

3. National Income and Equilibrium Determination

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

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Contents

1	Introduction	2
2	Composition of desired aggregate expenditure (DAE)	3
2.1	Desired aggregate consumption and consumption theories (C)	3
2.2	Desired aggregate investment expenditure (I)	12
2.3	Desired Aggregate Government Expenditure (G)	13
2.4	Desired aggregate net exports (X-M)	14
2.5	Desired Aggregate Expenditure (DAE)	16
3	Equilibrium National Income	17
3.1	Income-Expenditure Approach	17
3.2	Leakage - Injection Approach	18
4	Changes in equilibrium national income and the multiplier	22
4.1	Changes in equilibrium national income	22
4.2	Multiplier	24
5	Paradox of Thrift (Paradox of Saving)	28
6	Inflationary and deflationary gap	30
7	Topics to review	31

- 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 $\rightarrow \Delta inventories \rightarrow adjustment$

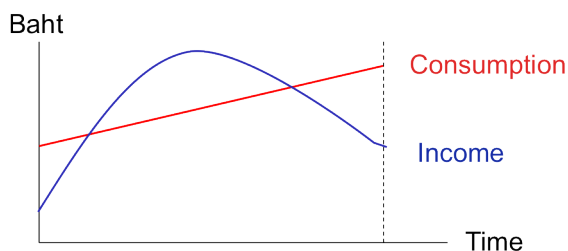
2 Composition of desired aggregate expenditure (DAE)

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
 - $Y = \text{Permanent Income} + \text{Temporary Income}$
 - $C = \text{Permanent Consumption} + \text{Temporary Consumption}$
- 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 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 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 =

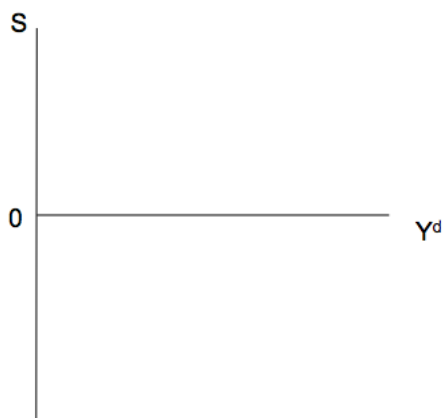
Example : Consumption function, $C = 100 + 0.6Y_d$

- 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?
 - $S \dots\dots 0$
 - At $Y_d = 0, C = \dots\dots\dots$ which is
- When $Y_d > \dots\dots\dots Y_d$
 - Consumption line is 45° line
 - $C \dots\dots\dots Y_d$
 - $S \dots\dots 0$
 - $Y_d \uparrow, C \dots\dots\dots, S \dots\dots\dots$
 - 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 $\dots\dots\dots$ horizontal axis.
 - Y_d at this point is called $\dots\dots\dots$ ($\dots\dots$)
- When $Y_d < \dots\dots\dots Y_d$
 - saving line is $\dots\dots\dots$ 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 $\dots\dots\dots$ 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 The Absolute Income Theory : 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 \dots APC $\dots 1$.0 \dots 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 MPC 1 $Y_d \uparrow$ MPC
APC		APC = MPC + $Y_d < Y_d^*$: APC $Y_d = Y_d^*$: APC $Y_d > Y_d^*$: APC $Y_d \uparrow$ APC

APC MPC

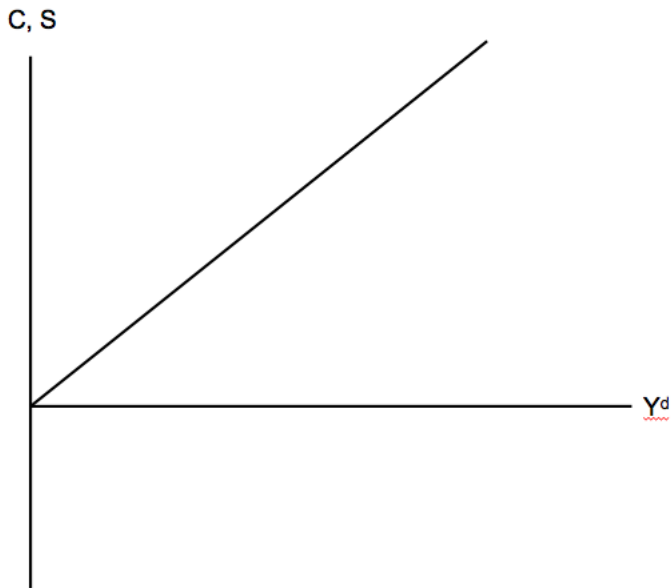
4. Relationship between APS and MPS

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

APS MPS

2.1.4 Move Along vs. Shift in Consumption and Saving Curve

- $S = \dots\dots\dots$



- $Y_d \uparrow, C \dots\dots\dots \Rightarrow \dots\dots\dots$
- $Y_d \uparrow, S \dots\dots\dots \Rightarrow \dots\dots\dots$
- Change in any factors determining consumption (except Y_d)
 $\Rightarrow \dots\dots\dots$
- Change in any factors determining consumption (except Y_d)
 $\Rightarrow \dots\dots\dots$
- Suppose
 - interest rate for consumption loan \downarrow
 - expect disposable income to \downarrow

