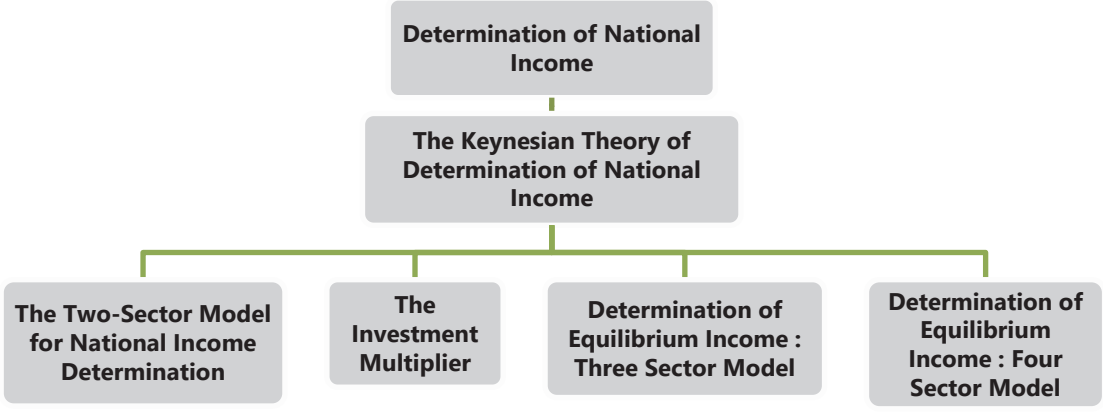
UNIT II: THE KEYNESIAN THEORY OF DETERMINATION OF NATIONAL INCOME

LEARNING OUTCOMES

At the end of this unit, you will be able to:

- Define Keynes' concept of equilibrium aggregate income
- Describe the components of aggregate expenditure in two, three and four sector economy models
- Explain national income determination in two, three and four sector economy models
- Illustrate the functioning of multiplier, and
- Outline the changes in equilibrium aggregate income on account of changes in its determinants

UNIT OVERVIEW



2.1 INTRODUCTION

In the previous unit on National Income Accounting, we have come across terms such as consumption, investment and total output of final goods and services (GDP). These macroeconomic variables were used in the accounting sense, representing actual values of these items in a certain year. These actual or accounting values are 'ex post' (realized) measures of these items. Thus, aggregate consumption (C) denotes what people have actually consumed and GDP is what is actually produced. These variables can also be defined in 'ex-ante' (anticipated) terms or in terms of what is intended or planned. In the theoretical model of the economy which we plan to discuss in this unit, the 'ex ante' values of these variables are our primary concern. Therefore, the term 'consumption' would indicate what people in an economy plan to consume and 'investment'would denote planned investment. If we want to predict what the equilibrium value of output or GDP is, we need to know what quantities of final goods people plan to demand and supply.

In this unit, we shall focus on two issues namely, the factors that determine the level of national income and the determination of equilibrium aggregate income and output in an economy. A comprehensive theory to explain these phenomena was first put forward by the British economist John Maynard Keynes in his masterpiece 'The General Theory of Employment Interest and Money' published in 1936. Before the 'General Theory' by Keynes, economists could not explain how economic depressions happen, or what to do about them. The classical economists maintained that the economy is self-regulating and is always capable of automatically achieving equilibrium at the 'natural level' of real GDP or output, which is the level of real GDP that is obtained when the economy's resources are fully employed. While circumstances arise from time to time that cause the economy to fall below or to exceed the natural level of real GDP, wage and price flexibility will bring the economy back to the natural level of real GDP. If an excess in the labour force (unemployment) or products exist, the wage or price of these will adjust to absorb the excess. According to them, there will be no involuntary unemployment.

Keynes' theory of determination of equilibrium real GDP, employment and prices focuses on the relationship between aggregate income and aggregate expenditure. There is a difference between equilibrium income (the level toward which the economy gravitates in the short run) and potential income (the level of income that the economy is technically capable of producing, without generating

accelerating inflation).Keynes argued that markets would not automatically lead to full-employment equilibrium and the resulting natural level of real GDP. The economy could settle in equilibrium at any level of unemployment. Keynesians believe that prices and wages are not so flexible; they are sticky, especially downward. The stickiness of prices and wages in the downward direction prevents the economy's resources from being fully employed and thereby prevents the economy from returning to the natural level of real GDP. Therefore, output will remain at less than the full employment level as long as there is insufficient spending in the economy. This was precisely what was happening during the great depression.

The Keynesian theory of income determination is presented in three models:

(i) The two-sector model consisting of the household and the business sectors,

(ii) The three-sector model consisting of household, business and government sectors, and

(iii) The four-sector model consisting of household, business, government and foreign sectors

Before we attempt to explain the determination of income in each of the above models, it is pertinent that we understand the concept of circular flow in an economy which explains the functioning of an economy.

2.2 CIRCULAR FLOW IN A SIMPLE TWO-SECTOR MODEL

Concept of circular flow

The circular flow of income is a process where the national income and expenditure of an economy flow in a circular manner continuously through time. Savings, expenditures, exports and imports are various components of circular flow of income which are shown in the figure in the form of currents and cross currents in such a manner that national income equals national expenditure.

Initially, we consider a hypothetical simple two-sector economy. Even though an economy of this kind does not exist in reality, it provides a simple and convenient basis for understanding the Keynesian theory of income determination. The simple two sector economy model assumes that there are only two sectors in the economy viz., households and firms, with only consumption and investment outlays. Households own all factors of production and they sell their factor

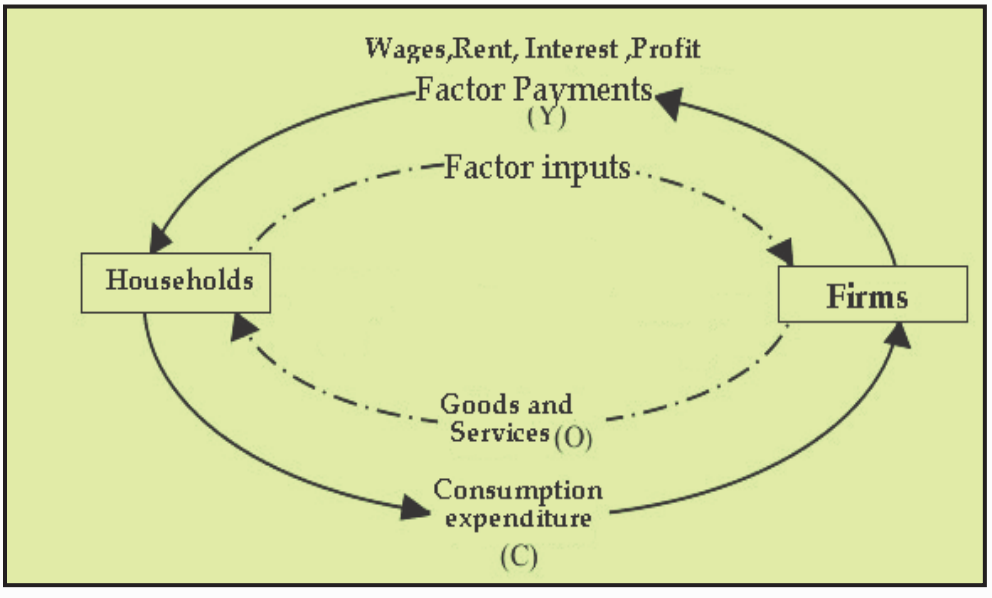
services to earn factor incomes which are entirely spent to consume all final goods and services produced by business firms. The business firms are assumed to hire factors of production from the households; they produce and sell goods and services to the households and they do not save. There are no corporations, corporate savings or retained earnings. The total income produced, *Y,* accrues to the households and equals their disposable personal income Y_d i.e., $Y = Yd$.

All prices (including factor prices), supply of capital and technology remain constant. The government sector does not exist and therefore, there are no taxes, government expenditure or transfer payments. The economy is a closed economy, i.e., foreign trade does not exist; there are no exports and imports and external inflows and outflows. All investment outlay is autonomous (not determined either by the level of income or the rate of interest); all investment is net and, therefore, national income equals the net national product.

In the figure 1.2.1, the circular flow of income and expenditure which presents the working of the two- sector economy is illustrated in a simple manner.

Figure 1.2.1

Circular Flow in a Two Sector Economy



The circular broken lines with arrows show factor and product flows and present 'real flows' and the continuous line with arrows show 'money flows' which are generated by real flows. These two circular flows-real flows and money flows-are

in opposite directions and the value of real flows equal the money flows because the factor payments are equal to household incomes. There are no injections into or leakages from the system. Since the whole of household income is spent on goods and services produced by firms, household expenditures equal the total receipts of firms which equal the value of output.

Factor Payments = Household Income = Household Expenditure = Total Receipts of Firms = Value of Output.

Before we go into the discussion on the equilibrium aggregate income and changes in it, we shall first try to understand the meaning of the term 'equilibrium' (defined as a state in which there is no tendency to change; or a position of rest). Equilibrium output occurs when the desired amount of output demanded by all the agents in the economy exactly equals the amount produced in a given time period. Logically, an economy can be said to be in equilibrium when the production plans of the firms and the expenditure plans of the households match.

Having understood the working of the two-sector model and the meaning of equilibrium output, we shall now have the formal presentation of the theory of income determination in a two-sector model which is the simplest representation of the key principles of Keynesian economics.In the theoretical model of the economy, the ex ante values of different variables should be our primary concern.Before we discuss the Keynesian theory of income determination, let us look at the basic concepts, definitions and functions used in his theory of income determination.

2.3 BASIC CONCEPTS AND FUNCTIONS

2.3.1 Aggregate Demand Function

Aggregate demand (AD) is what economists call total planned expenditure. In a simple two-sector economy, the ex ante aggregate demand (AD) for final goods or aggregate expenditure consists of only two components:

(i) Ex ante aggregate demand for consumer goods (C), and

(ii) Ex ante aggregate demand for investment goods (I)

$$AD = C + I \qquad (2.1)$$

Of the two components, consumption expenditure accounts for the highest proportion of the GDP. In a simple economy, the variable **I** is assumed to be

determined exogenously and constant in the short run. Therefore, the short-run aggregate demand function can be written as:

$$AD = C + \bar{I} \quad (2.2)$$

Where $\bar{I}$ = constant investment.

From the equation (2.2), we can infer that, in the short run, AD depends largely on the aggregate consumption expenditure. We shall now go over to the discussion on consumption function.

2.3.2 The Consumption Function

Consumption function expresses the functional relationship between aggregate consumption expenditure and aggregate disposable income, expressed as:

$$C = f(Y) \quad (2.3)$$

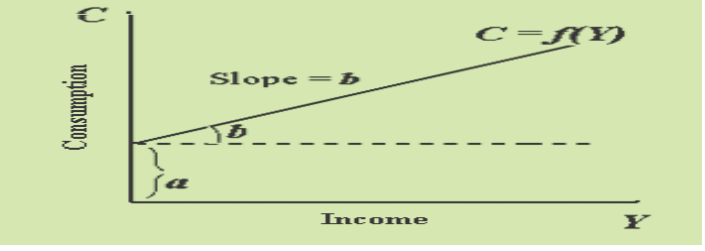
When income is low, consumption expenditures of households will exceed their disposable income and households dissave i.e. they either borrow money or draw from their past savings to purchase consumption goods. If the disposable income increases, consumers will increase their planned expenditures and current consumption expenditures rise, but only by less than the increase in income.

