CONSUMPTION'S FUNCTIONAL EQUATION

According to Keynes, consumption depends upon income.

Consumption's standard equation is as: $C = Co + cY$

where Co is the autonomous consumption, cY represents induced consumption and c = marginal propensity to consume (M.P.C.)

EXAMPLE. $C - 0.6Y - 40 = 0$. While $Y = 0, 50, 100, 150$, we find different levels of consumption with the above equation.

Converting the above equation in standard form: $C = 40 + 0.6Y$

Putting the values of Y

When $Y = 0$, $C = 40 + 0.6(0) = 40$

When $Y = 50$, $C = 40 + 0.6(50) = 40 + 30 = 70$

When $Y = 100$, $C = 40 + 0.6(100) = 40 + 60 = 100$

When $Y = 150$, $C = 40 + 0.6(150) = 40 + 90 = 130$

Thus we have following pairs of values of Y and C.

Y	0	50	100	150
C	40	70	100	130

With these values of Y and C we can construct the graph of consumption.

SAVING'S FUNCTIONAL EQUATION

According to Keynes, savings depend upon income of people.

Saving's standard equation is as: $S = -So + sY$

where $-So$ = autonomous savings, sY = induced saving and s = marginal propensity to save (M.P.S.)

EXAMPLE. $S + 40 - 0.4Y = 0$.

While $Y = 0, 50, 100, 150$, we find different levels of savings with the above equation.

Converting the above equation in standard form: $S = -40 + 0.4Y$

Putting the values of Y

When $Y = 0$, $S = -40 + 0.4(0) = -40$

When Y = 50, $S = -40 + 0.4(50) = -40 + 20 = -20$

When Y = 100, $S = -40 + 0.4(100) = -40 + 40 = 0$

When Y = 150, $S = -40 + 0.4(150) = -40 + 60 = 20$

Thus we have following pairs of values of Y and S.

Y	0	50	100	150
S	– 40	– 20	0	20

With these values of Y and S we can construct the graph of savings.

INVESTMENT'S FUNCTIONAL EQUATION

According to Clark, investment depends upon income .

Investment's standard equation is as: $I = Io + eY$

where Io = autonomous investment, eY =induced investment, i.e., investment increases alongwith increase in income and e = marginal propensity to investment (M.P.I.)

EXAMPLE. $I = 40 + 0.2Y$. While Y = 0, 100, 200, 300, we find different levels of investment with the above equation.

Putting the values of Y: $I = 40 + 0.2Y$

When Y = 0, $I = 40 + 0.2(0) = 40$

When Y = 100, $I = 40 + 0.2(100) = 40 + 20 = 60$

When Y = 200, $I = 40 + 0.2(200) = 40 + 40 = 80$

When Y = 300, $I = 40 + 0.2(300) = 40 + 60 = 100$

Thus we have following pairs of values of Y and I.

Y	0	100	200	300
I	40	60	80	100

With these values of Y and I we can construct the graph of investment function.

Q. Given the following investment function: I = 130 + 0.25Y, (i) find the investment level at income of Rs 300, (ii) find the income at which investment is Rs. 200 (iii) draw the graph of the function. (UOH:2007/S)

(i): $I = 130 + 0.25(300) = 205$

(ii): $200 = 130 + 0.25Y \Rightarrow$

$0.25Y = 200 - 130$, $0.25Y => 70$

$\Rightarrow Y = 70/0.25 = 280.$

With these values of Y and I we can construct the graph of investment function.

DETERMINATION OF EQUILIBRIUM LEVEL OF N. I.

The theory of NI determination is attributed to Prof. Keynes. Accordingly, NI is determined where

1. Savings are equal to investment
2. Aggregate demand is equal to Aggregate supply

1. NI determination in a Two Sector Economy — Saving and Investment Method

First we present equilibrium in general form:

As $S = -So + sY$, while $I = Io$ (autonomous investment)

At equilibrium : $S = I$. Putting the values of S and I: $-So + sY = Io$

$$sY = Io + So \Rightarrow \overline{Y} = \frac{Io + So}{s} \Rightarrow \overline{Y} = \frac{1}{s}(Io + So)$$

where $\overline{Y}$ is given the name of equilibrium level of national income (NI).Here s = MPS.

Thus the last equation shows the equilibrium level of NI in two sector economy.

EXAMPLE. If $S = -40 + 0.4\,Y$, $I = 80$, we find equilibrium level of NI and prove that at equilibrium level of NI savings are equal to investment. the value of multiple (K) is also found out.

At equilibrium : $S = I$

$$-40 + 0.4Y = 80 \Rightarrow 0.4\,Y = 80 + 40 \Rightarrow Y = \frac{120}{0.4} = 300$$

$$S = -40 + 0.4Y = -40 + 0.4(300) = -40 + 120 = 80$$

Here we find the value of investment multiplier (K_I) which is as: $\frac{1}{MPS} = \frac{1}{0.4} = 2.5$

(**Note**: The proof of this formula is available in my book Principles of Economics II)

By assuming different values of Y and putting them in S we get different values of S and then plotting we obtain Fig. 5.