Summary

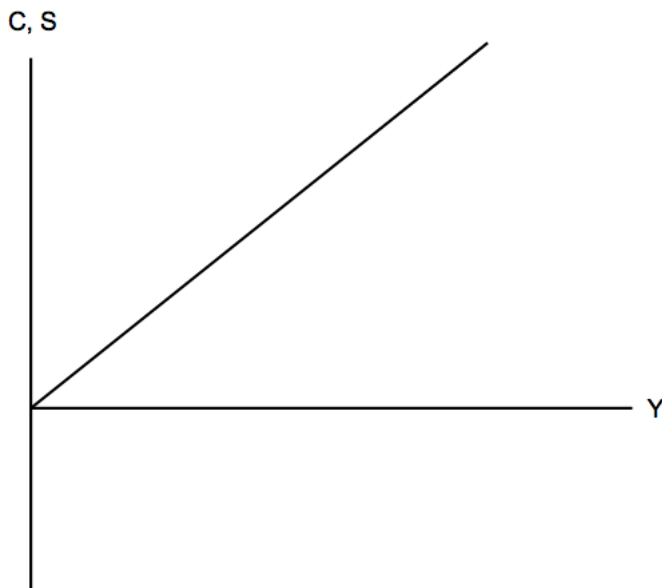
- $C = a + bY_d$
- $S = \dots\dots\dots$

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

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

APC = MPC +	APC MPC
APS = MPS +	APS MPS

- $C = a + bY_d$



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



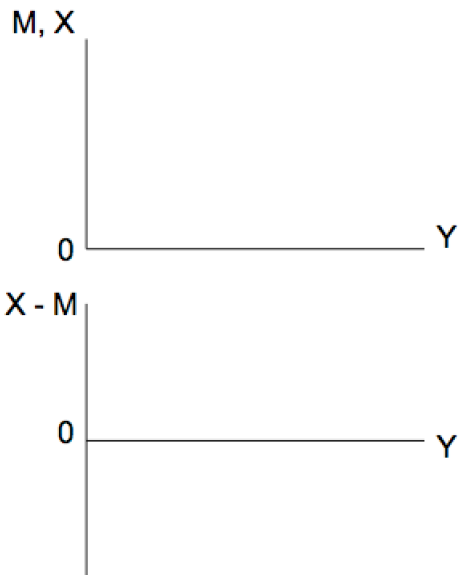
2.4 Desired aggregate net exports (X-M)

- Net export = Export - Import
- Factors determining

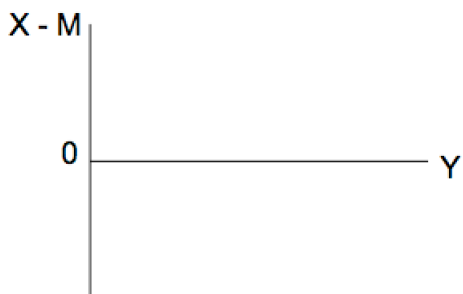
Export	Import
Income of	Income of
Demand from	Demand of
Price of (compared with)	Price of (compared with)
Exchange Rate	Exchange Rate
Others: Political and Economic Stability for example, government policy	Others: for example, government policy

- 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



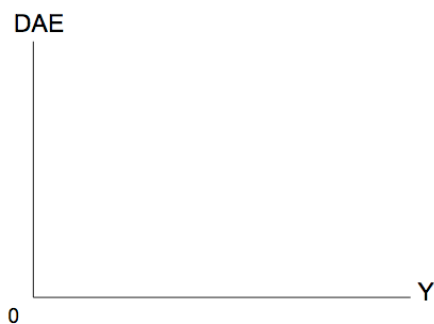
- Shift and move along in Net Export line
- Government export promotion policy
- Demand from foreign country ↓