The specific form of consumption–income relationship termed the consumption function, proposed by Keynes is as follows:

$$C = a + bY \quad (2.4)$$

where C = aggregate consumption expenditure; *Y*= total disposable income; *a* is a constant term which denotes the (positive) value of consumption at zero level of disposable income; and the parameter *b*, the slope of the function, ($\Delta C / \Delta Y$) is the marginal propensity to consume (MPC) i.e. the increase in consumption per unit increase in disposable income.

Figure 1.2.2
The Keynesian Consumption Function



The consumption function shows the level of consumption (C) corresponding to each level of disposable income (Y) and is expressed through a linear consumption function, as shown by the line marked C = f(Y) in figure 1.2.2.. The intercept for the consumption function, *a,* can be thought of as a measure of the effect on consumption of variables other than income, variables not explicitly included in this simple model.

The Keynesian assumption is that consumption increases with an increase in disposable income, but that the increase in consumption will be less than the increase in disposable income (b <1). i.e. 0 < b < 1. This fundamental relationship between income and consumption plays a crucial role in the Keynesian theory of income determination.

2.3.3 Marginal Propensity to Consume (MPC)

The consumption function is based on the assumption that there is a constant relationship between consumption and income, as denoted by constant *b* which is marginal propensity to consume. The concept of MPC describes the relationship between change in consumption (ΔC) and the change in income (ΔY). The value of the increment to consumer expenditure per unit of increment to income is termed the Marginal Propensity to Consume (MPC).

$$MPC = \frac{\Delta C}{\Delta Y} = b \qquad (2.5)$$

Although the MPC is not necessarily constant for all changes in income (in fact, the MPC tends to decline at higher income levels), most analysis of consumption generally works with a constant MPC.

2.3.4 Average Propensity to Consume (APC)

Just as marginal propensity to consume, the average propensity to consume is a ratio of consumption defining income consumption relationship. The ratio of totalconsumption to total income is known as the average propensity to consume (APC).

$$APC = \frac{\text{Total Consumption}}{\text{Total Income}} = \frac{C}{Y} \quad (2.6)$$

The table below shows the relationship between income and consumption

Table 1.2.1

Relationship between Income and Consumption

Income (Y) (₹ Crores)	Consumption (C)(₹ Crores)	Saving (₹ Crores)	APC (C/Y)	MPC (ΔC /ΔY)
0	50	-50	∞	-
100	125	-25	125/100 = 1.25	75/100 = 0.75
200	200	0	200/200 = 1.00	75/100 = 0.75
300	275	25	275/300 = 0.92	75/100 = 0.75
400	350	50	350/400=0.88	75/100 = 0.75
500	425	75	425/500=0.85	75/100 = 0.75

Note: The conventional Keynesian MPC is assumed to have a constant value less than 1.00 and usually greater than 0.50:

APC is calculated at various income levels. It is obvious that the proportion of income spent on consumption decreases as income increases. What happens to the rest of the income that is not spent on consumption? If it is not spent, it must be saved because income is either spent or saved; there are no other uses to which it can be put. Thus, just as consumption, saving is a function of disposable income: S=f(Y).

2.3.5 The Saving Function

Saving is also a function of disposable income. The saving function shows the function shows the functional relationship between national income (= disposable income in two sector model) and saving.

$$S = f(Y)$$

This can be illustrated with the following table and diagram.

Table 1.2.2

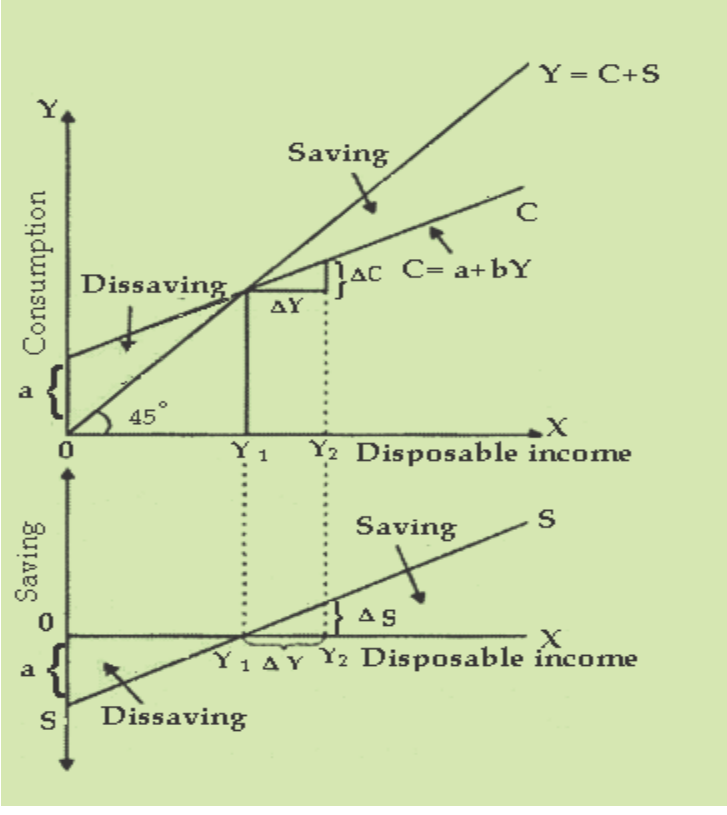
Relationship between Income, Consumption and Saving

Disposable Income (Yd) (₹ Crores)	Consumption (C) (₹ Crores)	Saving (S) (₹ Crores
0	20	-20
60	70	-10

120	120	0
180	170	10
240	220	20

Figure 1.2.3.

The Consumption and Saving Function



In figure 1.2.3, the consumption and saving functions are graphed. The saving function shows the level of saving (S) at each level of disposable income (Y). The saving curve has a negative intercept (-a) on Y axis and its magnitude is the same as the positive intercept of the consumption curve. We know that consumption at zero level of income is positive (equal to a), and as such there should be dissaving also of the same magnitude. By definition, national income Y = C + S, which shows that disposable income is, by definition, consumption plus saving. Therefore, S = Y – C. When national income is equal to Y1, C=Yand saving curve

crosses X axis. Thus, when we represent the theory of the consumption-income relationship, it also implicitly establishes the saving-income relationship.

2.3.6 The Marginal Propensity to Save (MPS)

The slope of the saving function is the marginal propensity to save. If one-unit increase in disposable income leads to an increase of 'b' units in consumption, the remainder (1 - b) is the increase in saving. This increment to saving per unit increase in disposable income (1 - b) is called the marginal propensity to save (MPS). In other words, the marginal propensity to save is the increase in saving per unit increase in disposable income.

Saving is an increasing function of the level of income. In other words, saving increases as income rises.

$$MPS = \frac{\Delta S}{\Delta Y} = 1 - b \quad (2.7)$$

Marginal Propensity to Consume (MPC) is always less than unity, but greater than zero, i.e., $0 < b < 1$ Also, MPC + MPS = 1; we have MPS $0 < b < 1$. Thus, saving is an increasing function of the level of income because the marginal propensity to save (MPS) = 1- b is positive, i.e. saving increase as income increases.

2.3.7 Average Propensity to Save (APS)

The ratio of total saving to total income is called average propensity to save (APS). Alternatively, it is that part of total income which is saved.

$$APS = \frac{\text{Total Saving}}{\text{Total Income}} = \frac{S}{Y} \quad (2.8)$$

2.3.8 Aggregate Supply:

Ex ante or planned aggregate supply is the total supply of goods and services which firms in a national economy plan on selling during a specific time period. It is equal to national income of the economy, which is either consumed or saved.

$$AS = C + S$$

Numerical Illustrations

Illustration 1

What will be the value of average propensity to save when -

(i) C = 200 at Y = 1,000

(ii) S = 450 at Y = 1,200

Solution

(i) APS = $\frac{S}{Y}$;S = Y – C = 1,000 – 200 = 800. Therefore, APS= $\frac{S}{Y}$ = $\frac{800}{1000}$ = 0.8

(ii) When S = 450 and Y = 1,200; APS= $\frac{S}{Y}$ = 450/1200= = 0.375

2.4 THE TWO-SECTOR MODEL OF NATIONAL INCOME DETERMINATION

In this section, we shall describe the two-sector model of determination of equilibrium levels of output and income in its formal form using the aggregate demand function and the aggregate supply function. We shall also have a brief discussion on the leakages – Injections model is alternatively known as the saving-investment model. The equilibrium level of income and output in the Keynesian framework is that level at which aggregate demand (C+ I) and aggregate supply (C + S) or output are equal. i.e.

$$C + I = C + S$$

or

$$I = S \qquad (2.9)$$

In a two sector economy, the aggregate demand (C+ I) refers to the total spending in the economy i.e. it is the sum of demand for the consumer goods (C) and investment goods (I) by households and firms respectively. In figure 1.2.4, the aggregate demand curve is linear and positively sloped indicating that as the level of national income rises, the aggregate demand (or aggregate spending) in the economy also rises. The aggregate expenditure line is flatter than the 45-degree line because, as income rises, consumption also increases, but by less than the increase in income.

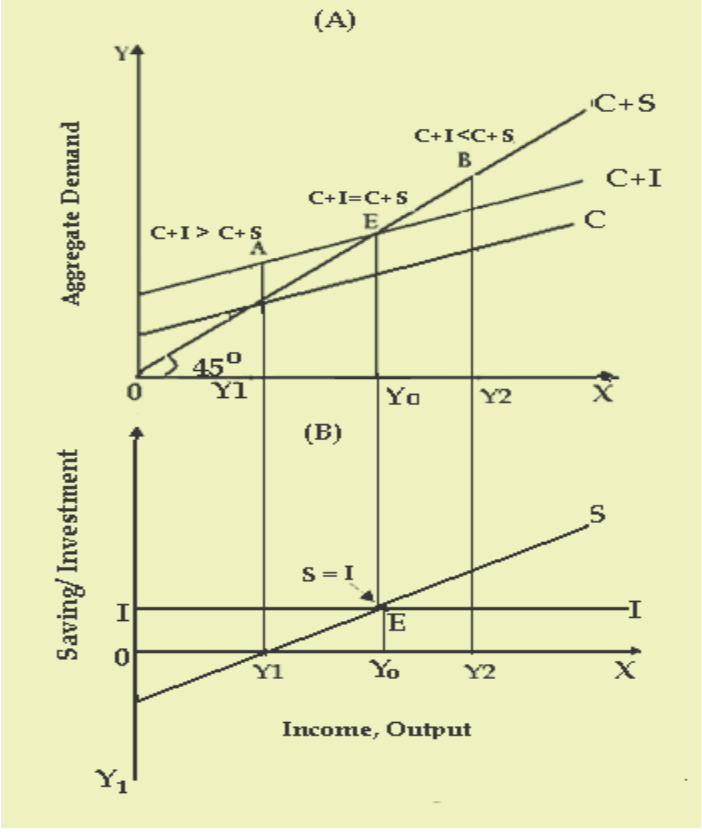
In the figure 1.2.4 below, the 45-degree line illustrates every single point at which planned aggregate expenditure, measured on the Y, or vertical axis, is equal to planned aggregate production, which is measured on the X, or horizontal axis.In other words, all points on the 45° line indicate that aggregate expenditure equal

aggregate output; i.e. (C+I) is equal to Y or (C+S). Therefore, the line maps out all possible equilibrium income levels.