When $Y = 0$, $S = -40 + 0.2(0) = -40$

When $Y = 100$, $S = -40 + 0.4(100) = -40 + 40 = 0$

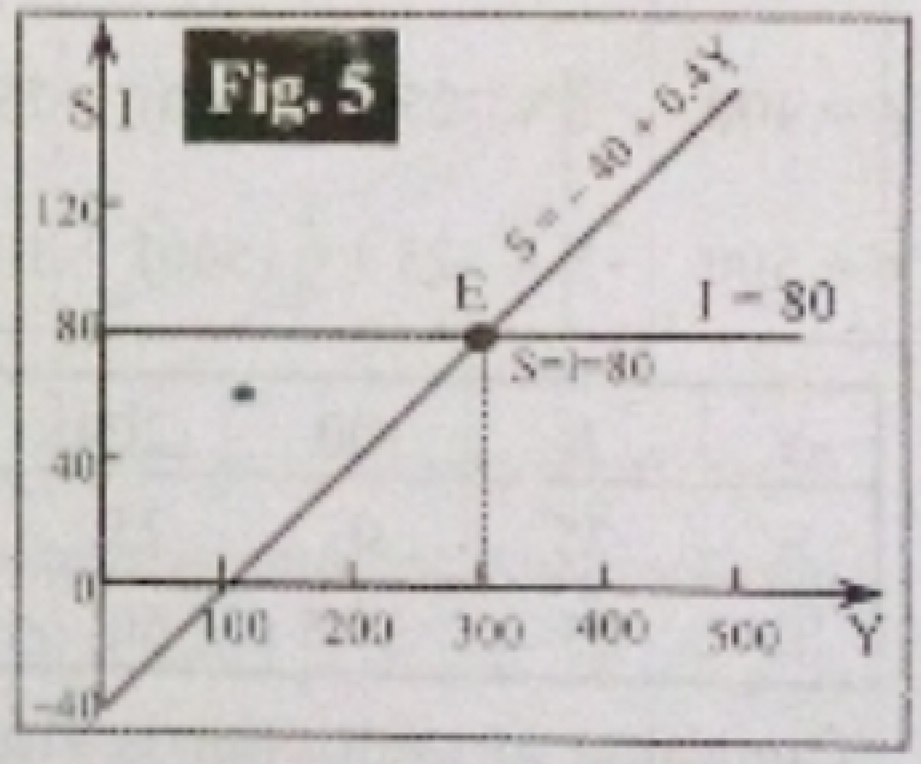
When $Y = 200$, $S = -40 + 0.4(200) = -40 + 80 = 40$

When $Y = 300$, $S = -40 + 0.4(300) = -40 + 120 = 80$

When $Y = 400$, $S = -40 + 0.4(400) = -40 + 160 = 120$

Y	0	100	200	300	400
S	-40	0	40	80	120
I	80	80	80	80	80

By plotting these pairs of values we get Fig. 5. The Fig. shows that at equilibrium level of NI (300) the savings are equal to investment (80= 80).



Now we include **induced investment** (eY). Thus investment function in its general form will be as: $I = Io + eY$, $0 < e < 1$. While $S = -So + sY$

At equilibrium: $S = I$. Putting the values of I and S, we have

$$-So + sY = Io + eY \Rightarrow sY - eY = So + Io$$

$$Y(s-e) = So + Io \Rightarrow \overline{Y} = \frac{So + Io}{s-e} \Rightarrow \overline{Y} = \frac{1}{s-e}(So + Io)$$. Here

s = MPS and e = MPI.

The last equation also shows equilibrium level of NI in a two sector economy in the presence of induced investment.

EXAMPLE. If $S = -25 + \frac{1}{4}Y$, $I = 25 + \frac{1}{8}Y$

We find equilibrium level of NI and show the equality between S and I. We also find the value of super multiplier $Ks = \frac{1}{MPS - MPI}$.

(**Note:** The proof of this formula is available in my book of Principles of Economics II)

At equilibrium: S = I. Putting the values of S and I and solving for Y, we have

$$-25 + \frac{1}{4} Y = 25 + \frac{1}{8} Y$$

$$-\frac{1}{8} Y + \frac{1}{4} Y = 25 + 25$$

$$\frac{1}{8} Y = 50 \Rightarrow Y = 50(8) = 400$$

Putting the value Y = 400 in S and I

$$-25 + \frac{1}{4} Y = 25 + \frac{1}{8} Y$$

$$-25 + \frac{1}{4}(400) = 25 + \frac{1}{8}(400)$$

$$-25 + 100 = 25 + 50 \Rightarrow 75 = 75$$

Assuming different values of Y and putting them in S and I equations, we get

Y = 0	$S = -25 + \frac{1}{4}(0) = -25$	$I = 25 + \frac{1}{8}(0) = 25$
Y = 100	$S = -25 + \frac{1}{4}(100) = 0$	$I = 25 + \frac{1}{8}(100) = 37.5$
Y = 200	$S = -25 + \frac{1}{4}(200) = 25$	$I = 25 + \frac{1}{8}(200) = 50$
Y = 300	$S = -25 + \frac{1}{4}(300) = 50$	$I = 25 + \frac{1}{8}(300) = 62.5$
Y = 400	$S = -25 + \frac{1}{4}(400) = 75$	$I = 25 + \frac{1}{8}(400) = 75$
Y = 500	$S = -25 + \frac{1}{4}(500) = 100$	$I = 25 + \frac{1}{8}(500) = 87.5$

Y	0	100	200	300	400	500
S	–25	0	25	50	75	100
I	25	37.5	50	62.5	75	87.5

The value of multiplier is also found here. But it is told that in such case the multiplier is not the simple one, rather it is super multiplier (Ks) whose formula is as:

$Ks = \frac{1}{s - e}$. Here s = MPS which is available in saving function, i.e., $= \frac{1}{4} = 0.25$ and

e = MPI which is available in investment function, i.e., $= \frac{1}{8} = 0.125$. Thus

$$Ks = \frac{1}{s - e} = \frac{1}{0.25 - 0.12} = 8.$$

With the help of values of Y and S and Y and I we construct Fig.6. This figure shows that at Y = 400, S and I are equal, i.e. when Y = 400, S = 75 = I.

