LESSON 21

INCOME – OUTPUT DETERMINATION

In the previous chapter, we studied the concept of Consumption function, Saving function and Investment function. In this chapter, we will study the Determination of Income and Output with the help of aggregate demand and aggregate supply curves.

Aggregate demand (AD): Aggregate demand refers to the total demand for final goods and services in the economy at a given level of income and employment. Aggregate demand equals to aggregate expenditure in an economy.

There are four components of Aggregate demand in an open economy -

1-Consumption expenditure (C)

2-Investment expenditure (I)

3-Government expenditure (G)

4- Net-Export (X - M)

(In an open economy) AD = C + I + G + (X-M)

(In closed economy) AD = C + I

In this chapter, we will analyse the determination of income and output in two sectors economy. Aggregate demand consists of the following economic elements in two sector economy.

1- Consumption demand

2- Investment demand

Consumption demand depends upon marginal propensity to consume and level of income. If marginal propensity to consume is given, then consumption demand depends upon income. Therefore, consumption is the function of income .

In the form of equation C = f (Y)

Investment demand depends upon two factors–

1- Marginal efficiency of capital.

2- Rate of Interest.

Out of these two, rate of interest is relatively stable and generally does not change in short run. So, Investment demand mainly depends upon change in marginal efficiency of capital. "The marginal efficiency of capital (MEC) is that rate of expected profit from the investment of capital assests."

Domestic investment demand = Gross domestic capital formation + change in unsold stocks of goods.

Aggregate supply:

Aggregate supply refers to the total supply of goods. One part of aggregate supply is sold for consumption and other part of is unsold stock of goods.

Aggregate Supply is summation of total consumption expenditure (C) and total savings (S) in an economy. Consumption expenditure is done on production of goods and services and total savings are invested in production of capital goods.In form of equation :-

Aggregate Supply (AS) = C + S

Aggregate supply is the total value of all goods and services available for sale in the market.

Determination of equilibrium level of income in two sector economy.:

In an economy which has two sectors-one is household sector and the other is business sector.AD and AS curves can be obtained in the following manner:-

Aggregate demand curve – In an economy which consists of two sectors, the demand of goods in household is for final consumption and in business sector demand is for domestic investment. It is also assumed that investment is autonomous.

I = Ia (autonomous investment)

AD = C + Ia

AD = a + bY_d + Ia (because C = a + b.Y_d)

So, an aggregate demand curve can be drawn graphically in the following manner –

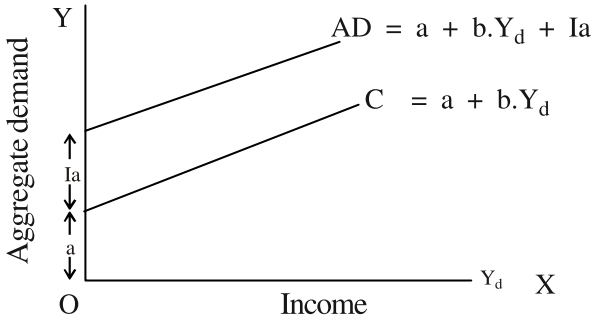

Figure 21.1

In the above figure 21.1 the consumption curve (C = a + b (Yd) is drawn , a stands for autonomous consumption . It shows the constant level of consumption, at zero level of income.When Ia is added to C then Aggregate Demand curve is obtained, therefore it is added to parallel consumption function.The aggregate demand can be calculated as-

Suppose autonomous consumption is (a) = 1000 cr. and autonomous investment (Ia) = 5000cr., and MPC = b = 0.7

Table 21.1

Y_d	autonomous consumption a = 1000	b . Y_d 0.70 x Y_d	C = a+b.Y	Ia	AD = C+Ia
1000	1000	700	1700	5000	6700
2000	1000	1400	2400	5000	7400
3000	1000	2100	3100	5000	8100
4000	1000	2800	3800	5000	8800
5000	1000	3500	4500	5000	9500

Aggregate supply depicts the money value of total output to be sold in the market.