For all points below the 45-degree line, planned aggregate expenditure is lesser than GDP and for all points above the 45-degree line; planned aggregate expenditure is greater than GDP. If an economy is operating on the 45-degree line, then the aggregate product market is in equilibrium.Ideally, we would like equilibrium to occur at potential GDP i.e. at the level of full employment. Only at point E and at the corresponding equilibrium levels of income and output Y_O does aggregate demand exactly equals output. At that level of output and income, planned spending precisely matches production.

Figure 1.2.4

Determination of Equilibrium Income: Two Sector Model



You may bear in mind the basic point that according to Keynes, aggregate demand will not always be equal to aggregate supply. Aggregate demand

depends on the households' plan to consume and to save. Aggregate supply depends on the producers' plan to produce goods and services. In other words, aggregate supply represents aggregate value expected by business firms and aggregate demand represents their realized value. The expectations of businessmen are realized only when aggregate expenditure equals aggregate income. For the aggregate demand and the aggregate supply to be equal so that equilibrium is established, the households' plan must coincide with producers' plan. At equilibrium, expected value equals realized value. However, Keynes held the view that that there is no reason to believe that:

(i) consumers' consumption plan always coincides with producers' production plan, and

(ii) that producers' plan to invest matches always with households plan to save.

Putting it differently, there is no reason for C + I and C + *S* to be always equal.

The figure above depicts the determination of equilibrium income. Income is measured along the horizontal axis and the components of aggregate demand, C and *I*, are measured along the vertical axis. The investment function (*I*) is shown in panel B of the figure, the (C+ I) or aggregate expenditure schedule which is obtained by adding the autonomous expenditure component namely investment to consumption spending at each level of income. Since the autonomous expenditure component (*I*) does not depend directly on income, the (C+I) schedule lies above the consumption function by a constant amount. Equilibrium level of income is such that aggregate demand equals output (which in turn equals income). Only at point E and at the corresponding equilibrium levels of income and output (Y_0), does aggregate demand exactly equals output. At that level of output and income, planned spending precisely matches production. Once national income is determined, it will remain stable in the short run.As long as the economy is operating at less than its full-employment capacity, producers will produce any output along the 45-degree line that they believe purchasers will buy.

Our understanding of the equilibrium level of income would be better if we find out why the other points on the graph are not points of equilibrium. For example, consider a level of income below Y_0, for example Y_1, generates consumption as shown along the consumption function. When this level of consumption is added to the autonomous investment expenditure (I), the aggregate demand exceeds income; i.e. the (C + I) schedule is above the 45° line. Equivalently, at all those levels,' *I*' is greater than S, as can be seen in panel (B) of

the figure 1.2.4. The aggregate expenditures exceed aggregate output. Excess demand makes businesses to sell more than what they currently produce. The unexpected sales would draw down inventories and result in less inventory investment than business firms planned. They will react by hiring more workers and expanding production. This will increase the nation's aggregate income. It also follows that with demand outstripping production, desired investment will exceed actual investment.

Conversely, at levels of income above Y_0, for example at Y_2, output exceeds demand (the 45° line is above the C +*I* schedule). The planned expenditures on goods and services are less than what business firms thought they would be; business firms would be unable to sell as much of their current output as they had expected. In fact, they have unintentionally made larger inventory investments than what they planned and their actual inventories would increase. Therefore, there will be a tendency for output to fall. This process continues till output reaches Y_0, at which current production exactly matches planned aggregate spending and unintended inventory shortfall or accumulation are therefore equal to zero. At this point, consumers' plan matches with producers' plan and savers' plan matches with investors' plan. Consequently, there is no tendency for output to change.

Since C + S = Y, the national income equilibrium can be written as:

$$Y = C + I \qquad (2.10)$$

Since at equilibrium C = $a + b$ Y, and I is constant at $\bar{I}$. By substituting a+ bY for C and $\bar{I}$ for I in Y= C + I, the equilibrium level of national income can be expressed as:

$$Y = C + I$$

$$Y = a + bY + \bar{I}$$

$$Y - bY = a + \bar{I}$$

$$Y(1-b) = a + \bar{I}$$

$$Y = \frac{a+\bar{I}}{1-bY} = \frac{1}{1-b}(a+\bar{I}); \text{ and}$$

$$C = a + bY$$

$$C = a + b\left[\frac{1}{1-b}\right](a + \bar{I})$$

$$C = a + \frac{b}{1-b}(a + \bar{I})$$

Now, we shall move to the leakages –injections approach or the savings and investment approach. In a two-sector circular flow model, we now introduce financial markets and savings and investment which they facilitate. A leakage is referred to as an outflow of income from the circular flow model. Leakages are that part of the income which is not used to purchase goods and services or what households withdraw from the circular flow. The act of saving by households is called a leakage from the circular flow model because the income is not spent on goods and services produced by firms, and it will reduce the velocity of the circular flow. An injection is an inflow of income to the circular flow. Due to an injection of income in the circular flow, the volume of income increases. Investment is an injection into the circular flow.The circular flow will be balanced and therefore in equilibrium when the injections are equal to the leakages. If at any time, intended saving is greater than intended investment, this would mean that people are spending lesser volume of money on consumption. As a result, the inventories of goods will pile up. Consequently, the firms would decrease their production which would lead to a fall in output and income of the household. If the leakages are greater than the injections, then national income will fall, while if injections are greater than leakages, national income will rise. The national income will be in equilibrium only when intended saving is equal to intended investment.

The equality between saving and investment can be seen directly from the identities in national income accounting. Since income is either spent or saved, Y = C + S. Without government and foreign trade, aggregate demand equals consumption plus investment, Y = C + I. Putting the two together, we have $C + S = C + I$, or $S = I$.This last equation indicates that equilibrium can be achieved by equating injections I with leakages S.

The saving schedule S slopes upward because saving varies positively with income. In equilibrium, planned investment equals saving. Therefore,

corresponding to this income, the saving schedule *(S)* intersects the horizontal investment schedule (I). This intersection is shown in panel (B) of figure 1.2.4.

Without government and foreign trade, the vertical distance between the aggregate demand (C+I) and consumption line (C) in the figure is equal to planned investment spending, I. You may also find that the vertical distance between the consumption schedule and the 45° line also measures saving (S = Y-C) at each level of income. Equilibrium is found at the intersection of the saving line and the investment line. At the equilibrium level of income (at point E in panel B), the two vertical distances are equal. Thus, at the equilibrium level of income, ex ante saving equals ex ante investment. By contrast, above the equilibrium level of income, Yo, saving (the distance between 45° line and the consumption schedule) exceeds planned investment, while below Yo level of income, planned investment exceeds saving. If there is any deviation from equilibrium, i.e. planned saving is not equal to planned investment, the process of readjustment will bring the economy back to equilibrium.

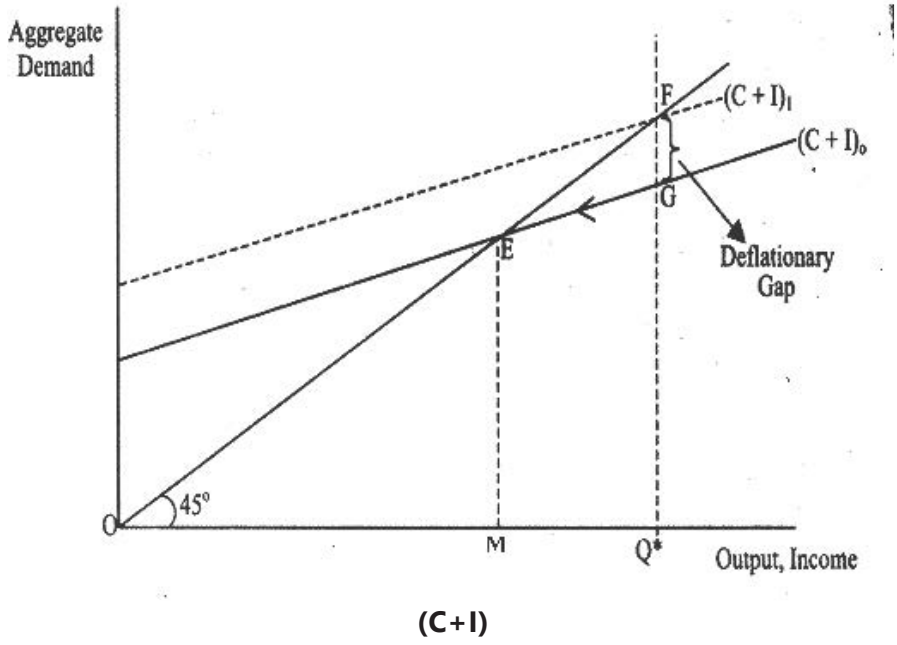
2.4.1 Equilibrium with Unemployment or Inflation

An important point to remember is that Keynesian equilibrium with equality of planned aggregate expenditures and output need not take place at full employment. If the aggregate expenditure line intersects the 45-degree line at the level of potential GDP, then there is full employment equilibrium. There is no recession, and unemployment is at the natural rate. But there is no guarantee that the equilibrium will occur at the potential GDP level of output. The economy can settle at any equilibrium which might be higher or lower than the full employment equilibrium.

(i) Deflationary Gap

If the aggregate demand is for an amount of output less than the full employment level of output, then we say there is deficient demand. Deficient demand gives rise to a 'deflationary gap' or 'recessionary gap'. Recessionary gap also known as 'contractionary gap' arises in the Keynesian model of the macro economy when the equilibrium level of aggregate production achieved in the short-run falls short of what could be produced at full employment. Recessionary gap occurs when the economy is in a business-cycle contraction or recession.

Figure 1.2.5
Deficient Demand - Deflationary Gap



In figure 1.2.5, OQ* is the full employment level of output. For the economy to be at full employment equilibrium, aggregate demand should be Q*F. If the aggregate demand is Q*G, it represents a situation of deficient demand. The resulting deflationary gap is FG. Firms will experience unplanned build-up of inventories of unsold goods and they will respond by cutting production and employment leading to decrease in output and income until the under-employment equilibrium is reached at E.

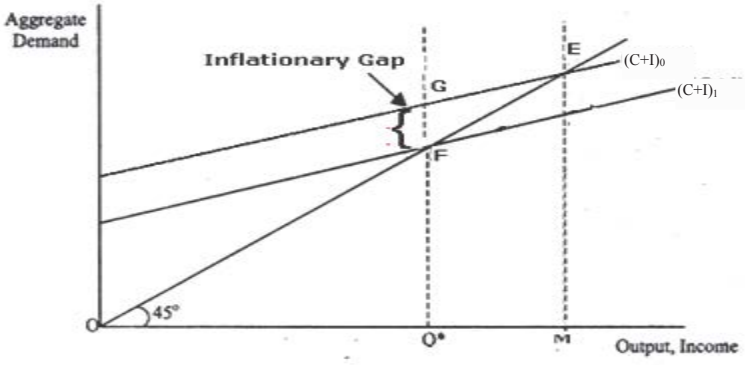
Deflationary gap is thus a measure of the extent of deficiency of aggregate demand and it causes the economy's income, output and employment to decline, thus pushing the economy to under- employment equilibrium. The macro-equilibrium occurs at a level of GDP less than potential GDP; thus, there is cyclical unemployment i.e. rate of unemployment is higher than the natural rate. (Demand deficient unemployment is the same as cyclical unemployment)

(ii) Inflationary Gap

If the aggregate demand is for an amount of output greater than the full employment level of output, then we say there is excess demand. Excess demand gives rise to 'inflationary gap' which is the amount by which actual aggregate

demand exceeds the level of aggregate demand required to establish the full employment equilibrium. This is the sort of gap that tends to occur during a business-cycle expansion and sets in motion forces that will cause demand pull inflation.