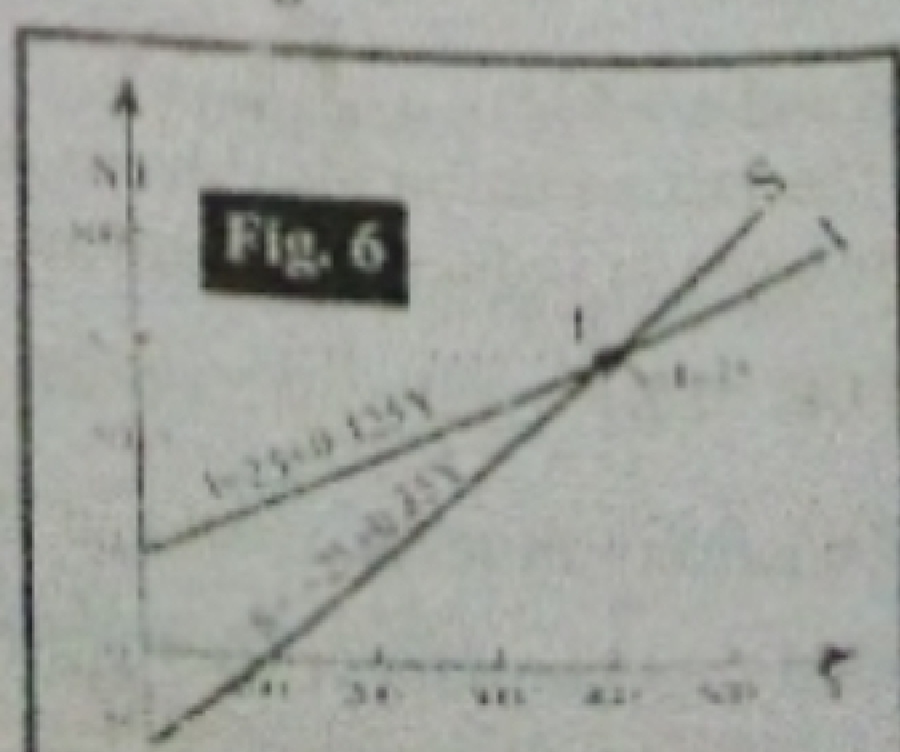


Fig. 6

2. NI DETERMINATION IN A TWO SECTOR ECONOMY

Aggregate Demand and Aggregate Supply Method OR Consumption and Investment Method

We suppose that investment is autonomous ($I = Io$) while consumption equation is as: $C = Co + cY$

Putting the values of C and I in NI equation, i.e., $Y = C + I$

$$Y = C + I \Rightarrow Y = Co + cY + I \Rightarrow Y - cY = Co + Io$$

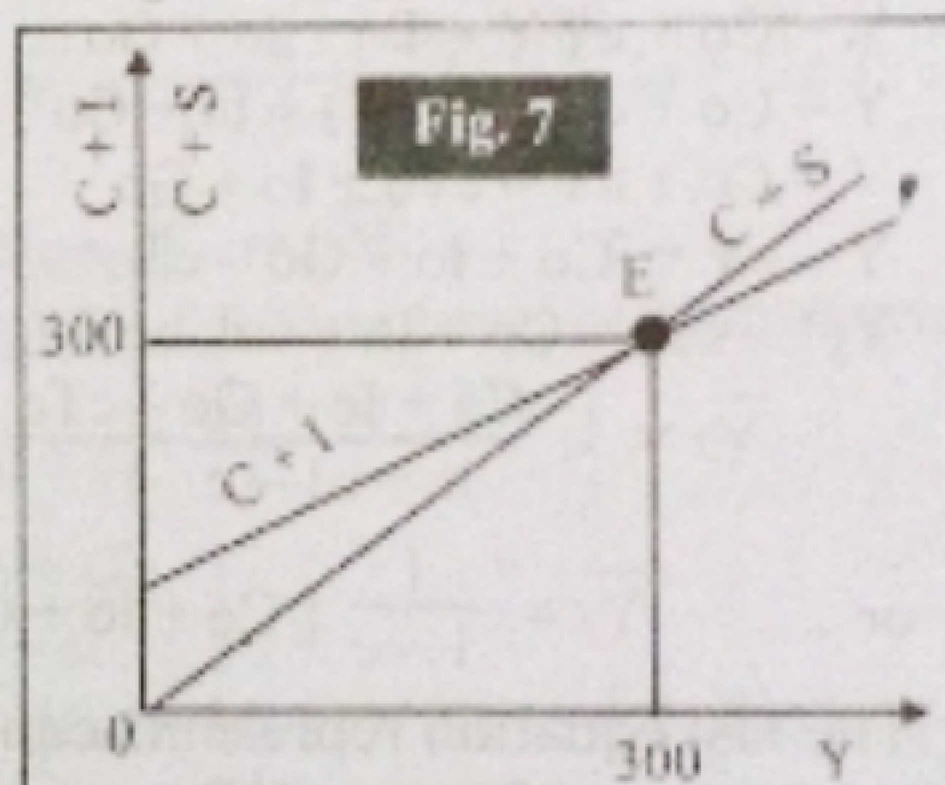
$$Y(1-c) = Co + Io \Rightarrow Y = \frac{Co + Io}{1-c} \Rightarrow Y = \frac{1}{1-c}(Co + Io)$$

The last equation shows equilibrium level of NI. Here c = MPC.

EXAMPLE. If $C = 40 + 0.6Y$, $I = 80$. We find the equilibrium level of NI and prove that $Y = C + I$. Also find the value of multiplier (K).