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

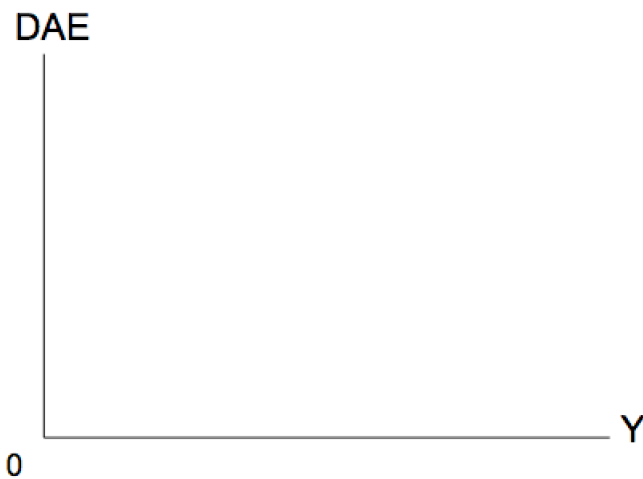
- Two methods

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

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

3.1 Income-Expenditure Approach

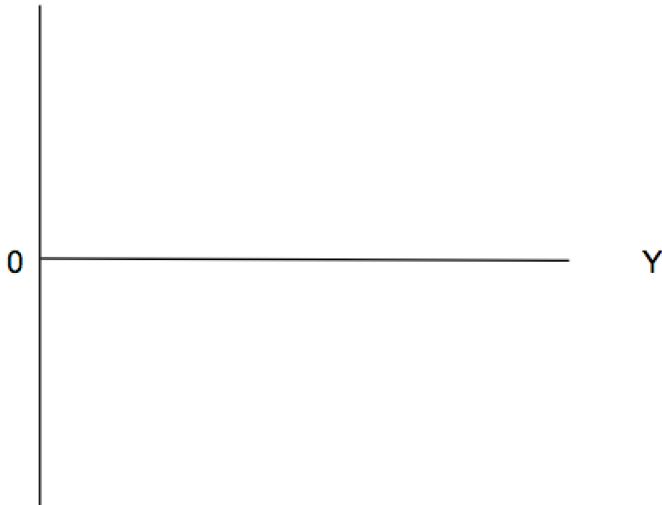
- Example : $C = 200 + 0.8Y$, $I = 400$, What is equilibrium Y ? Calculation



- $Y > DAE \Rightarrow$ 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 $Y=DAE$, Actual 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?)

3.2 Leakage - Injection Approach

- Example : $C = 200 + 0.8Y$, $I = 400$, What is equilibrium Y ? : 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) , produce next year, Y
- $S = I$, leakage = Injection \Rightarrow Actual output Desired aggregate expenditure \Rightarrow (same explanation as $Y=DAE$ approach)

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

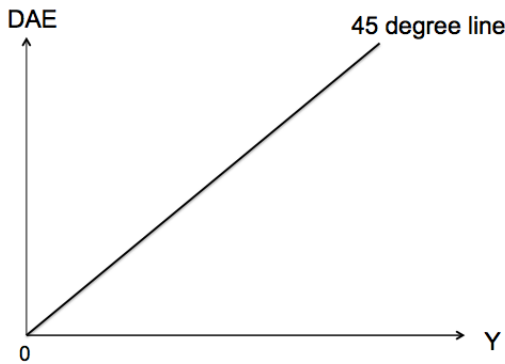
- Example

$$C = 200 + 0.8Y$$

$$I = 400$$

$$S = -200 + 0.2Y$$

Y	C	S	I	DAE	difference	Adjustment
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