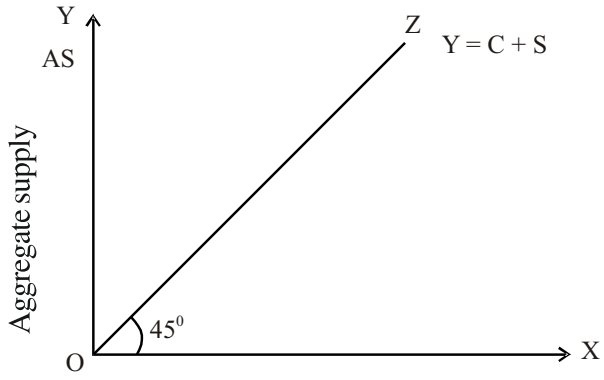

Figure 21.2

Aggregare supply curves has been shown in the figure 21.2

In the above figure 21.2 OZ is equal proportion line . It is 45° from both axis. It represents aggregate supply curves, and is also known as income line.This 45°simple line depicts two things –

1-Aggregate production

2-Money value of national income. Actually national product and national income are synonymous.

Income line OZ which has angle of 45°. The consumption curve C (fig.21.1) shows as income increases consumption also increases.

Determination of equilibrium level of Income

Equilibrium level of income is that level of income and output where (AD = AS) aggregate demand is equal to aggregate supply.

AD = AS

By depicting both curves together,(AD=AS) the equilibrium level of income is determined in figure below:

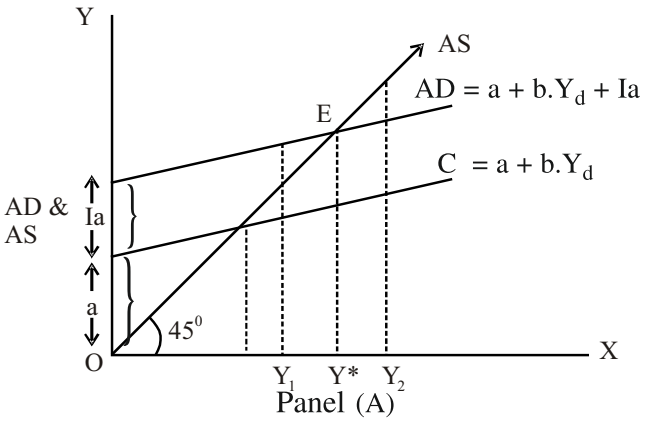

Figure 21.3

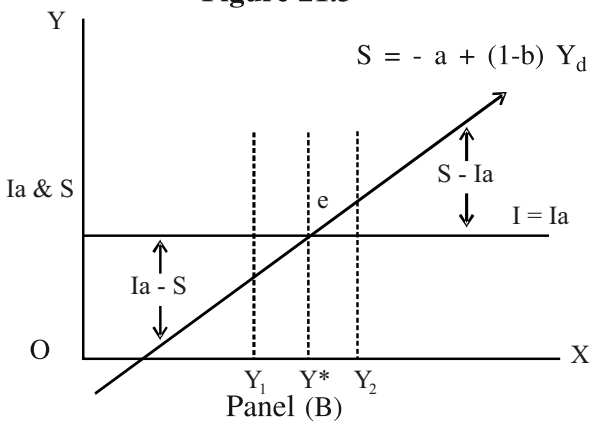

Figure 21.3

In figure 21.3 (A) Point E is equilibrium point of income. At this point AD = AS

$$C + Ia = C + S$$

$$Ia = S$$

In figure 21.3 (B) saving function $S=- a+(1-b)Y_d$ has been depicted.

Investment is autonomous and constant. So it's drawn parallel to OX axis. Investment function and saving function cut/intersect each other at point e and it is exactly below the above point E (shown in figure 21.3 (A)).

Therefore, the point where aggregate demand (AD) intersects aggregate supply (AS) and is the point of equilibrium. At this point, Ia and S equal, which shows the equilibrium level of income. If the level of full employment is determined at the Y_1 then $Y_1 < Y^*$ or AD > AS. Therefore, this gap is equal to Ia-S, which is known as inflationary gap.