Putting the values of Y and C and solving for Y

$$Y = 40 + 0.6Y + 80$$
$$Y - 0.6Y = 40 + 80$$
$$Y(1 - 0.6) = 120$$
$$Y(0.4) = 120 \Rightarrow Y = \frac{120}{0.4} = 300$$



Putting Y = 300 in C,
$C = 40 + 0.6(300) = 40 + 180 = 220$
Putting the value of Y, C and I, we have

$Y = C + I \Rightarrow 300 = 220 + 80 \Rightarrow 300 = 300$

> Q: If $C = 20 + \frac{7}{10}Y$, $I = 10 + \frac{1}{10}Y$
> Find equilibrium level of national income also prove that at equilibrium level of income S=I (UAJK 2014/A)

Here value of investment multiplier (K_I) is also calculated: (Its proof is in my book Principles of Economics II) $K_I = \frac{1}{1 - MPC} = \frac{1}{1-0.6} = \frac{1}{0.4} = 2.5$

Now we include **induced investment** (eY). Thus the investment function in its standard form will be as: $I = Io + eY$ and $C = Co + cY$

Putting the values of C and I to get equilibrium level of NI in its general form.

$$Y = Co + cY + Io + eY \Rightarrow Y - cY - eY = Co + Io \Rightarrow Y(1 - c - e) = Co + Io \Rightarrow$$

$Y = \frac{Co + Io}{1-c-e} \Rightarrow Y = \frac{1}{1-c-e}(Co + Io)$ This equation shows equilibrium level of NI.

EXAMPLE. If $C = 40 + 0.6Y$, $I = 80 + 0.2Y$. We find the equilibrium level of NI and prove that $Y = C + I$. We also find the value of super multiplier (K_S).

Putting the values of Y and C and solving Putting the value of Y, C and I. we have for Y

$Y = C + I$
$Y = 40 + 0.6Y + 80 + 0.2Y$
$Y - 0.6Y - 0.2Y = 40 + 80$
$Y(1 - 0.6 - 0.2) = 120$
$Y(0.2) = 120 \Rightarrow Y = \frac{120}{0.2} = 600$

$600 = [40 + 0.6(600)] + [80 + 0.2(600)]$
$600 = [40 + 360] + [80 + 120]$
$600 = 400 + 200 \Rightarrow 600 = 600$

$$Ks = \frac{1}{1-c-e} = \frac{1}{1-0.6-0.2} = 5$$

(**Note:** The proof of this formula is available in my book Principles of Economics II)
Moreover, at this level of NI (600), savings are also equal to investment (200),

i.e., $Y = 600 \Rightarrow S = I$, i.e. $200 = 200$

3. NI DETERMINATION IN 3 SECTOR ECONOMY When Taxes are Autonomous (T = To).

As NI in 3 sector of economy is $Y = C + I + G$

Whereas
$C = Co + cYd$
$Yd = Y - T$
$T = To$
$G = Go$
$I = Io$
where Yd = disposable income

Putting the values in Y
$Y = Co + cYd + Io + Go$
$Y = Co + c(Y - T) + Io + Go$
$Y = Co + c(Y - To) + Io + Go$
$Y = Co + cY - cTo + Io + Go$
$Y - cY = Co + Io + Go - cTo$
$Y(1 - c)] = Co + Io + Go - cTo$

$$Y = \frac{Co + Io + Go - cTo}{1-c}$$

or
$$\overline{Y} = \frac{1}{1-c}[Co + Io + Go - cTo]$$

The last equation represents equilibrium level of NI in 3 sector of economy and it is called **Reduced Form of NI**.

Now we find equilibrium level of consumption.
$C = Co + cYd \qquad \overline{C} = c[\overline{Y} - T]$
Putting the values of $\overline{Y}$ and T

$$\overline{C} = Co + c\left[\frac{Co + Io + Go - cTo}{1-c}\right] - To$$

The last equation shows the equilibrium level of consumption.

> Q. If $C = 20 + 0.8Y_d$, $Io = 40$, $Go = 30$ and $To = 30$ (i) find equilibrium level of national income and consumption (ii) also prove $Y = C+I+G$
> (OAU: 2015)

EXAMPLE. If $G = Go = 20$, $To = 50$, $I0 = 40$, $c = 0.6$, $Co = 100$, we find equilibrium level of NI, and value of tax multiplier (K_T).

By putting the above values in $\overline{Y}$, we get

$$\overline{Y} = \frac{1}{1-c}[Co + Io + Go - cTo] = \frac{1}{1-0.6}[100 + 40 + 20 - (0.6)(50)]$$

$= \frac{1}{0.4} \times 130 = 325$. This is equilibrium level of NI. $K_G = \frac{1}{1-c} = \frac{1}{1-0.6} = 2.5$

Here $K_T = \frac{-c}{1-c} = \frac{-0.6}{1-0.6} = -1.5$. $Yd = Y - To = 325 - 50 = 275$

(The proof of K_T and K_G are available in my book Principles of Economics II).

$\overline{C} = 100 + 0.6\,Yd = 100 + 0.6(275) = 265,\quad \overline{S} = Yd - C = 275 - 265 = 10$

$\overline{Y} = C + I + G \Rightarrow \quad 325 = 265 + 40 + 20 = 325$

$S + T = Io + Go \quad \Rightarrow \quad 10 + 50 = 40 + 20 \quad \Rightarrow \quad 60 = 60$

Thus we proved that at equilibrium level (Y = 325), S + T = I + G and Y = C + I + G.

3 – A. NI DETERMINATION IN 3 SECTOR ECONOMY — When Induced Taxes are included.

NI in 3 sector economy gives

$Y = C + I + G$

$Y = Co + cYd + Io + Go$

$Y = Co + c[Y - T] + Io + Go$

$Y = Co + c[Y - tY] + Io + Go$

$Y = Co + cY - ctY + Io + Go$

$Y - cY + ctY = Co + Io + Go$

as $I = Io,\ G = Go$

$C = Co + cYd$

$Yd = Y - T$

$T = tY$

Here t = marginal propensity to tax (MPT). Its value is as: $0 < t < 1$.

$$Y(1 - c + ct) = Co + Io + Go \quad \Rightarrow \quad \overline{Y} = \frac{1}{1 - c + ct}[Co + Io + Go]$$

This is equilibrium level of NI. As $T = tY$ then $\overline{T} = t\overline{Y}$

This is equilibrium level of taxes. Now we find equilibrium level of consumption.

$$C = Co + c[\overline{Y} - \overline{T}] \Rightarrow \quad \overline{C} = Co + c\left[\frac{Co + Io + Go}{1 - c + ct}\right] - t\overline{Y}$$

$$\overline{C} = Co + c\left[\frac{Co + Io + Go}{1 - c + ct} - t\left(\frac{Co + Io + Go}{1 - c + ct}\right)\right]$$

EXAMPLE. If $C = 40 + 0.6Yd,\ Yd = Y - T, T = tY, I = 80,\ G = 20, t = 0.2$. Find equilibrium level of income $(\overline{Y})$ equilibrium level of consumption $(\overline{C})$ and value of multiplier. Then putting these values in $\overline{Y}$: $\quad \overline{Y} = \frac{1}{1 - c + ct}[Co + Io + Go]$

$$\overline{Y} = \frac{1}{1 - 0.6 + 0.6(0.2)}[40 + 80 + 20] = \frac{1}{0.52} \times 140 = 269.23$$

This is equilibrium level of NI.