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

$$I = 35$$

$$G = 15$$

$$T = 20 + 0.2Y$$

$$X = 36$$

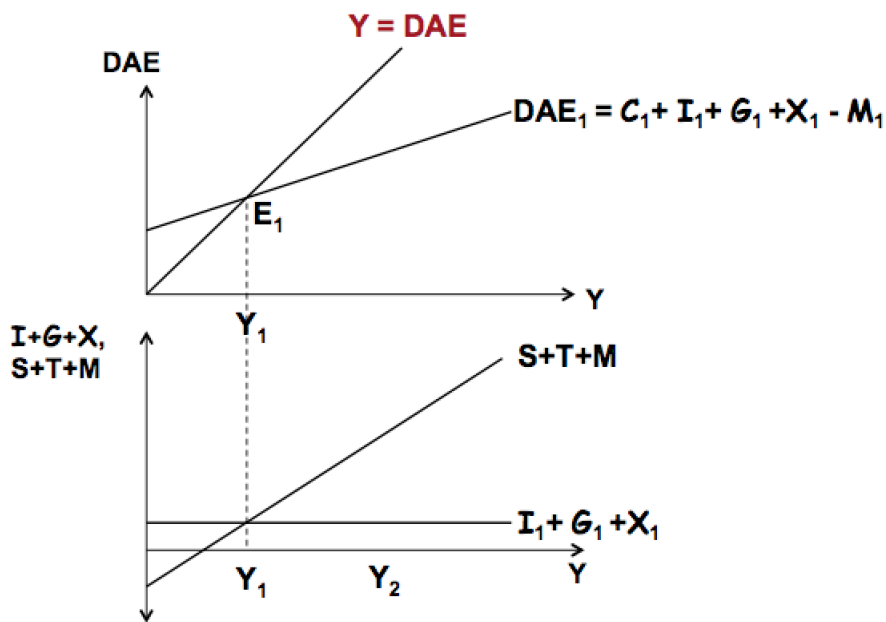
$$M = 10 + 0.24Y$$

- 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.

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

$$I = 35$$

$$G = 15$$

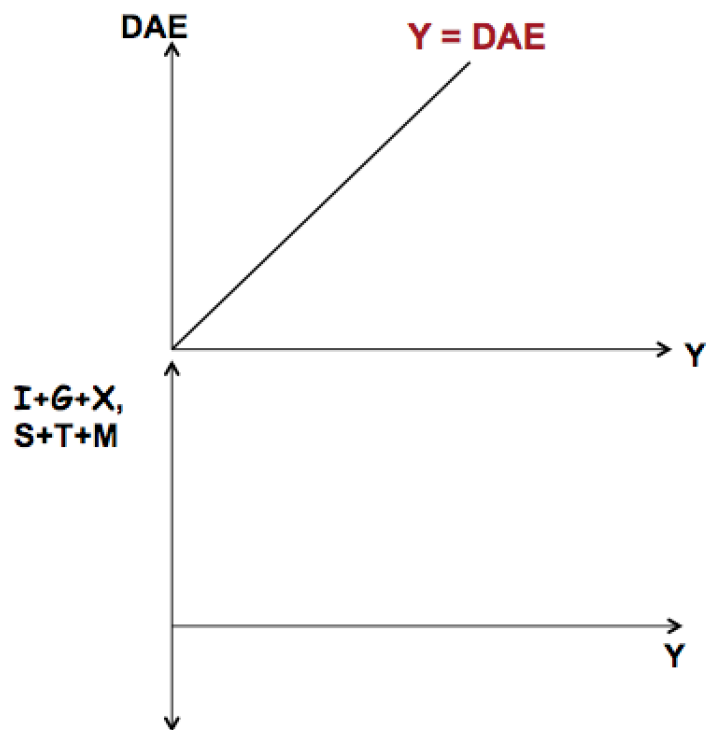
$$T = 20 + 0.2Y$$

$$X = 36$$

$$M = 10 + 0.24Y$$

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

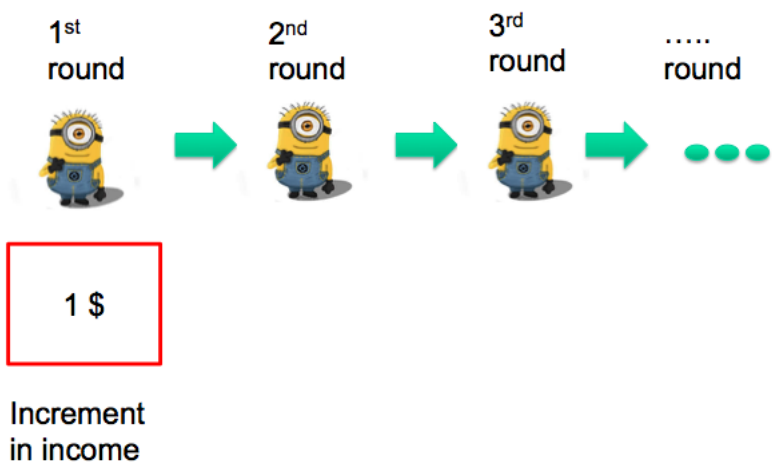
- What is new Y^* if I_0 (autonomous consumption) is increased from 35 to 45?



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



4.2.2 Multiplier : closed versus open economy

- Let's assume $I = I_0 + iY$
- $Y = \dots\dots\dots$

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

- Open economy multiplier is closed economy multiplier. Why?

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**

- $\frac{\Delta Y}{\Delta G_0} = \quad , \quad \frac{\Delta Y}{\Delta T_0} =$
- $\frac{\Delta Y}{\Delta B} =$

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

Short Summary.