Figure 1.2.6
Excess Demand - Inflationary Gap



In figure 1.2.6, the economy will be at full employment equilibrium at F with OQ* full employment level of output and income. Suppose the aggregate demand is for Q*G, there is excess demand and the resulting inflationary gap FG. The real output will be constant, but the rise in the price level will cause an increase in the nominal output until the new equilibrium is reached at point E. Point E is an equilibrium point because the aggregate demand ME is equal to output OM. At the new equilibrium, real output, real income and employment will be the same; nominal output and income has increased due to inflation.

In the Keynesian model, neither wages nor interest rates will decline in the face of abnormally high unemployment and excess capacity. Therefore, output will remain at less than the full employment rate as long as there is insufficient spending in the economy. Keynes argued that this was precisely what was happening during the Great Depression.

Numerical Illustrations

Illustration 2

Calculate marginal propensity to consume and marginal propensity to save from the following data about an economy which is in equilibrium:

National income = 2500, Autonomous consumption expenditure = 300, Investment expenditure = 100

Solution

$Y = C + I$

By putting the value we get, $2500 = C + 100$

$C = 2500 - 100 = 2400$

$C = \bar{C} + bY$

$2400 = 300 + 2500\,b$

$2400 - 300 = 2500b$

$b = 0.84$; $MPS = 1 - MPC = 1 - 0.84 = 0.16$

Illustration 3

An economy is in equilibrium. Calculate national income from the following-

Autonomous consumption = 100; Marginal propensity to save= 0.2; Investment expenditure= 200

Solution

$Y = C + I$

$Y = \bar{C} + MPC\,(Y) + I$ where $MPC = 1 - MPS$

$Y = 100 + 0.8Y + 200 = 300 + 0.8Y$

$Y - 0.8Y = 300$

$0.2Y = 300$,

$Y = 1500$

Illustration 4

Suppose the consumption of an economy is given by $C = 20 + 0.6\,Y$ and investment $I = 10 + 0.2\,Y$. What will be the equilibrium level of National Income?

Solution

$Y = C + I = 20 + 0.6\,Y + 10 + 0.2\,Y$

$Y = 30 + 0.8\,Y$

$Y - 0.8\,Y = 30$

$Y = 150$

Illustration 5

Suppose the consumption function C= 7+ 0.5Y, Investment is ₹ 100, Find out equilibrium level of Income, consumption and saving?

Solution

Equilibrium Condition–

Y= C +I, Given C= 7+0.5Y and I= 100

Therefore Y= 7+0.5Y+ 100

Y- 0.5Y= 107

Y= $\frac{107}{0.5}$ = 214

Y= C+I

214= C+100

C=114

S= Y- C =100

Illustration 6

If the consumption function is C= 250 + 0.80 Y and I = 300. Find out equilibrium level of Y, C and S?

Solution

Y= $\frac{1}{1-b}$ (a+ $\bar{I}$)or Y = C+ I

Y**=** $\frac{1}{1-.80}(250+300)$ **= 2750**

C = a + $\frac{b}{1-b}$ (a+ $\bar{I}$)or C= 250 + 0.80 Y

C = 250**+0.8(2750**) **C = 2450**

S = Y-C where C = a+ bY

S = Y- (a + bY)

S= -a + (1- b) Y
= - 250 + (1 – 0.80)2750= 300

Or directly,

S=Y- C

S=2750 – 2450= 300.

Illustration 7

If saving function S = -10 + 0.2Y and autonomous investment I = 50 Crores. Find out the equilibrium level of income, consumption and if investment increases permanently by ₹ 5 Crores, what will be the new level of income and consumption?

Solution

S= I

-10 + 0.2Y = 50

0.2Y = 50+ 10

Y = 300 Crores

C= Y- S

Where S= -10 + 0.2 (300) = 50

C= 300-50 = 250 Crores

With the increase in investment by ₹ 5 Crores, the new investment will become equal to ₹ 55 Crores.

S= I

-10 + 0.2Y = 55

Y= 325 Crores

C= 270 Crores

Illustration 8

Given the empirical consumption function C= 100+0.75Y and I = 1000, calculate equilibrium level of national income. What would be the consumption expenditure at equilibrium level national income?

Solution

C= 100+0.75Y and I = 1000,

Y=C+I in equilibrium

Y= 100+0.75 Y + 1000 =>Y $= \frac{I}{1-0.75}$ (100+1000)

$Y = \frac{I}{1-0.75}(1100) = 1/0.25(1100) = 4400.$

Y=C + I; C= 4400 – 1000 = 3400

We shall now examine the nature of shift in aggregate demand curve and its effect on equilibrium level of national income.

- Given the intercept, a steeper aggregate demand function—as would be implied by a higher marginal propensity to consume—implies a higher level of equilibrium income.
- For a given marginal propensity to consume, a higher level of autonomous spending implies a higher equilibrium level of income.

Therefore, it may be inferred that a change in aggregate spending will shift the equilibrium from one point to another and a shift in the equilibrium will change the level of national income. An increase in aggregate spending makes the aggregate demand schedule shift upward. As a result, the equilibrium point would shift upward along the *AS* schedule causing an increase in the national income. Likewise, a fall in the aggregate spending causes a fall in the national income. This relationship between the aggregate spending and the national income is simple and straightforward.

The proposition put forth above tells us only the direction of change in the national income resulting from the change in the aggregate demand. It does not quantify the relationship between the two variables, i.e.; it does not tell us the magnitude of change in national income due to a given change in aggregate spending. The theory of investment multiplier provides answer to the above problem.

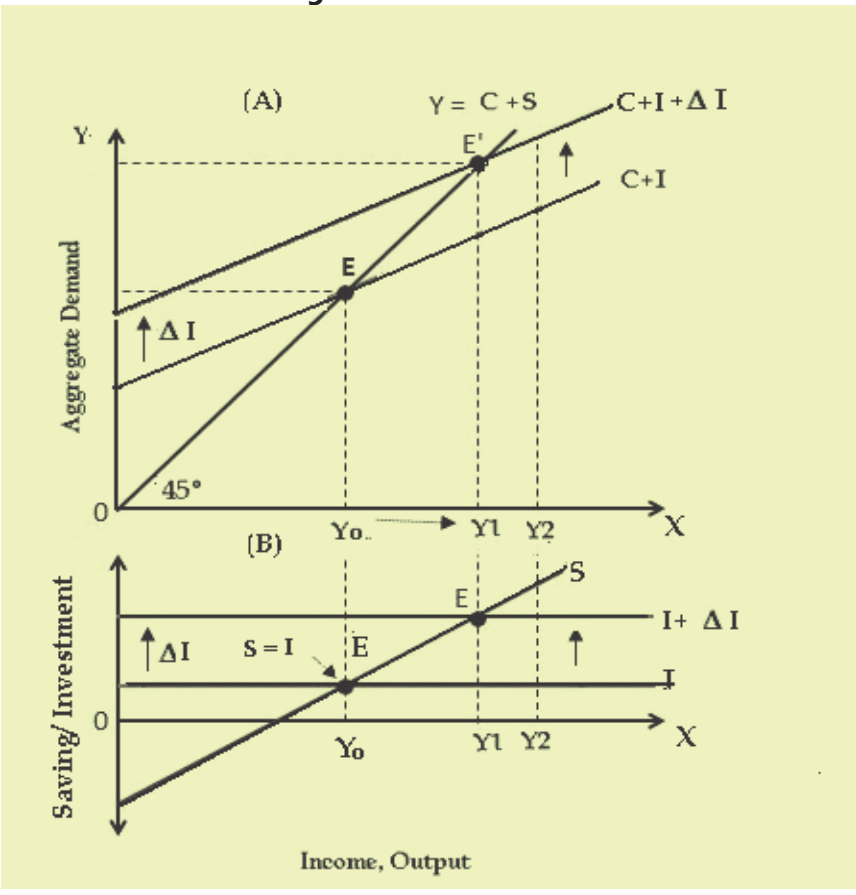
We will first graphically illustrate the change in the aggregate spending and the shift in the equilibrium. It will be followed by a simple model of the multiplier. We will finally discuss the limitations of the multiplier.

2.5 THE INVESTMENT MULTIPLIER

In our two-sector model, a change in aggregate demand may be caused by change in consumption expenditure or in business investment or in both. Since consumption expenditure is a stable function of income, changes in income are primarily from changes in the autonomous components of aggregate demand, especially from changes in the unstable investment component. We shall now examine the effect of an increase in investment (upward shift in the investment

schedule) causing an upward shift in the aggregate demand function. But before this, let us know about the investment multiplier. It is a process of multiple increases in equilibrium income due to increase in investment and how much increase occurs depends upon the marginal propensity to consume. The process of increase in national income due to increase in investment is illustrated below.

Figure 1.2.7
Effect of Changes in Autonomous Investment



In the figure 1.2.7, an increase in autonomous investment by ΔI shifts the aggregate demand schedule from C+I to C+I+ΔI. Correspondingly, the equilibrium shifts from E to $E^1$and the equilibrium income increases more than proportionately from Yo to Y_1. Why and how does this happen? This occurs due to the operation of the investment multiplier.

Multiplier refers to the phenomenon whereby a change in an injection of expenditure will lead to a proportionately larger change (or multiple changes) in

the equilibrium level of national income. The investment multiplier explains how many times the equilibrium aggregate income increases as a result of an increase in autonomous investment. When the level of investment increases by an amount say ΔI, the equilibrium level of income will increase by some multiple amounts, ΔY. The ratio of ΔY to ΔI is called the investment multiplier, k.

$$k = \frac{\Delta Y}{\Delta I} \qquad (2.11)$$

The size of the multiplier effect is given by $\Delta Y = k \Delta I$.

For example, if a change in investment of ₹ 2000 million causes a change in national income of ₹ 6000 million, then the multiplier is 6000/2000 =3. Thus multiplier indicates the change in equilibrium national income for each rupee change in the desired autonomous investment. The value 3 in the above example tells us that for every ₹ 1 increase in desired autonomous investment expenditure, there will be ₹ 3 increase in equilibrium national income. Multiplier, therefore, expresses the relationship between an initial increment in autonomous investment and the resulting increase in equilibrium aggregate income. Since the increase in national income (ΔY) is the result of increase in investment (ΔI), the multiplier is called 'investment multiplier.'

The process behind the multiplier can be compared to the 'ripple effect' of water. Let us assume that the initial disturbance comes from a change in autonomous investment (ΔI) of 500 units. The economy being in equilibrium, an upward shift in aggregate demand leads to an increase in national income which in a two sector economy will be, by definition, distributed as factor incomes. There will be an equal increase in disposable income. Firms experience increased demand and as a response, their output increases. Assuming that MPC is 0.80, consumption expenditure increases by 400, resulting in increase in production. The process does not stop here; it will generate a second-round of increase in income. The process further continues as an autonomous rise in investment leads to induced increases in consumer demand as income increases.

We find at the end that the increase in equilibrium income per rupee increase in investment is:

$$\frac{\Delta Y}{\Delta I} = \frac{1}{1-MPC} = \frac{1}{MPS} \qquad (2.12)$$

From the above, we find that the marginal propensity to consume (MPC) is the determinant of the value of the multiplier and that there exists a direct relationship between MPC and the value of multiplier. Higher the MPC more will be the value of the multiplier, and vice-versa. On the contrary, higher the MPS, lower will be the value of multiplier and vice-versa. The maximum value of multiplier is infinity when the value of MPC is 1 i.e. the economy decides to consume the whole of its additional income. We conclude that the value of the multiplier is the reciprocal of MPS.