(i) $\overline{C} = Co + c[\overline{Y} - \overline{T}] = 40 + 0.6[269.23 - 53.83]$
$= 40 + 0.6[215.40] = 40 + 129.24 = 169.24$

This is equilibrium level of C.

(ii) $\overline{T} = t\overline{Y} \Rightarrow \overline{T} = 0.2(269.23) = 53.83$

This is equilibrium level of T.

(iii) $S = Yd - C \Rightarrow S = Y - T - C = 269.23 - 53.83 - 169.24 = 46.16$

This is equilibrium level of S. Thus

$S + T = I + G$ $46.16 + 53.83 = 80 + 20$ $100 = 100$	$\overline{Y} = \overline{C} + Io + G$ $269.23 = 169.24 + 80 + 20$ $269.23 = 269.24$

3 – B. NI DETERMINATION IN A 3 SECTOR ECONOMY

When Autonomous and Induced Taxes are included.

> Q. With the help of national income determination model, $Y = C + I + G$ while $S = -40 + 0.4Y_d$, $I_o = 40$, $G_o = 50$, $T = 10 + 0.2Y$, $Yd = Y - T$, find (i) equilibrium level of income and consumption (ii) value of multiplier (K) and (iii) show equilibrium level of income graphically. (UOS:2015II)

NI in 3 sector economy gives

as $I = Io$, $G = Go$, $C = Co + cYd$, $Yd = Y - T$, $T = To + tY$

$$Y = C + I + G$$
$$Y = Co + cYd + Io + Go$$
$$Y = Co + c[Y - T] + Io + Go$$
$$Y = Co + c[Y - (To + tY)] + Io + Go$$
$$Y = Co + cY - cTo - ctY + Io + Go$$
$$Y - cY + ctY = Co + Io + Go - cTo \qquad Yd = Y - T$$
$$Y(1 - c + ct) = Co + Io + Go - cTo$$
$$\overline{Y} = \frac{1}{1 - c + ct}[Co + Io + Go - cTo]$$

This is reduced form of NI or this is equilibrium level of NI.

$$T = To + tY, \qquad \overline{T} = T_o + t\overline{Y}$$
$$\overline{T} = To + t\left[\frac{Co + Io + Go - cTo}{1 - c + ct}\right]$$

This is equilibrium level of taxes.

Now we find equilibrium level of consumption. $C = Co + c[\overline{Y} - \overline{T}]$

$$\overline{C} = Co + c\left[\left\{\frac{Co + Io + Go - cTo}{1 - c + ct}\right\} - t\left\{\frac{Co + Io + Go - cTo}{1 - c + ct}\right\} + To\right]$$

The last equation represents equilibrium level of consumption.

EXAMPLE 1: $Y = C + Io + Go$ Solution to the Q given in the box of this page.

$S = -40 + 0.4Yd$, $Io = 40$, $Go = 50$, $T = 10 + 0.2Y$, $Yd = Y - T$

$MPC = 1 - MPS = 1 - 0.4 = 0.6$, $-So = Co = 40$

$Y = C + Io + Go = 40 + 0.6Yd + 40 + 50 = 40 + 0.6(Y - T) + 90 \Rightarrow$

$Y = 130 - 0.6Yd[Y - (10 + 0.2Y)] \Rightarrow Y = 130 + 0.6[Y - 10.0.2Y] \Rightarrow$

$Y = 130 + 0.6Y - 6 - 0.12Y \Rightarrow Y - 0.6Y + 0.12Y = 130 - 6 \Rightarrow$

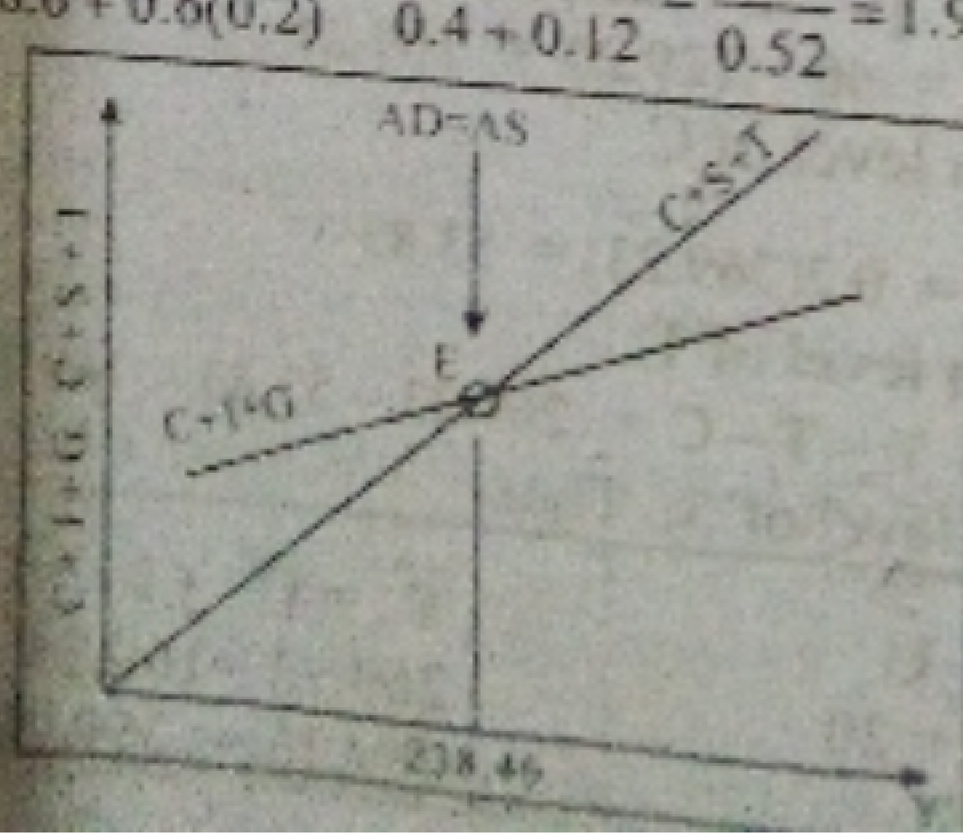
$Y(1 - 0.6 + 0.12) = 124 \Rightarrow Y(0.52) = 124 \Rightarrow \overline{Y} = 124/0.52 = 238.46$