If the level of full employment is at the income level is Y_2, then $Y_2 > Y^*$ or AD < AS

This gap is equals to S-Ia. This gap is known as deflationary gap. If there is situation of inflationary gap then it can be eliminated by reducing aggregate demand (AD) and if there is situation of deflationary gap then it can be eliminated by increasing AD.

We can understand the equilibrium level of income and output mathematically as follows :

$$AS = Y$$

And $AD = C+Ia$

For equilibrium level of income AD = AS

$$Y = C + Ia$$

$$\therefore \quad C = a + b\ (Y)$$

$$Y = a + bY + Ia$$

$$Y - bY = a + Ia$$

$$Y(1 - b) = a + Ia$$

$$Y + \frac{1}{(1-b)}(a = Ia)$$

This is equilibrium level of income.

Here, b is stands for marginal propensity to consume.

1 - b = 1 - MPC = MPS (Marginal Propensity to save)

Here equilibrium income is

$$Y + \frac{1}{1-MPC}(a = Ia)$$

$$\text{or } Y + \frac{1}{MPS}(a = Ia)$$

Example : Autonomous investment in an economy is ₹ 200 cr. And the given consumption function C=80+0.75y,then

1- What will be the equilibrium level of income?

2- How much will national income increase if investment is increased by ₹ .25cr. ?

Solution : Ia = 200cr.

$$\Delta I = 25$$

$$C = 80 + 0.75Y$$

$$AS = Y,\ AD = C + I_a$$

$$AS = AD$$

$$Y = C + Ia$$

$$Y = 80 + 0.75Y + 200$$

$$(Y - 0.75Y) = 80 + 200$$

$$Y(1 - 0.75) = 280$$

$$0.25Y = 280$$

$$Y = 280 \times \frac{100}{25} \times 1120$$

Equilibrium income level will be Rs. 1120 cr.

Value of multiplier :-

$$K \quad \frac{1}{1-MPC} = \frac{1}{1-0.75} = 4$$

$$K = \frac{\Delta Y}{\Delta I}$$

$$\Delta Y = K.\Delta I$$

$$= 4 \times 25 \text{ Crores}$$

$$= 100 \text{ Crores}$$

The national income will increase by 100 crores if investment increases by ₹ 25 crores.

Concept of Investment Multiplier

The theory of multiplier occupies an important place in the modern theory of income and employment. The concept of multiplier was first developed by Prof. R.F. Kahn in 1931.

In the decade of 1930's, there was a great depression in economy of America and Europe, then Keynes suggested the idea of increase in aggregate demand to face the challenges of Great Depression. Keynes multiplier is known as investment multiplier or income multiplier .The concept of multiplier occupies an important place in the theories of income, production and employment.

It explains the amount of increase in national income as a result of an initial increase in investment. According to this concept,income increases manifold to the initial increase in investment. Investment multiplier refers to manifold increase in income caused due to initial increase in a investment. Suppose, initial investment is$_c$ 100cr. in the economy and due to this investment, income increases to$_c$ 500cr. then –

$$\text{Investment multiplier} = \frac{500\ Cr.Rs.}{100\ Cr.Rs.} = 5\ Cr.$$

So the value of investment multiplier is equal to the ratio of change in income to the change in investment. In mathematical form :

$$K = \frac{\Delta Y}{\Delta I}$$

Here, K – investment multiplier

ΔY – change in income

ΔI – change in investment

The concept of multiplier is based on the idea that one's expenditure is the income of another. The part of income spent on consumption depends upon MPC. If marginal propensity to consume is high, then it means people will spend large part of their income on consumption. In other words, increase in income is many times more than initial increase in investment. Therefore ,there is a direct relationship between (K) and marginal propensity to consume (MPC).

