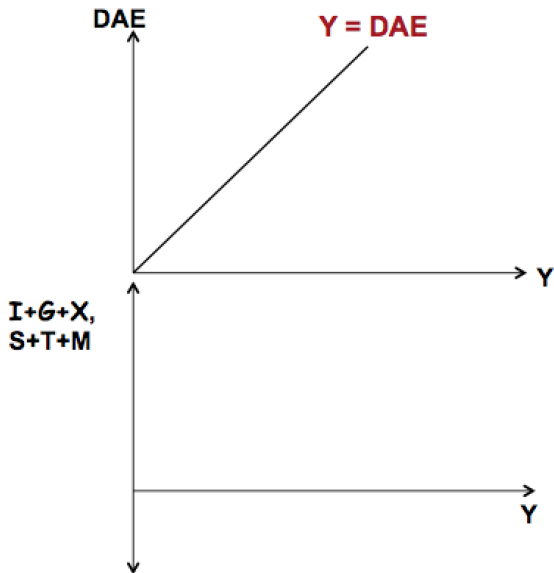
$$T = 20 + 0.2Y$$

$$X = 36$$

$$M = 10 + 0.24Y$$

- $Y^* = \dots\dots\dots$

- What is new Y^* if I_0 (autonomous consumption) is increased from 35 to 45?



If $I \uparrow$

DAE **shift** to the left from DAE_1 to **DAE_2**

Equilibrium Δ from E_1 to **E_2**

$Y \uparrow$ from Y_1 to **Y_2**

when $DAE \Delta$ to **DAE_2**

at $Y = Y_1$

Injection > Leakage

$DAE > Y$

$DAE > Y$

Producer sells their inventory

inventory $\downarrow$

production $\uparrow$

Use of factor of production $\uparrow$

when **$DAE \Delta$**
eg. from **$I \Delta$**

$Y \Delta$ for how much ?
Calculate from
multiplier

National income (Y) $\uparrow$
until **$Y = DAE$**

- **“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.
- $DAE = \dots\dots\dots + \dots\dots\dots Y$
- $\Delta Y_E = \dots\dots\dots \times \dots\dots\dots$
- $multiplier =$
- multiplier 1
- Basically, this is because

1st
round



2nd
round



3rd
round



.....
round



1 \$

Increment
in income

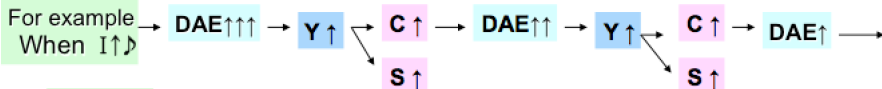
Multiplier (revisit)

Ratio between changes in income compared to changes in autonomous spending

(Case of closed economy without government)

$$C = C_a + bY$$

$$I = I_a$$



when $I \uparrow$ → $Y \uparrow$ for how much depends on **MPC** and **MPS**

If $MPC = 0.6$, $MPS = 0.4$

If $I \uparrow$ **1,000** million Baht to build a factory

Pay to construction contractor

Contractor pays owner's of factor of production including profits for contractor as an entrepreneur compensation

1st round income of all owner of factor of production altogether will $\uparrow$ **1,000 million Baht**



They will spend only **60%** of the increased income and saving $\uparrow$ **40%**

Income of another group will be **$1000 \times 0.6 = 600$** million Baht
2nd round

These people will spend **60%** and save **40%** next group of people will get
 $= (1000 \times 0.6) \times 0.6$
 $= 1000 \times (0.6)^2$ **3rd round**
 $= 360$ million Baht

1. Closed Economy Multiplier

- Let's firstly assume $I = I_0$ (there is no induced investment)
- $Y =$

- $\frac{\Delta Y}{\Delta C_0} =$, $\frac{\Delta Y}{\Delta I_0} =$, $\frac{\Delta Y}{\Delta G_0} =$, $\frac{\Delta Y}{\Delta T_0} =$

- Now let's assume $I = I_0 + iY$
- $Y =$

- $\frac{\Delta Y}{\Delta C_0} =$, $\frac{\Delta Y}{\Delta I_0} =$, $\frac{\Delta Y}{\Delta G_0} =$, $\frac{\Delta Y}{\Delta T_0} =$

2. Open Economy Multiplier

- let's assume $I = I_0 + iY$
- $Y =$

- $\frac{\Delta Y}{\Delta C_0} =$, $\frac{\Delta Y}{\Delta I_0} =$, $\frac{\Delta Y}{\Delta G_0} =$, $\frac{\Delta Y}{\Delta T_0} =$
- Open economy multiplier is closed economy multiplier.
Why?

- **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 multiplier”.

This means that

- The balanced budget multiplier in closed economy is one.
Why?

- Balanced budget multiplier in Opened 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 multiplier”.

This means that

- $DAE = \dots\dots\dots + \dots\dots\dots Y$
- $Y^E = \dots\dots\dots \times \text{Autonomous Expenditure}$
- $multiplier =$
- marginal propensitiy to spend $\uparrow \Rightarrow$ slope of DAE $\dots\dots\dots$ (DAE $\dots\dots\dots$) $\Rightarrow$ multiplier $\dots\dots\dots$

Short Summary : multiplier

- $DAE = \text{Autonomous Expenditure} + (\text{marginal propensity to spend})Y$
- $Y^E = \left(\frac{1}{1 - \text{marginal propensity to spend}} \right) \times \text{Autonomous Expenditure}$
- $\text{multiplier} = \left(\frac{1}{1 - \text{marginal propensity to spend}} \right)$
- multiplier 1
- multiplier : $C = C_a + bY_d$, $I = I_a + iY$, $G = G_a$, $T = T_a$, $X = X_a$,
 $M = M_a + mY$