- $DAE = \dots\dots\dots + \dots\dots\dots Y$
- $Y^E = \dots\dots\dots \times \text{Autonomous Expenditure}$
- *multiplier* =
- 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

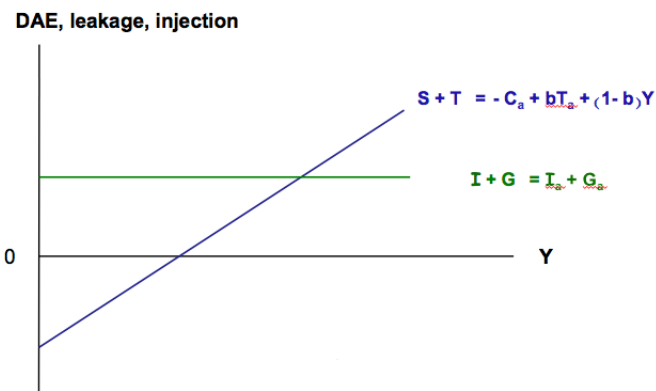
- **Balance Budget Multiplier** $\Delta G = \Delta T : C = C_a + bY_d, I = I_a, G = G_a, T = T_a,$
 $\frac{\Delta Y}{\Delta B} =$
- marginal propensitiy to spend $\uparrow \Rightarrow$ slope of DAE (DAE)
 \Rightarrow multiplier

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.

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

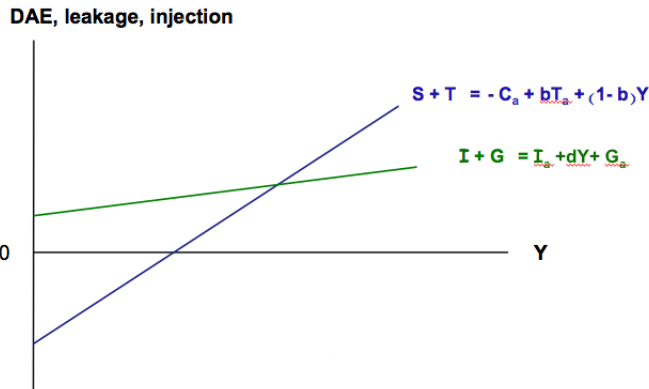
- Existing equilibrium : $S = S_1$, $I = I_0 = I_1$, $Y = Y_1$
- If people change their behaviour to save more, then (graphically illustration)



- 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 shouldS 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: $C = C_0 + bY^d$, $I = I_0 + dY$, $G = G_0$, $T = T_0$

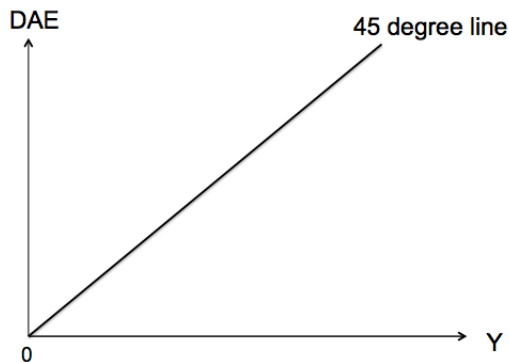
- Existing equilibrium : $Y = Y_1$, $S = S_1$, $I = I_0 + dY_1 = I_1$,
 - If people change their behaviour to save more, then (graphically illustration)



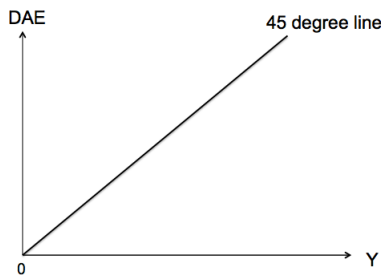
- Saving curve shift from to
- Y from to
- New equilibrium : $S =$ and $I =$
- $S \uparrow \Rightarrow Y \downarrow$
- $S \uparrow \Rightarrow \begin{matrix} C \downarrow \\ DAE \downarrow \end{matrix} \Rightarrow Y \downarrow \Rightarrow \begin{matrix} C \dots \\ I \dots \end{matrix} \Rightarrow DAE \dots \Rightarrow Y \dots \Rightarrow \dots$
- 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

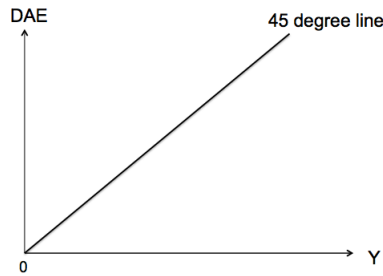
- Potential Output or Full Employment Output (natural output) = Y^F
- Output gap =
- We have to define where Y^F is.
- Graphically Illustration.



- **Inflationary Gap** : $Y_E > Y^F$,



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

7 Topics to review

- Break-even national income : =
- 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