On the contrary, higher the marginal propensity to save (MPS) lower will be the size of multiplier. Therefore, there is inverse relationship between investment multiplier and marginal propensity to save (MPS),

We can also see the relationship between K, MPC and MPS.

If MPS = 0.75

then $K = \frac{1}{1 - MPC}$

$$\frac{1}{1-0.75} = \frac{1}{.25} = 4$$

We know that MPC + MPS = 1

Or MPS = 1 - MPC

MPS = 1 - 0.75

Or MPS = 0.25

Or $K \quad \frac{1}{MPS} = \frac{1}{0.25} = 4$ is the value of multiplier

If MPC is zero which is rare case, then

$$K = \frac{1}{1-0} = 1$$

and if MPC = 1, Then

$$K = \frac{1}{1-1} = \frac{1}{0} = \infty$$

Two values mentioned above can be seen as lowest and highest values of multiplier i.e. 1 and .

Since MPC lies between limits of 0 to 1

Diagrammatic representation of multiplier

We know that equilibrium point in an economy is where aggregate demand is equal to aggregate supply or where savings and investment are equal to each other i.e. S = I.

1- Aggregate demand and aggregate supply curve method :

Aggregate demand is equal to consumption expenditure and investment expenditure. When investment expenditure increases, then aggregate demand curve shifts upwards and equilibrium points

changes and reaches to higher income level. This is explained in figure 21.4

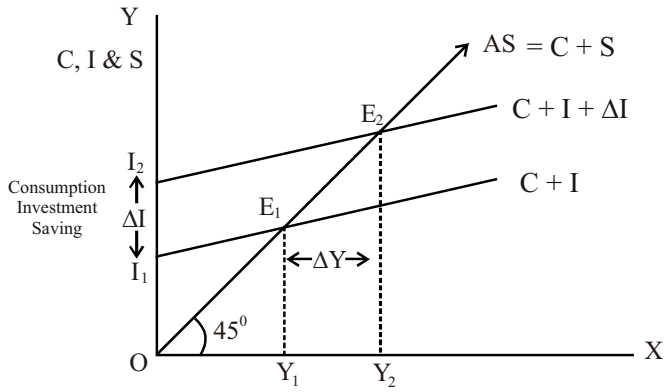

Figure 21.4

According to figure 21.4 when investment increases by $I_1 I_2 = \Delta I$ then income increases by $Y_1 Y_2 = \Delta Y$

Because, Investment multiplier $= \frac{Y_1 Y_2}{I_1 I_2} = \frac{\Delta Y}{\Delta I}$

This is known as forward working of the multiplier. On contrary, if there is a decrease in investment in the economy, then income decreases by many times. This is known as backward working of the multiplier.

2. Saving and Investment Method

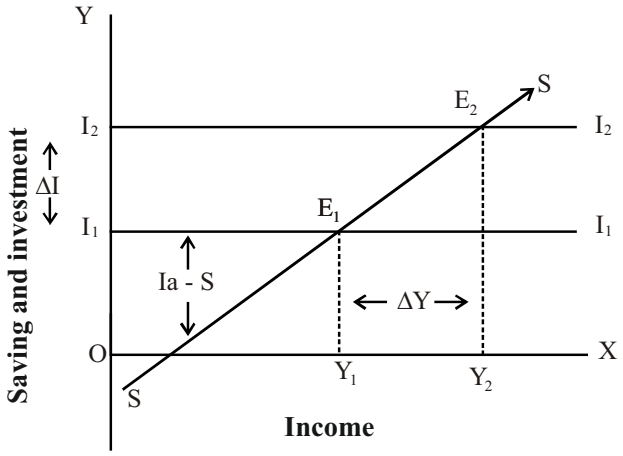

Figure 21.5

In figure 21.5 saving and investment curves are equal at point E_1 Initally, where initial investment has been depicted by I_1. When investment increases, investment curve shifted upward to I_2 and new equilibrium point is at E_2, where $S = I_2$.

Therefore, if investment increases by $I_1 I_2$ then income increases $Y_1 Y_2$.