$\overline{T} = 10 + 0.2(238.46) = 57.69$

$\overline{C} = 40 + 0.6(Y - T) = 40 + 0.6(238.46 - 57.69) = 148.46$

$\overline{Y} = \overline{C} + Io + Go \Rightarrow 238.46 = 148.46 + 40 + 50 \Rightarrow 238.46 = 238.46$

$$K = \frac{1}{1 - c + ct} = \frac{1}{1 - 0.6 + 0.6(0.2)} = \frac{1}{0.4 + 0.12} = \frac{1}{0.52} = 1.923$$



2. GENERAL EQUILIBRIUM IN MONEY MARKET

According to Hicks, LM curve shows general equilibrium in money market. Therefore, "LM curve shows the combinations of rate of interest and level of NI where Md = Ms, or money market is in equilibrium". According to Hicks, Md has two parts :

(1) The transactive demand for money (Mtd) which depends upon level of income (Y). Its general and standard form are as: Mtd = f (Y) and Mtd = kY where k = proportion of cash balance.

(2) Speculative demand for money (Msd) which depends upon the rate of interest. There exists an inverse relationship between Msd and rate of interest. Its general and standard forms are as: Msd = f (i) and Msd = – mi

where m is the slope of Msd curve and negative sign shows inverse relationship between interest rate and Msd. Md = Mtd + Msd

Ms is the supply of money which is fixed in short-run. It is as: Ms = Mo

At equilibrium Md = Mtd + Msd Summing two demands Md = kY – mi

$$Ms = Mo \quad , \quad Md = Mo$$

$$kY - mi = Mo \quad \Rightarrow \quad kY = Mo - mi$$

$$Y = \frac{Mo + mi}{k} \quad \text{or} \quad Y = \frac{Mo}{k} + \frac{M}{k} i \quad : \text{LM equation}$$

Numerical Example 1. If the following information are given regarding money market, the level of income is found at some rate of interest where Md = Ms.

$$Mtd = 0.25\,Y,\ Msd = -200i,\ Ms = Mo = 300$$

Solution.

Md = Mtd + Msd

Md = 0.25 Y + (– 200i)

Md = 0.25Y – 200i

Ms = Mo = 300

Md = Ms

0.25 Y – 200i = 300

0.25 Y = 300 + 200i

$$Y = \frac{300 + 200i}{0.25}$$

By supposing 10% as interest rate we get the following level of NI

Y = 1200 + 800 (10/100)

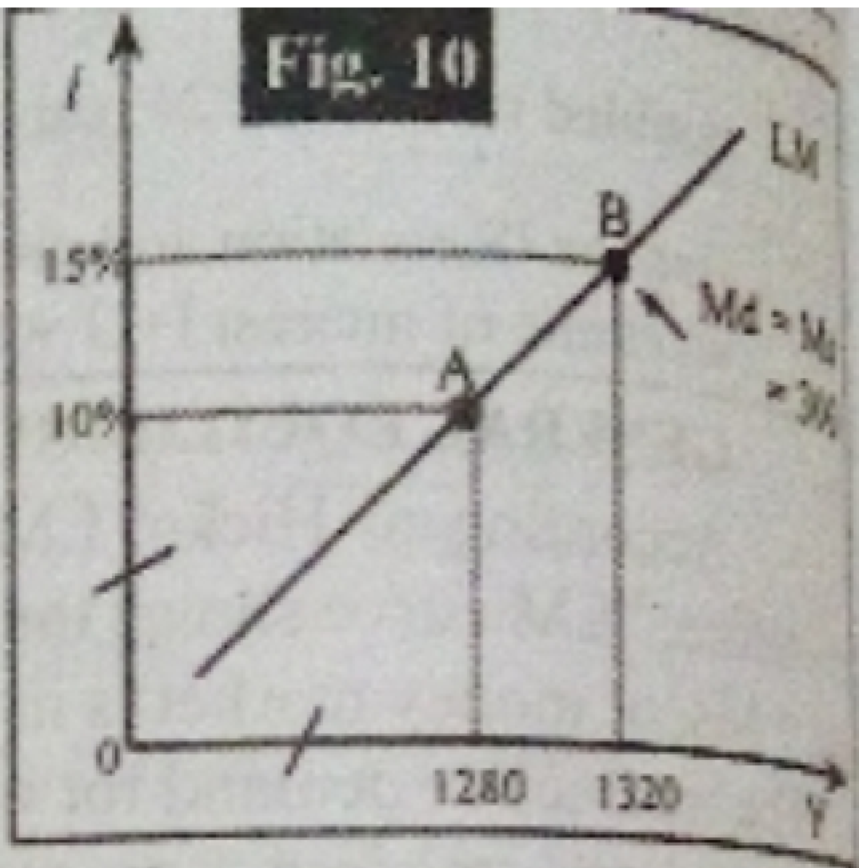
Y = 1200 + 80 = 1280

Putting the values of Y and i

Md = 0.25Y – 200i

Md = 0.25 (1280) – 200(10/100)

Md = 320 – 20 = 300



$Y = 1200 + 800\,i$ The LM equation

Thus, $i = 10\%$, $Y = 1280$, where $Md = Ms = 300$.