For example, if the value of MPC is 0.75, then the value of the multiplier as per (2.11) is:

$$\frac{1}{1-MPC} = \frac{1}{0.25} = 4$$

The multiplier concept is central to Keynes's theory because it explains how shifts in investment caused by changes in business expectations set off a process that causes not only investment but also consumption to vary. The multiplier shows how shocks to one sector are transmitted throughout the economy.

Increase in income due to increase in initial investment, does not go on endlessly. The process of income propagation slows down and ultimately comes to a halt. Causes responsible for the decline in income are called leakages. Income that is not spent on currently produced consumption goods and services may be regarded as having leaked out of income stream. If the increased income goes out of the cycle of consumption expenditure, there is a leakage from income stream which reduces the effect of multiplier. The more powerful these leakages are the smaller will be the value of multiplier. The leakages are caused due to:

1. progressive rates of taxation which result in no appreciable increase in consumption despite increase in income
2. high liquidity preference and idle saving or holding of cash balances and an equivalent fall in marginal propensity to consume
3. increased demand for consumer goods being met out of the existing stocks or through imports
4. additional income spent on purchasing existing wealth or purchase of government securities and shares from shareholders or bond holders

5. undistributed profits of corporations
6. part of increment in income used for payment of debts
7. case of full employment additional investment will only lead to inflation, and
8. scarcity of goods and services despite having high MPC

The MPC, on which the multiplier effect of increase in income depends, is high in under developed countries; but ironically the value of multiplier is low. Due to structural inadequacies, increase in consumption expenditure is not generally accompanied by increase in production. E.g. increased demand for industrial goods consequent on increased income does not lead to increase in their real output; rather prices tend to rise.

An important element of Keynesian models is that they relate to short-period equilibrium and contain no dynamic elements. There is nothing like Keynesian macro-economic dynamics. When a shock occurs, for example when there is a change in autonomous investment due to change in some variable, one equilibrium position can be compared with another as a matter of comparative statics. There is no link between one period and the next and no provision is made for an analysis of processes through time.

Numerical Illustrations

Illustration 9

In an economy investment expenditure is increased by ₹ 400 Crores and marginal propensity to consume is 0.8. Calculate the total increase in income and saving.

Solution

MPC = 0.8; ΔI = 400 Crores

Multiplier (K)= 1 /1- MPC = 1 /1- 0.8 =1/ 0.2= 5

MPS= 1 - MPC = 1 – 0.8 = 0.2

Increase in income (ΔY) = K $\times \Delta I$ = 5 × 400=2,000 Crores

Increase in saving= ΔY × MPS = 2,000 × 0.2 = 400Crores

Illustration 10

An increase in investment by 400 Crores leads to increase in national income by 1,600 Crores. Calculate marginal propensity to consume.

Solution

Increase in investment (ΔI) = 400 Crores

Increase in national income (Δ Y) = 1,600 Crores

Multiplier (K) =ΔY/ΔI = K= 1,600/ 400 = 4

We know, K= 1 /1 –MPC

4= 1 /1 -MPC

⇨ MPC= 0.75

Illustration 11

In an economy, investment is increased by Rs 600 Crores. If the marginal propensity to consume is 0.6, calculate the total increase in income and consumption expenditure.

Solution

MPC = 0.6; ΔI = ₹ 600 Crores

Multiplier (K) = 1/ 1- MPC = 1/ 1 – 0.6 = 1/ 0.4 =25.

Increase in income (ΔY) = K × ΔI = 2.5 × Rs 600 Crores= Rs1,500 Crores

Increase in consumption (ΔC) =ΔY × MPC = Rs1, 500Crores × 0.6 = ₹ 900 Crores.

Illustration 12

Suppose in a country investment increases by ₹ 100 Crores and consumption is given by C = 10 + 0.6Y (where C = consumption and Y = income). How much increases will there take place in income?

Solution

Multiplier = k = $\frac{1}{1-MPC}$ k = $\frac{1}{1-0.6}$ = 2.5

Substituting the value of k and ΔI value in ΔY= kΔI

ΔY= 2.5 × 100= ₹ 250Crores

Thus, increase in investment by Rs 100 Crores will cause equilibrium income to rise by ₹ 250 Crores.

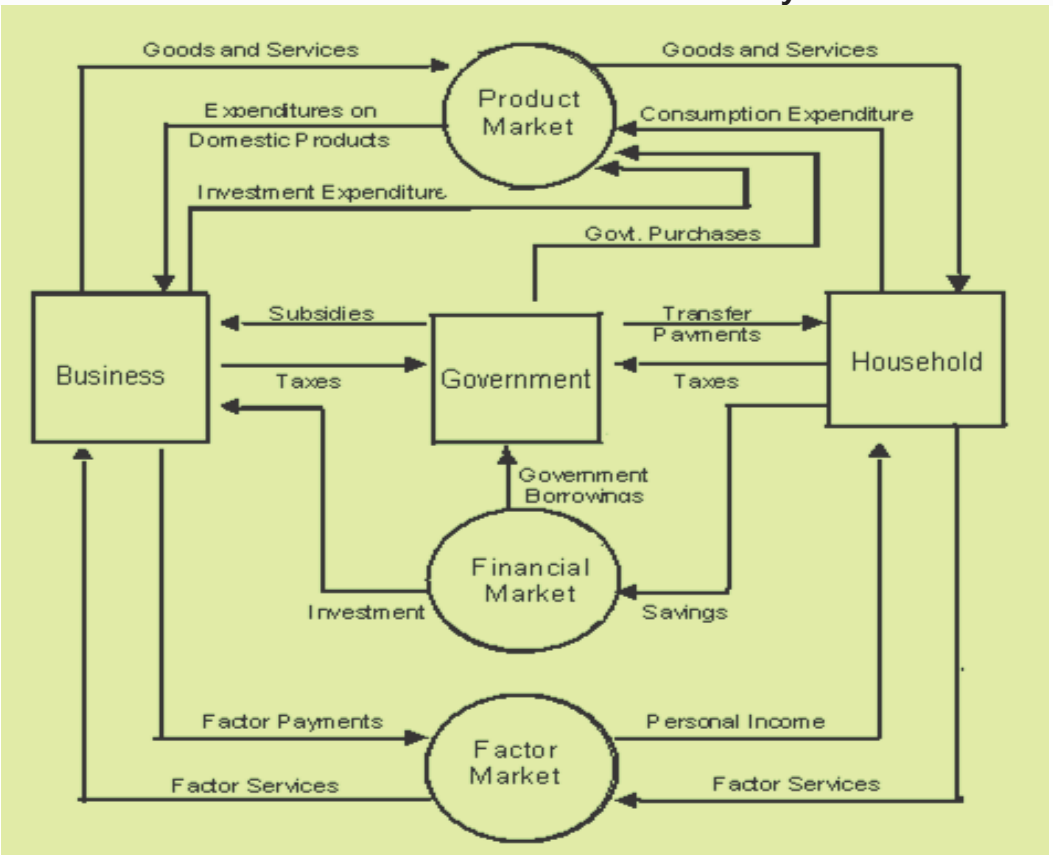
2.6 DETERMINATION OF EQUILIBRIUM INCOME: THREE SECTOR MODEL

Aggregate demand in the three sector model of closed economy (neglecting foreign trade) consists of three components namely, household consumption(C), desired business investment demand(I) and the government sector's demand for goods and services(G). Thus in equilibrium, we have

$$Y = C+I+G \qquad (2.13)$$

Since there is no foreign sector, GDP and national income are equal. As prices are assumed to be fixed, all variables are real variables and all changes are in real terms. To help interpret these conditions, we turn to the flowchart below. Each of the variables in the model is a flow variable.

Figure 1.2.8
Circular Flow in a Three Sector Economy



The three-sector, three-market circular flow model which accounts for government intervention highlights the role played by the government sector. From the above flow chart, we can find that the government sector adds the following key flows to the model:

i) Taxes on households and business sector to fund government purchases

ii) Transfer payments to household sector and subsidy payments to the business sector

iii) Government purchases goods and services from business sector and factors of production from household sector, and

iv) Government borrowing in financial markets to finance the deficits occurring when taxes fall short of government purchases

However, unlike in the two sector model, the whole of national income does not return directly to the firms as demand for output. There are two flows out of the household sector in addition to consumption expenditure namely, saving flow and the flow of tax payments to the government. These are actually leakages. The saving leakage flows into financial markets, which means that the part of that is saved is held in the form of some financial asset (currency, bank deposits, bonds, equities, etc.). The tax flow goes to the government sector. The leakages which occur in household sector do not necessarily mean that the total demand must fall short of output. There are additional demands for output on the part of the business sector itself for investment and from the government sector. In terms of the circular flow, these are injections. The investment injection is shown as a flow from financial markets to the business sector. The purchasers of the investment goods, typically financed by borrowing, are actually the firms in the business sector themselves. Thus, the amount of investment in terms of money represents an equivalent flow of funds lent to the business sector.

The three-sector Keynesian model is commonly constructed assuming that government purchases are autonomous. This is not a realistic assumption, but it will simplify our analysis. Determination of income can also be explained with the help of aggregate demand and aggregate supply (figure 1.2.9)

$$AD = C + I + G$$

$$AS = C + S + T$$

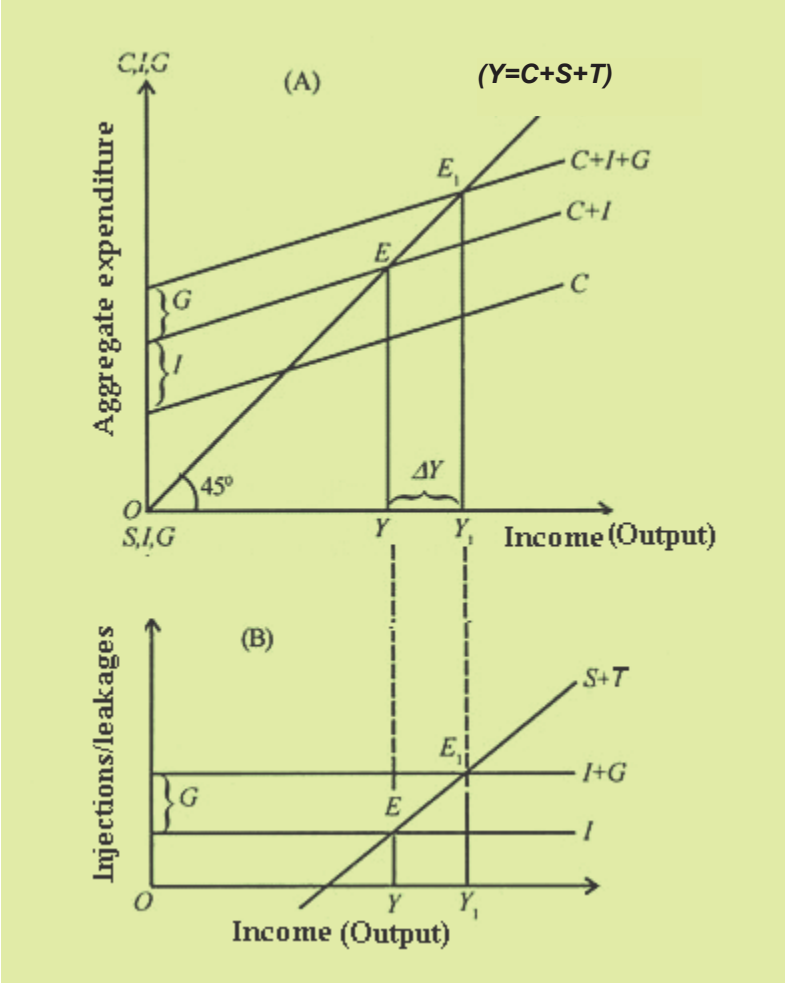
The equilibrium national income is determined at a point where both aggregate demand and aggregate supply are equal, that is,

AD = Y = AS

C + I+ G =Y= C + S+ T

Figure 1.2.9

Determination of Equilibrium Income: Three Sector Model



The variables measured on the vertical axis are C, I and G. The autonomous expenditure components namely, investment and government spending do not directly depend on income and are exogenous variables determined by factors outside the model. You may observe that in panel B of the figure 1.2.9, the lines that plot these autonomous expenditure components are horizontal as their level

does not depend on Y. Therefore, C + I + G schedule lies above the consumption function by a constant amount.