Investment multiplier $= \frac{Y_1 Y_2}{I_{12} I} = \frac{\Delta Y}{\Delta I}$

The concept of multiplier is very important in Keynes theory of income and employment. When there is increase in investment, national income increases manifold. Similarly, at any specific level of income if AD>AS then inflationary situation appears in the economy and if AD<AS then deflationary situation appears in economy. The study of multiplier helps to understand trade cycle and it also helps in policy making. Equality can be achieved between saving and investment with the help of the multiplier. The amount of investment necessary to achieve the objective of full employment can be determined by the value of multiplier. Public investment has an important role in economic development. Government also determines the volume of public expenditure. Thus the concept of multiplier reveals the importance of investment and public expenditure.

Important points

- Equilibrium level of income and employment – is at the point were aggregate demand is equal to aggregate supply. The equilibrium level of income and employment.

  AD = AS

  C + I = C + S

  I = S

- Equilibrium level of income and employment is also at the point where total savings are equal to total investments.
- In an open economy, aggregate demand has four components :-

  (i) Consumption Expenditure (C)

  (ii) Investment Expenditure (I)

  (iii) Government Expenditure (G)

  (iv) Net Export (X-M)

- Equilibrium income

$$Y = \frac{1}{1 - MPC}(a + Ia)$$

$C = a + bY$

Here a= autonomous consumption

Ia = autonomous investment

- Concept of investment multiplier: The value of multiplier is equal to the ratio of change in the income to change in investment.

$$K = \frac{\Delta Y}{\Delta I}$$

Here K= multiplier

ΔY = change in income

ΔI = change in investment

- Value of multiplier depends upon the level of marginal propensity to consume (MPC). Higher the value of MPC, higher is the value of K and vice-versa.
- Multiplier can be expressed in the form of MPS as below:

$$K = \frac{1}{1 - MPC} = \frac{1}{MPS}$$

- Lower the value of MPS, higher the value of multiplier (K)
- If an investment increases then it will increase the level of income manifold times this process is known as forward working of multiplier. On the contrary if an investment decreases, then it will also lower down the level of income, this process is known as backward movement of multiplier.
- Aggregate demand is the sum of total demand for goods and services in an economy. It is expressed in the form of total expenditure on goods and services in an economy in a year.
- Total goods available in an economy in a given period of time is aggregate supply.

Exercise Questions

Objective type Question:-

1- Aggregte demand is equal to-

(A) I + S (B) C + I

(C) Zero (D) Infinity

2- When MPC is zero, what will be value of multiplier-

(A) 100 (B) 1

(C) 0 (D) infinity

3- When MPS equal to 0.5 what will be the value of K ?

(A) 1 (B) 2

(C) 0 (D) infinity

4- Which of follwing is the formula of multiplier-

(A) $\frac{1}{1 - MPC}$

(B) $\frac{MPC}{MPS}$

(C) $\frac{1}{MPC + MPS}$

(D) $\frac{1}{MPC}$

5- Who developed the concept of Employment Multiplier -

(A) Richard Goodwin

(B) J.M.Keyens

(C) J.S.Ducsnbery

(D) R.F.Kahn.

Very Short Answer Type Questions :-

1- What do you understand by multiplier ?

2- If MPC=0.9, what will be the value of multiplier?

3- What do you understand by equilibrium level of income and employment?

4- What are the important components of aggregate demand?

5- What are the important components of aggregate supply?

Short Answer Type Questions :-

1- Expalin the working of multiplier with the help of the Figure.

2- How is the value of multiplier determined by MPC?

3- Find out the value of multiplier using formula when MPS =0.25?

4- What are the lowest and highest value of multiplier?

5- What is the practical importance of multiplier?

Essay Type Questions :-

1- Explain the equilibrium level of income with the help of Figure and formula.

2- Explain the equilibrium level of income through saving and investment with the help of a suitable figure.

3- What do you understand by investment multiplier?

4. What is the relationship between marginal propensity to consume and investment multiplier?

Answer Table

1	2	3	4	5
B	B	B	A	D