If $i = 15\%$, then $Y = 1200 + 800(15/100) = 1320$

$Mtd = 0.25Y = 0.25(1320) = 330$

$Msd = -200(15/100) = -30$,

$Md = Mtd + Msd = 330 - 30 = 300$

Thus, $i = 10\%$, $Y = 1280$, where $Md = Ms = 300$.

Thus, $i = 15\%$, $Y = 1320$, where $Md = Ms = 300$.

All this is shown in Fig.10.

Example 2. If following are the information regarding money market, find the level of NI at some rate of interest where $Md = Ms$.

$$Mtd = L_1 = 0.25\,Y,\ Msd = L_2 = -62.5i,\ Ms = 500 = Mo.$$

It is told that some people represent Md by L, Mtd by L_1 and Msd by L_2.

Solution.

$L = L_1 + L_2 = 0.25Y + (-62.5\,i)$
$= 0.25Y - 62.5\,i$

$Ms = 500$, $Ms = Md$

$Mo = Md$

$500 = 0.25Y - 62.5\,i$

$500 + 62.5i = 0.25\,Y$

$0.25Y = 500 + 62.5\,i$

$$Y = \frac{500 + 62.5i}{0.25}$$

$\therefore Y = 2000 + 250\,i$

If $i = 10\%$ then

$Y = 2000 + 250(10/100)$

$Y = 2000 + 25$

$Y = 2025$

$L_1 = 0.25Y = 0.25\,(2025) = 506.25$

$L_2 = -62.5i = -62.5\,(10/100) = -6.25$

$L = L_1 + L_2$

$= (506.25) + (-6.25) = 500$

$Ms = Mo = 500$

Thus, when $i = 10\%$ and $Y = 2025$, where $Md = Ms = 500$. This represents general equilibrium in money market.

EXERCISE–8

No.	Questions	Answers
(1).	$Md = 0.25Y - 30i$ $Ms = Mo = 350$	$Y = 1400 + 120i$ i: 10%, Y: 1412, Md: 350, Ms: 350 [i = 10 % is supposed here.]

(2).	Mtd = 0.25Y Msd = – 1500r Ms = 375	Y = 1500 + 6000r r Y Md Ms 5% 1800 375 375 where r = 5% is rate of interest which is supposed here.
(3).	Msd = 135 – 600i Mtd = 0.25Y Ms = 200	Y = 260 + 2400i i Y Md Ms 5% 380 200 200 [**N.B.** i = 5% is supposed]

3. SIMULTANEOUS EQUILIBRIUM IN GOODS AND MONEY MARKETS

We have already told that IS represents general equilibrium in goods markets while LM shows general equilibrium in money market. Therefore, according to Hicks the simultaneous equilibrium in goods and money markets takes place where IS intersects LM curve. Now we explain them with examples.

Numerical Example 1:

If the following informations are given regarding goods and money markets, find equilibrium rate of interest and level of NI where goods and money markets are in equilibrium. If

C = 102 + 0.7 Y (UAJK:2012)
I = 150 – 100i
L_T = Mtd = 0.25 Y
L_S = Msd = 124 – 200i
M_S = Ms = Mo = 300

Y = C + I
Y = 102 + 0.7Y + 150 – 100i
Y – 0.7 Y = 252 – 100i
Y(1 – 0.7) = 252 – 100i
Y(0.3) = 252 – 100i

$$Y = \frac{252 - 100i}{0.3}$$

Note please: Msd = Ls = speculative demand for money, Mtd = L_T = transactive demand for money Y = 840 – 333.33i… (1) The IS Equation.

Md = Mtd + Msd = 0.25Y + 124 – 200i ⇒ $L = L_T + L_S$
Md = Ms ⇒ L = M
0.25Y + 124 – 200i = 300
0.25Y = 300 – 124 + 200i
0.25Y = 176 + 200i

$$Y = \frac{176 + 200i}{0.25}$$

Y = 704 + 800i ... (2)
The LM equation
Subtracting (2) from (1)

Y = 840 – 333.33i
±Y = ± 704 ± 800i
0 = 136 – 1133.33i

1133.33 i = 136

$$i = \frac{136}{1133.33} = 0.12 = 12\%$$

Putting the value of i in (1)) and (2)
Y = 840 – 333.33 (0.12) = 800
Y = 704 + 800(0.12) = 800
Mtd = 0.25Y. Putting the value of Y in Mtd
Mtd = 0.25(800) = 200
Msd = 124 – 200i
Putting the value of i in Msd
Msd = 124 – 200(0.12) = 100
Md = Mtd + Msd
Md = 200 + 100 = 300
C = 102 + 0.7 Y
C = 102 + 0.7(800) = 662
S = Y – C = 800 – 662 = 138
I = 150 – 100i = 150–100(0.12) = 138