The line S + T in the graph plots the value of savings plus taxes. This schedule slopes upwards because saving varies positively with income. Just as government spending, level of tax receipts (T) is decided by policy makers.

The equilibrium level of income is shown at the point E_1 where the (C + I + G) schedule crosses the 45° line, and aggregate demand is therefore equal to income (Y). In equilibrium, it is also true that the (S + T) schedule intersects the (I + G) horizontal schedule.

We shall now see why other points on the graph are not points of equilibrium. Consider a level of income below YI. We find that it generates consumption as shown along the consumption function. When this level of consumption is added to the autonomous expenditures (I + G), aggregate demand exceeds income; the (C + I + G) schedule is above the 45° line. Equivalently at this point I + G is greater than S + T, as can be seen in panel B of the figure 1.2.9. With demand outstripping production, desired investments will exceed actual investment and there will be an unintended inventory shortfall and therefore a tendency for output to rise. Conversely, at levels of income above Y_1, output will exceed demand; people are not willing to buy all that is produced. Excess inventories will accumulate, leading businesses to reduce their future production. Employment will subsequently decline and output will fall back to the equilibrium level. It is only at YI that output is equal to aggregate demand; there is no unintended inventory shortfall or accumulation and, consequently, no tendency for output to change. An important thing to note is that the change in total spending, followed by changes in output and employment, is what will restore equilibrium in the Keynesian model, not changes in prices.

2 .6.1 The Government Sector and Income Determination

We have seen above that the government influences the level of income through taxes, transfer payments, government purchases and government borrowing. A comprehensive discussion on the effect of government fiscal policy is beyond the scope of this unit; and therefore, we shall look into a few variables.

(i) Income Determination with Lump Sum Tax

We assume that the government imposes lump sum tax, i.e. taxes that do not depend on income, has a balanced budget (G=T) and also that there are no transfer payments. The consumption function is defined as –

$C = a + b\,Y_d$

Where $Y_d = Y - T$ (disposable income), T = lump sum tax

$Y = a + b\,(Y - T) + I + G$

$$Y = \frac{1}{1-b}(a - bT + I + G)$$

Numerical Illustrations

Illustration 13

Suppose we have the following data about a simple economy**:**

$C = 10 + 0.75Y_d$, $I = 50$, $G = T = 20$where C is consumption, I is investment, Y_d is disposable income, G is government expenditure and T is tax.

(a) Find out the equilibrium level of national income.

(b) What is the size of the multiplier?

Solution

(a) Since G = T, budget of the government is balanced

Substituting the values of C, I and G in Y we have

$Y=C+I+G$

$Y = a + bY_d + I + G$

$Y= 10 + 0.75\,(Y - 20) + 50 + 20$

$Y= 10 + 0.75\,Y - 15 + 50 + 20$

or, $Y - 0.75\,Y = 65$

or, $Y\,(1 - 0.75) = 65$

or, $0.25\,Y = 65$

or, $Y = 65 / .25 = 260$

The equilibrium value of Y = 260

(b) The value of the multiplier is = 1/ (1 – MPC) = 1/ (1 – b) = 1/ (1 – 0.75) = 1/0.25 = 4

(ii) Income Determination with Lump Sum Tax and Transfer payments

The consumption function is defined as –

$$C = a + b\,Y_d$$

Where Y_d= Y- T+ TR where T is a lump sum tax and TR is autonomous transfer payments

C = a+ b (Y - T + TR)

Y= C+ I+ G

Y= a+ b (Y - T + TR) + I + G

Y= a +bY – bT +bTR + I + G

Y – bY= a – bT +bTR + I + G

Y(1-b)= a – bT +bTR + I + G

$$Y = \frac{1}{1-b}(a - bT + bTR + I + G)$$

Illustration 14

Suppose the structural model of an economy is given –

C = 100+ 0.75 Yd; I = 200, G = T = 100; TR= 50, find the equilibrium level of income?

Solution

Y= C+ I+ G

Y = 100+ 0.75 Yd + 200 + 100

Y= 100 + 0.75(Y– 100 + 50) + 200 + 100

Y = 100 + 0.75Y -75 + 37.5 +200 +100

Y = 1450

Or use $Y = \frac{1}{1-b}(a - bT + bTR + I + G)$ to calculate income.

(iii) Income Determination with tax as a function of Income

In (i) and (ii) above, we have analysed the effect of balanced budget with an autonomous lump sum tax. In reality, the tax system consists of both lump sum tax and proportional taxes. The tax function is defined as;

Tax function $T = \bar{T} + t\,Y$

Where $\bar{T}$ = autonomous constant tax

t = income tax rate

T = total tax

The consumption function is

$C = a + b\,Y_d$

Where $Y_d = Y - T$ or $Y - \bar{T} - t\,Y$

$C = a + b(Y - \bar{T} - t\,Y)$

Therefore, the equilibrium level of national income can be measured as-

$Y = C + I + G$

$Y = a + bYd + I + G$

$Y = a + b(Y - \bar{T} - tY) + I + G$

$Y = a + bY - b\bar{T} - b\,t\,Y + I + G$

$Y - bY + btY = a - b\bar{T} + I + G$

$Y(1 - b + bt) = a - b\bar{T} + I + G$

$$Y = \frac{1}{1-b(1-t)}(a - b\bar{T} + I + G)$$

Where $\frac{1}{1-b(1-t)}$ (represent the tax multiplier)

Illustration 15

For a closed economy, the following data is given –

Consumption C = 75 + 0.5 (Y-T); Investment I = 80; Total tax T = 25 + 0.1Y; Government expenditure G = 100.

(a) Find out equilibrium income?

(b) What is the value of multiplier?

Solution

a) $Y = C + I + G$

$Y = 75 + 0.5(Y - 25 - 0.1Y) + 80 + 100$

Y(1-0.5+0.05)= 75-12.5+80+100

Y= $\frac{1}{1-0.5+0.05}(242.5)$

Y= 440.91

b) Multiplier = $\frac{1}{1-b(1-t)}$ = 1/[1-0.5(1-0.1)] = 1.82

(iv) Income Determination with Tax (as a Function of Income), Government Expenditure and Transfer Payments

Here consumption function is written as C= a + b(Y- $\bar{T}$ -tY + TR)

Y= a + b(Y- $\bar{T}$ -tY + TR) + I + G

Y= $\frac{1}{1-b(1-t)}$ (a- b$\bar{T}$ +bTR + I + G)

Illustration 16

Suppose C= 100 + 0.80 (Y- T + TR); I = 200; T= 25+0.1Y; TR= 50; G = 100

Find out equilibrium level of Income?

Solution

Y = C + I + G

Y= 100 + 0.80 (Y- T + TR) + I+ G

Y=100 +0.80(Y – 25 - 0.1Y + 50) + 200 + 100

Y – 0.80 Y +0.08 Y = 420

Y(1-0.8+0.08) =420

Y= 1500

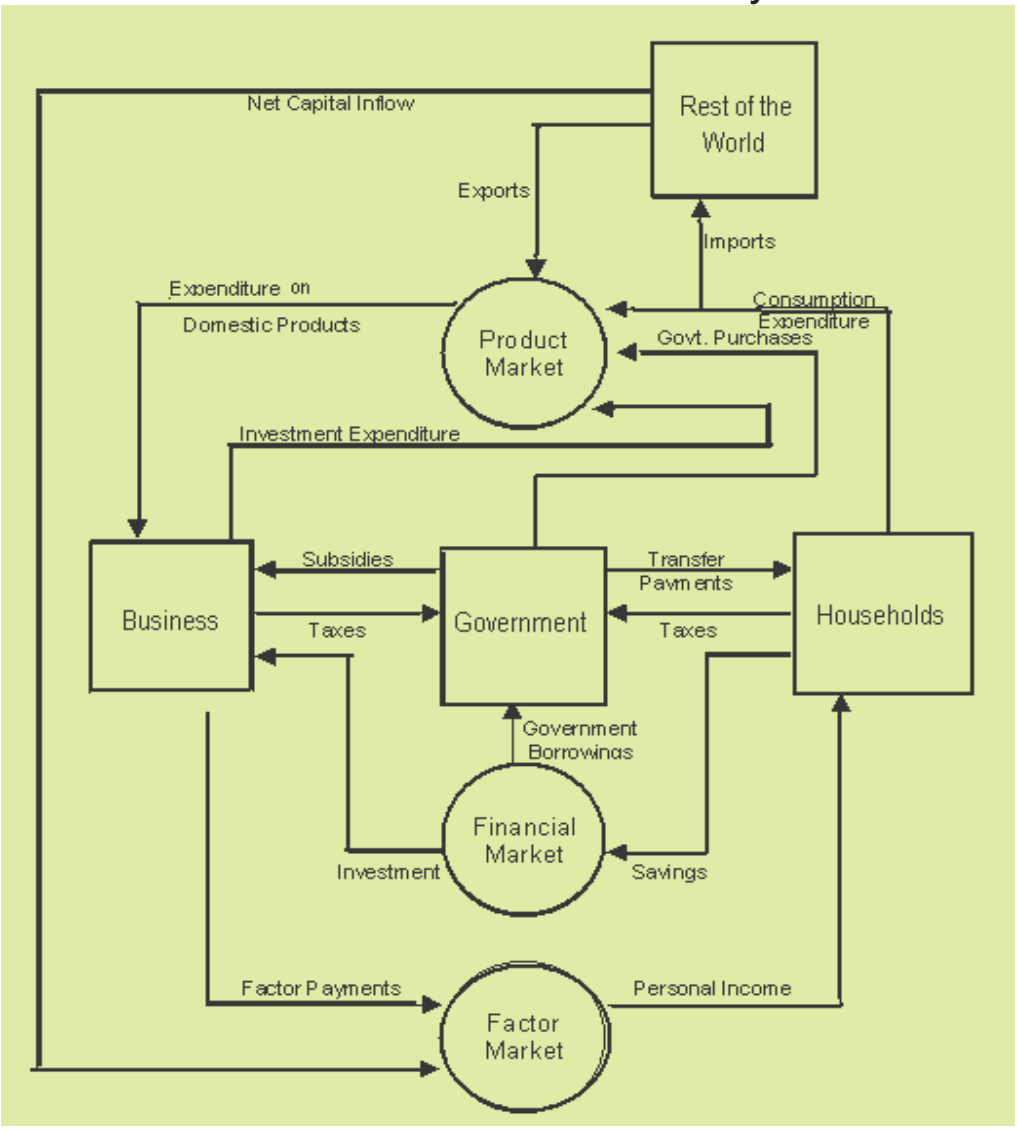
2.7 DETERMINATION OF EQUILIBRIUM INCOME: FOUR SECTOR MODEL

The four sector model includes all four macroeconomic sectors, the household sector, the business sector, the government sector, and the foreign sector. The foreign sector includes households, businesses, and governments that reside in

other countries. The following flowchart shows the circular flow in a four sector economy.