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

5. 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.
- If the population saves more money, MPS and MPC
- Given the other things (autonomous expenditures) being constant, multiplier and equilibrium national income

- Multiplier (revisit) : Find Multipliers

- Closed Economy : Case 1

$$C = C_0 + bY^d$$

$$I = I_0$$

$$G = G_0$$

$$T = T_0$$

- Closed economy : Case 2

$$C = C_0 + bY^d$$

$$I = I_0 + dY$$

$$G = G_0$$

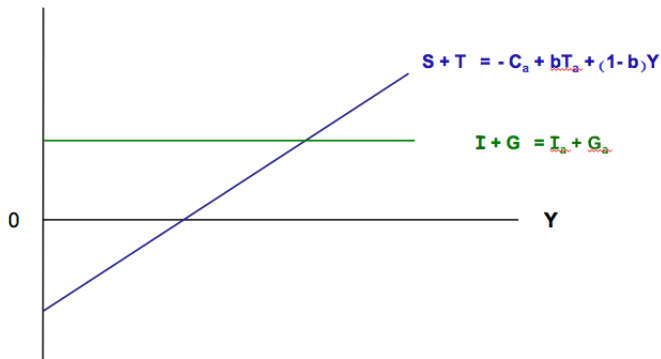
$$T = T_0$$

- Closed Economy Case 1 :

$$C = C_0 + bY^d, \quad I = I_0, \quad G = G_0, \quad T = T_0$$

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

DAE, leakage, injection



- 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)”

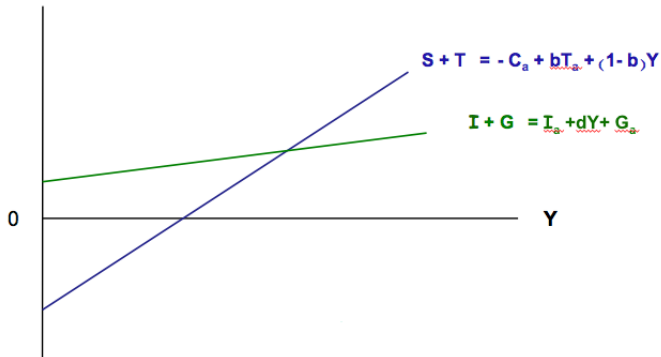
- Closed Economy Case 2:

$$C = C_0 + bY^d, \quad I = I_0 + dY, \quad G = G_0, \quad T = T_0$$

- 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)

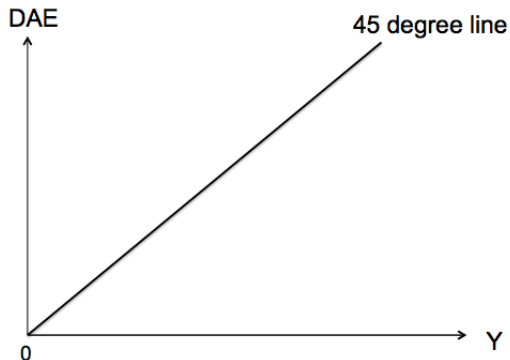
DAE, leakage, injection



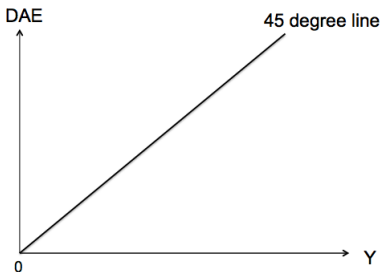
- Saving curve shift from to
- Y from to
- New equilibrium : $S = \dots\dots\dots$ and $I = \dots\dots\dots$ which is the old equilibrium saving and old equilibrium investment.
- Multiplier effect depends on both MPC and MPI.
- $S \uparrow \Rightarrow Y \downarrow$
- $$S \uparrow \Rightarrow \begin{matrix} C \downarrow \\ DAE \downarrow \end{matrix} \Rightarrow Y \downarrow \Rightarrow \begin{matrix} C \dots\dots \\ I \dots\dots \end{matrix} \Rightarrow DAE \dots\dots \Rightarrow Y \dots\dots \Rightarrow$$
- When $S \uparrow$, in the case of induced investment $\downarrow >$ the case of autonomous investment because there exists the effect from $\downarrow$ in I

6. Inflationary 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.

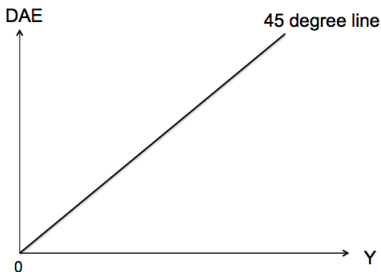


● **Inflationary Gap** : $Y_E > Y_F$,



- When $Y^E > Y^F$, at Y^F , DAE is 45 degree line.
- This means that $DAE \dots Y$, 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

- Graphically Illustration.



- 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 inflationary gap by DAE by C, I, G or X-M

- Break-even national income : $Y = \dots\dots\dots$
- Relationship between APC and MPC and between APS and MPS
- Equilibrium national income
- Change in equilibrium national income
- Multipliers
- Balanced budget multiplier
- Inflationary gap and deflationary gap
- Paradox of Thrift

- NNP : total output excludes output used to replace existing capital goods

- ① $NNP = C + \text{net } I + G + X - M$

- NI : NI at factor cost

- ① $NI = NNP + \text{subsidies} - \text{indirect taxes}$

- ② $NI = \text{wage} + \text{rent} + \text{profit} + \text{interest} + \text{depreciation}$

- PI : received by individuals or HH

- ① $PI = NI - \text{corporate profit} + \text{transfer payment from the government}$
(R)

- DI : actual income which can be spent on consumption by individuals and families

- ① $DI = PI - \text{direct taxes}$