i	Y	S	I	Md=Mtd+Msd	Ms
12%	800	138	138	300=200+100	300

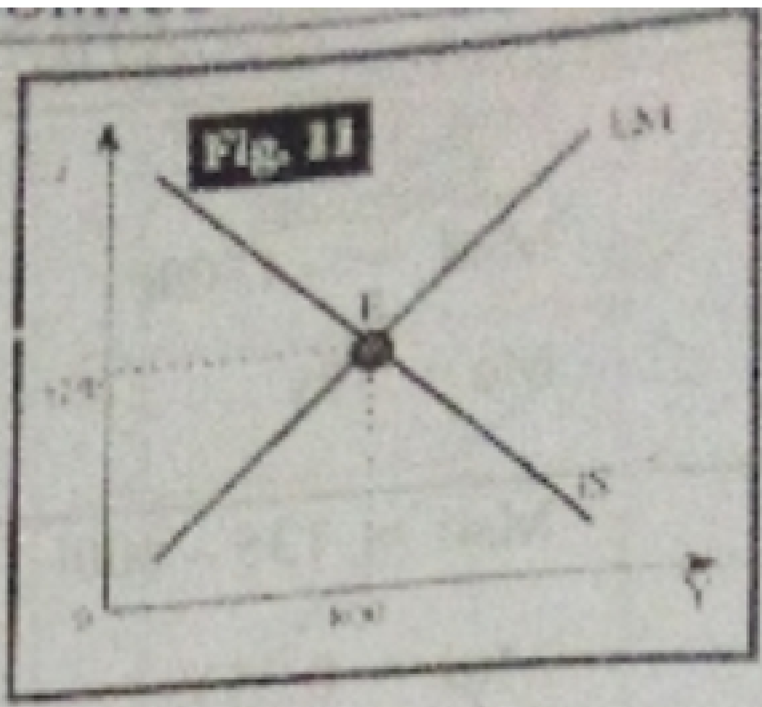


Fig. 11

All this is shown in Fig.11.Thus equilibrium rate of interest (i) = 12% and equilibrium level of NI = 800 where S = I and Md = Ms. If Ms = 317, then we also find values of i and Y.

$L_T + L_S = M \Rightarrow$ (UAJK:2012/A)

$0.25Y + 124 - 200i = 317 \Rightarrow 0.25Y = 317 - 124 + 200i \Rightarrow Y = 772 + 800i,$

New LM: $Y = 772 + 800i$, old IS: $Y = 840 - 333.33i$

$$Y = 840 - 333.33i$$
$$\underline{-Y = -772 \pm 800i}$$
$$0 = 68 - 1133.33i \Rightarrow 1133.33i = 68 \Rightarrow$$

$i = 0.06$. $Y = 840 - 333.33\,(0.06) = 820$, $Y = 772 + 800\,(0.06) = 820$

Thus new Y = 820 and i = 0.06 = 6%

Example 2. With the following equations, find simultaneous equilibrium in goods and money markets:

Goods Market Equilibrium

$$Y = C + I + G$$
$$Y = 10 + 0.8\,Yd + 100 - 200i + 15$$
$$Y = 10 + 0.8\,[\,Y - T\,] + 100 - 200i + 15$$
$$Y = 10 + 0.8\,[\,Y - 30\,] + 100 - 200i + 15$$
$$Y = 10 + 0.8Y - 24 + 100 - 200i + 15$$
$$Y - 0.8Y = 101 - 200i$$
$$Y(1 - 0.8) = 101 - 200i$$
$$Y(0.2) = 101 - 200i$$
$$Y = \frac{101 - 200i}{0.2} \quad \text{OR} \quad Y = 505 - 1000i \quad \dots (1)$$

$C = 10 + 0.8Yd$

$Yd = Y - T$, $T = 30$

$G = Go = 15$

$I = 100 - 200i$

$Md = 0.25Y - 40i$, $Mo = 100$

Money Market Equilibrium

$$Md = Ms$$
$$0.25\,Y - 40i = 100$$
$$0.25Y = 100 + 40i$$
$$Y = \frac{100 + 40i}{0.25}$$
$$Y = 400 + 160\,i \quad \dots (2)$$

Subtracting (2) from (1)

$$Y = 505 - 1000i$$
$$\underline{\pm Y = \pm 400 \pm 160\,i}$$
$$0 = 105 - 1160\,i$$
$$1160\,i = 105$$
$$i = \frac{105}{1160} = 0.0905172$$

Putting the value of i in (1) and (2)

$Y = 505 - 1000i = 505 - 1000(0.0905172)$

> Q: If $C = 48 + 0.8Y$
> $I = 98 - 75i$
> $M = 250$
> $L = L_T + L_S \Rightarrow$
> $0.3Y + 52 - 150i$
> (i) find IS and LM equations
> (ii) find equilibrium level of income and rate of interest.
> (UAJK: 2013)
> Goods, market equilibrium
> $Y = C + I$
> $Y = 48 + 0.8Y + 98 - 75i$
> Money market equilibrium
> $L = M \Rightarrow L_T + L_S = M$
> $0.3Y + 52 - 150i = 250$
> For further solution, see Example 1

$Y = 505 - 90.5172 = 414.48275$

$Y = 400 + 160i = 400 + 160(0.0905172) = 414.48275$

$Md = 0.25Y - 40i = 0.25(441.48275) - 40(0.0905172) = 100$

$C = 10 + 0.8Y = 10 + 0.8\,[Y - T]$

$C = 10 + 0.8\,[414.48275 - 30] = 317.58624$

$Yd = Y - T = 414.4828 - 30 = 384.4828$

$S = Yd - C = 384.4828 - 317.58624 = 66.89656$

$I = 100 - 200i = 100 - 200(0.0905172)$

$I = 100 - 18.10344 = 81.89$

Thus at 9% rate of interest the equilibrium level of NI is 414.48, where

$Md = Ms = 100$ and $I + G = S + T = 96.90$

i	Y	Md	Ms	S + T	I + G
9%	414.48	100	100	66.89+30=96.90	81.89+15=96.90

Numerical Example 3. With the following equations, find equilibrium level of interest and equilibrium level of NI.

$C = 130 + 0.5\,Yd,\ \ Yd = Y - T,\ T = 20 + 0.2Y,\ G = Go = 112,$

$I = 200 - 600i,\ Ms = 300,\ Mtd = 0.5Y, Msd = 50 - 600i$