In the four sector model, there are three additional flows namely: exports, imports and net capital inflow which is the difference between capital outflow and capital inflow. The C+I+G+(X-M) line indicates the aggregate demand or the total planned expenditures of consumers, investors, governments and foreigners (net exports) at each income level.

Figure 1.2.10
Circular Flow in a Four Sector Economy



In equilibrium, we have

$$Y = C + I + G + (X-M) \qquad (2.14)$$

The domestic economy trades goods with the foreign sector through exports and imports. Exports are the injections in the national income, while imports act as leakages or outflows of national income. Exports represent foreign demand for domestic output and therefore, are part of aggregate demand. Since imports are not demands for domestic goods, we must subtract them from aggregate demand. The demand for imports has an autonomous component and is assumed to depend on income. Imports depend upon marginal propensity to import which is the increase in import demand per unit increase in GDP. The demand for exports depends on foreign income and is therefore exogenously determined and are autonomous. Imports are subtracted from exports to derive net exports, which is the foreign sector's contribution to aggregate expenditures. Since import has an autonomous component ($\bar{M}$) and is assumed to depend on income(Y) and marginal propensity to import (m), the import function is expressed as $M= \bar{M} + mY$. Marginal propensity to import $m = \Delta M/\Delta Y$ is assumed to be constant.

As noted above, the equilibrium level of national income is determined at the level at which the aggregate demand is equal to aggregate supply. As the aggregate demand in the four sector model is given in equation 2.14, the equilibrium condition is expressed as follows-

$$Y = C + I + G + (X - M)$$

$$\text{Where } C = a + b(Y-T)$$

$$M= \bar{M} + mY$$

The equilibrium level of National Income can now be expressed by –

$$Y = C + I + G + (X - M)$$

$$Y = a + b(Y - T) + I + G + X - \bar{M} - mY$$

$$Y - bY + mY = a - bT + I + G + X - \bar{M}$$

$$Y = \frac{1}{1-b+m}(a - bT + I + G + X - \bar{M})$$

The economy being in equilibrium, suppose export of country increases by ΔX autonomously, all other factors remaining constant. By incorporating the increase in exports by ΔX, the equilibrium equation of the country can be expressed as

$$Y + \Delta Y = \frac{1}{1-b+m}(a - b\,T + I + G + X - \bar{M} + \Delta X) \text{ or}$$

$$Y + \Delta Y = \frac{1}{1-b+m}(a - b\,T + I + G + X - \bar{M}) + \frac{1}{1-b+m}\Delta X$$

$$\text{As, } Y = \frac{1}{1-b+m}(a - b\,T + I + G + X - \bar{M})$$

$$\text{We get, } Y + \Delta Y = Y + \frac{1}{1-b+m}\Delta X$$

$$\text{Subtracting Y from both sides, we get } \Delta Y = \frac{1}{1-b+m}\Delta X$$

$$\text{By rearranging } \Delta Y = \frac{1}{1-b+m}\Delta X, \text{ we get}$$

$$\frac{\Delta Y}{\Delta X} = \frac{1}{1-b+m}$$

Or alternatively written as

$$\frac{\Delta Y}{\Delta X} = \frac{1}{1-(b-m)}$$

The term $\frac{1}{1-b+m}$ is known as foreign trade multiplier whose value is determined by marginal propensity to consume (b) and marginal propensity to import (m).

If in the model proportional income tax and government transfer payments are incorporated, then only the denominator of multiplier will change. If income tax is of form $T = \bar{T} + t\,Y$ where $\bar{T}$ is constant lump-sum, t is the proportion of income tax and TR > 0 and autonomous, then the four sector model can be expressed as: –

$$Y = C + I + G + (X - M)$$

$$\text{Where } C = a + b(Y - \bar{T} - t\,Y + TR)$$

$$M = \bar{M} + mY.$$

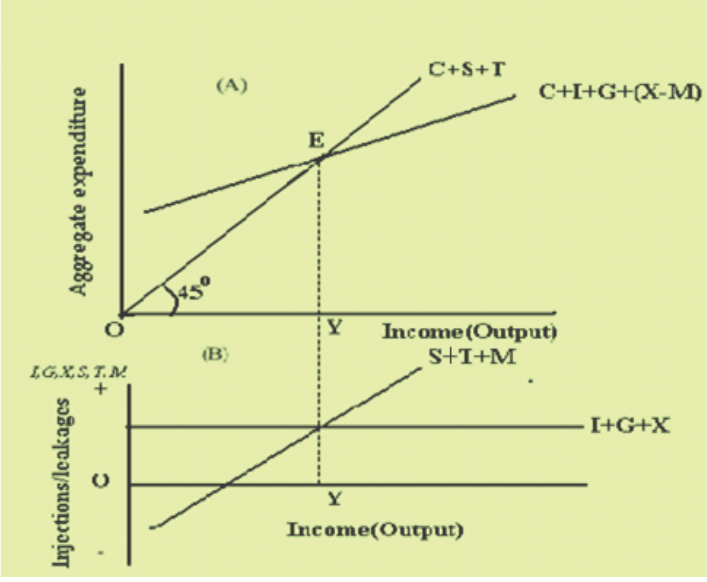
The equilibrium level of National Income can now be expressed as:

$$Y = \frac{1}{1-b(1-t)+m}(a - b\,\bar{T} + b\,TR + I + G + X - \bar{M})$$

With the help of figure 1.2.11, we shall explain income determination in the four sector model.

Figure 1.2.11

Determination of Equilibrium Income: Four Sector Model



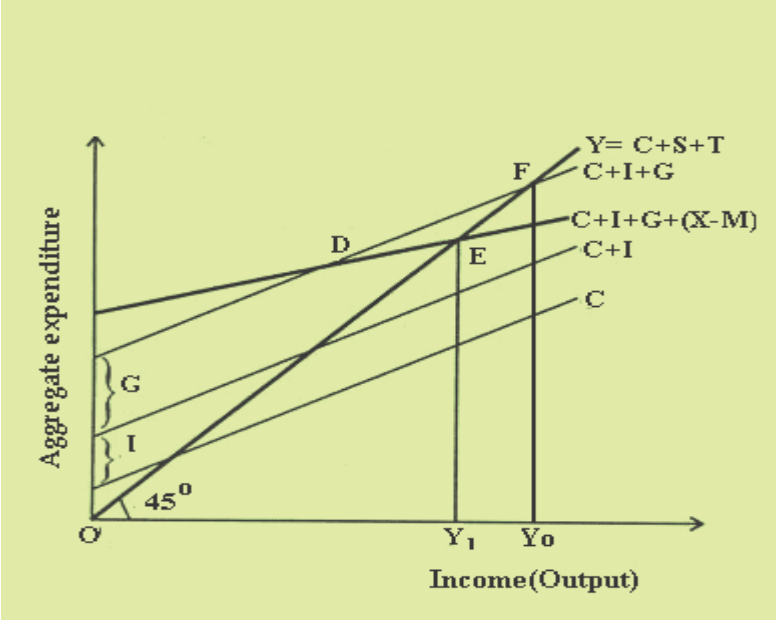
Equilibrium is identified as the intersection between the C + I + G + (X - M) line and the 45-degree line. The equilibrium income is Y. From panel B, we find that the leakages(S+T+M) are equal to injections (I+G+X) only at equilibrium level of income.

We have seen above that only net exports(X-M) are incorporated into the four sector model of income determination. We know that injections increase the level of income and leakages decrease it. Therefore, if net exports are positive (X > M), there is net injection and national income increases. Conversely, if X<M, there is net withdrawal and national income decreases. The figure 1.2.12 depicts a case of X<M.

We find that when the foreign sector is included in the model (assuming M > X), the aggregate demand schedule C+I+G shifts downward with equilibrium point shifting from F to E. The inclusion of foreign sector (with M > X) causes a reduction in national income from $Y_0$to Y_1. Nevertheless, when X > M, the aggregate demand schedule C+I+G shifts upward causing an increase in national income. Learners may infer diagrammatic expressions for possible changes in equilibrium income for X>M and X = M.

Figure 1.2.12

Effects on Income When Imports are Greater than Exports



We have seen in section 2.5 above that equilibrium income is expressed as a product of two terms: $\Delta Y = k\ \Delta I$; i.e. the level of autonomous investment expenditure and the investment multiplier. The autonomous expenditure multiplier in a four sector model includes the effects of foreign transactions and is stated as $\frac{1}{(1-b+m)}$ where 'm' is the propensity to import which is greater than zero. You may recall that the multiplier in a closed economy is $\frac{1}{(1-b)}$

The greater the value of 'm', the lower will be the autonomous expenditure multiplier. The more open an economy is to foreign trade, (the higher m is) the smaller will be the response of income to aggregate demand shocks, such as changes in government spending or autonomous changes in investment demand. A change in autonomous expenditures— for example, a change in investment spending,—will have a direct effect on income and an induced effect on consumption with a further effect on income. The higher the value of m, larger the proportion of this induced effect on demand for foreign, not domestic, consumer goods. Consequently, the induced effect on demand for domestic goods and, hence on domestic income will be smaller. The increase in imports per unit of income constitutes an additional leakage from the circular flow of (domestic)

income at each round of the multiplier process and reduces the value of the autonomous expenditure multiplier.

An increase in demand for exports of a country is an increase in aggregate demand for domestically produced output and will increase equilibrium income just as an increase in government spending or an autonomous increase in investment. In summary, an increase in the demand for a country's exports has an expansionary effect on equilibrium income, whereas an autonomous increase in imports has a contractionary effect on equilibrium income. However, this should not be interpreted to mean that exports are good and imports are harmful in their economic effects. Countries import goods that can be more efficiently produced abroad, and trade increases the overall efficiency of the worldwide allocation of resources. This forms the rationale for attempts to stimulate the domestic economy by promoting exports and restricting imports.

Numerical Illustration

Illustration 17

The consumption function is $C = 40 + 0.8Y_d$, $T = 0.1Y$, $I = 60$ Crores $G = 40$ Crores, $X = 58$ and $M = 0.05\ Y$. Find out equilibrium level of income, Net Export, net export if export were to increase by 6.25.

Solution

$C = 40 + 0.8Y_d$

$C = 40 + 0.8\ (Y - 0.1Y)$

$Y = C + I + G + (X - M)Y = 40+0.8(Y-0.1Y)+60+40+(58-0.05Y)$

$Y = 40+0.8(0.9Y)+60+40+58-0.05Y$

$Y-0.72Y+0.05Y = 198$

$Y(1-0.72+0.05) = 198$

$Y(0.33) = 198$

$Y = 198/0.33 = 600$ Crores

Net Export $= X-M = 58 - 0.05Y$

$58 - 0.05\ (600) = 58 - 30 = 28$

If exports increase by 6.25, then exports = 64.25

Then, $Y = 40 + 0.8\ (Y - 0.1Y) + 60 + 40 + (64.25 - 0.05Y)$

Y(1-0.72+0.05) = 204.5

Y(0.33) = 204.5

Y=204.5/0.33 = 619.697

Then import = .05 × 619.697= 30.98

Net Export= 64.25- 30.98= 33.27 Crores

Thus, there is surplus in balance of trade as Net Exports are positive.

Illustration 18

An economy is characterised by the following equation-

Consumption	$C = 60+0.9Y_d$
Investment	I = 10
Government expenditure	G = 10
Tax	T = 0
Exports	X = 20
Imports	M = 10 +0.05 Y

What is the equilibrium income?

Calculate trade balance and foreign trade multiplier.

Solution

Y = C + I+ G + (X – M)

= 60+0.9(Y – 0) + 10 +10 + (20- 10 -0.05Y)

= 60+ 0.9 Y +30 -0.05 Y

Y= 600

Trade Balance = X – M = 20-10-0.05(600)=- 20

Thus, trade balance in deficit.

Foreign trade multiplier= $\frac{1}{1-b+m} = \frac{1}{1-0.9+0.05}$ = 6.66

2.8 CONCLUSION

According to the Keynesian theory of income and employment, national income depends upon the aggregate effective demand. If the aggregate effective demand falls short of that output at which all those who are both able and willing to work are employed, it will result in unemployment in the economy. Consequently, there will be a gap between the economy's actual and optimum potential output. On the contrary, if the aggregate effective demand exceeds the economy's full employment output (production capacity), it will result in inflation. Nominal output will increase, but it simply reflects higher prices, rather than additional real output. It is not necessary that the equilibrium aggregate output will also be the full employment aggregate output. It is undesirable and a cause of great concern for the society and government if large number of people remains unemployed. In the absence of government policies to stabilize the economy, incomes will be unstable because of the instability of investment. Full employment could be maintained in a capitalist economy only if governments are willing to incur countercyclical budgetary deficits to offset the inbuilt tendency towards private over-saving. By making appropriate changes in government spending (G) and taxes, the government can counteract the effects of shifts in investment. Appropriate changes in fiscal policy by adjusting government expenditure and taxes could keep the autonomous expenditure constant even in the face of undesirable changes in the investment.

SUMMARY

- John Maynard Keynes in his masterpiece 'The General Theory of Employment Interest and Money' published in 1936 put forth a comprehensive theory to explain the determination of equilibrium aggregate income and output in an economy.
- The equilibrium analysis is best understood with a hypothetical simple two-sector economy which has only households and firms with all prices (including factor prices), supply of capital and technology constant; the total income produced *Y,* accrues to the households and equals their disposable personal income.
- The equilibrium output occurs when the desired amount of output demanded by all the agents in the economy exactly equals the amount produced in a given time period.

- In the two-sector economy aggregate demand (AD) or aggregate expenditure consists of only two components: aggregate demand for consumer goods and aggregate demand for investment goods, *I* being determined exogenously and constant in the short run.
- Consumption function expresses the functional relationship between aggregate consumption expenditure and aggregate disposable income, expressed as C = f (Y).The specific form consumption function, proposed by Keynes C = a + bY
- The value of the increment to consumer expenditure per unit of increment to income *(b)* is termed the Marginal Propensity to Consume (MPC).
- The Keynesian assumption is that consumption increases with an increase in disposable income ($b > 0$), but that the increase in consumption will be less than the increase in disposable income ($b < 1$).
- The propensity to consume refers to the proportion of the total and the marginal incomes which people spend on consumer goods and services.
- The proportion or fraction of the total income consumed is called 'average propensity to consume' *(APC)*= Total Consumption /Total Income
- Since $Y = C + S$, consumption and saving functions are counterparts of each other. The condition for national income equilibrium can thus be expressed as C + I = C + S
- Changes in income are primarily from changes in the autonomous components of aggregate demand, especially from changes in the unstable investment component.
- The investment multiplier k is defined as the ratio of change in national income (ΔY) due to change in investment (ΔI)
- The marginal propensity to consume (MPC) is the determinant of the value of the multiplier. The higher the marginal propensity to consume (MPC) the greater is the value of the multiplier.
- The more powerful the leakages are, the smaller will be the value of multiplier.
- Aggregate demand in the three sector model of closed economy (neglecting foreign trade) consists of three components namely, household consumption(C), desired business investment demand(I) and the government sector's demand for goods and services(G).

- The government sector imposes taxes on households and business sector,effects transfer payments to household sector and subsidy payments to the business sector, purchases goods and services and borrow from financial markets.
- In equilibrium, it is also true that the (S + T) schedule intersects the (I + G) horizontal schedule.
- Taxes act as leakage from the economic system. Thus, tax multiplier when, $T=\bar{T}-tY$, is $\frac{1}{1-b(1-t)} < \frac{1}{(1-b)}$
- The four sector model includes all four macroeconomic sectors, the household sector, the business sector, the government sector, and the foreign sector and in equilibrium, we have Y = C + I + G + (X-M)
- The domestic economy trades goods with the foreign sector through exports and imports.
- Imports are subtracted from exports to derive net exports, which is the foreign sector's contribution to aggregate expenditures. If net exports are positive (X > M), there is net injection and national income increases. Conversely, if X<M, there is net withdrawal and national income decreases.
- The autonomous expenditure multiplier in a four sector model includes the effects of foreign transactions and is stated as $\frac{1}{(1-b+m)}$ against $\frac{1}{(1-b)}$ in a closed economy.
- The greater the value of *m*, the lower will be the autonomous expenditure multiplier.
- An increase in the demand for exports of a country is an increase in aggregate demand for domestically produced output and will increase equilibrium income just as would an increase in government spending or an autonomous increase in investment.

TEST YOUR KNOWLEDGE

I Multiple Choice Questions

1. In the Keynesian model, equilibrium aggregate output is determined by
   (a) aggregate demand
   (b) consumption function
   (c) the national demand for labor
   (d) the price level
2. Keynes believed that an economy may attain equilibrium level of output
   (a) only at the full-employment level of output
   (b) below the full-employment level of output
   (c) only if prices were inflexible
   (d) a) and c) above
3. According to Keynes, consumption expenditure is determined by
   (a) the level of interest rates
   (b) extent of government taxes and subsidies
   (c) disposable income
   (d) autonomous investment expenditure
4. The marginal propensity to consume (MPC) can be defined as
   (a) a change in spending due to a change in income
   (b) a change in income that is saved after consumption
   (c) part of income that is spent on consumption.
   (d) part of income that is not saved.
5. If the consumption function is expressed as $C = a + bY$ then b represents
   (a) autonomous consumer expenditure when income is zero
   (b) the marginal propensity to consume.
   (c) the expenditure multiplier when consumption is increased
   (d) part of disposable income

6. If the consumption function is expressed as C = a + bY then a represents
   (a) autonomous consumer expenditure.
   (b) the marginal propensity to consume.
   (c) the consumption income relationship
   (d) Non- linear consumption function
7. If the consumption function is C = 20 + 0.5Yd, then an increase in disposable income by ` 100 will result in an increase in consumer expenditure by `----------
   (a) 25
   (b) 70
   (c) 50
   (d) 100
8. If the autonomous consumption equals ` 2,000 and the marginal propensity to consume equals 0.8. If disposable income equals ` 10,000, then total consumption will be ` ---------
   (a) 8,000
   (b) 6,000
   (c) 10,000
   (d) None of the above
9. In the Keynesian cross diagram, the point at which the aggregate demand function crosses the 45-degree line indicates the
   (a) level of full employment income.
   (b) less than full employment level of income.
   (c) equilibrium level of income which may or may not be full employment level of income
   (d) autonomous level of income which may not be full employment level of income
10. In a closed economy, aggregate demand is the sum of
   (a) consumer expenditure, demand for exports and government spending.

(b) consumer expenditure, planned investment spending and government spending.

(c) consumer expenditure, actual investment spending, government spending and net exports.

(d) consumer expenditure, planned investment spending, government spending, and net exports.

11. Under equation C= a+by, b=0.8, what is the value of 2 sector expenditure multiplier?

(a) 4

(b) 2

(c) 5

(d) 1

II Short Answer Type Questions

1. Define equilibrium output?
2. What are the components of aggregate expenditure in two sector economy?
3. Define consumption function?
4. Explain the concept of marginal propensity to consume?
5. Define average propensity to consume?
6. Distinguish between saving function and marginal propensity to save.
7. What is meant by autonomous expenditure?
8. What would happen if aggregate expenditures were to exceed the economy's production capacity?
9. Outline the relationship between marginal propensity to consume and multiplier.
10. What is the effect of income leakages on multiplier?
11. List out the components of aggregate demand in a three-sector economy?
12. What role does government play in a three-sector economy?
13. Define net exports?

14. How do imports affect investment multiplier?

15. Differentiate excess demand and deficient demand.

III Long Answer Type Questions

1. Explain Keynesian concept of equilibrium aggregate income? Illustrate your answer with appropriate diagrams.

2. Describe the circular flow in a simple two-sector model?

3. Explain the concept of investment multiplier? Give suitable examples?

4. Describe the components of aggregate expenditure in two, three and four sector economy models.

5. Explain national income determination in a two sector economy?

6. Distinguish between national income determination in three and four sector economy models?

7. Define multiplier. Explain the functioning of multiplier?

8. Outline the changes in equilibrium aggregate income on account of changes in its determinants?

9. Elucidate the relationship between consumption function and saving function?

10. Describe the rationale behind multiplier? Point out the factors that weaken the multiplier?

11. How do imports and exports with the rest of the world affect the level of income and output?

12. Define Inflationary gap and how it arises in an economy?

IV Application Oriented Question

1. In a two sector economy, the business sector produces 7000 units at an average price of ₹ 5.

   (a) What is the money value of output?

   (b) What is the money income of households?

   (c) If households spend 80 percent of their income, what is the total consumer expenditure?

   (d) What are the total money revenues received by the business sector?

(e) What should happen to the level of output?

2. Assume that an economy's consumption function is specified by the equation C = 500 + 0.80Y.

   (a) What will be the consumption when disposable income (Y) is ₹ 4,000, ₹ 5,000, and ₹ 6,000?

   (b) Find saving when disposable income is ₹ 4,000, ₹ 5,000, and ₹ 6,000.

   (c) What amount of consumption for consumption function C is autonomous?

   (d) What amount is induced when disposable income is₹ 4,000?₹ 5,000? ₹ 6,000?

3. Find the value of the multiplier when

   (a) MPC is 0.2

   (b) MPC is 0.5

   (c) MPC is 0.8

4. For the linear consumption function is C = 700 + 0.8Y; I is ₹ 1200 and Net exports X-M = 100. Find equilibrium output?

5. Suppose in an economy

   C = 100 + b(Y – 50 –t Y) ; I = 50; G = 50 ;X = 10; M = 5 + 0.1Y; MPC (b) = 0.8; Proportional income tax rate (t) = 0.25

   (a) Find the equilibrium national income, foreign trade multiplier, equilibrium value of imports.

   (b) If equilibrium national income falls short of full employment income by ₹ 50, how much government should increase its expenditure to attain full – employment?

6. Suppose the consumption function is C=50+0.8Yd, I=180 crores, G=190, crores, T=0.20Y

   (a) Find the equilibrium level of income.

   (b) Find the revenue from taxes at equilibrium. Is the government budget balanced?

   (c) Find the equilibrium level of income when investment increases by 120 crores.

7. Given the following equations:

   C=50+0.6Yd, I= 160, T =30, G =28, X-M = 20 -0.05 Y

   (a) Find the equilibrium level of income.

   (b) Find the net exports at equilibrium.

   (c) Find the income and net exports when investment increases to 195.

ANSWERS/ HINTS

Multiple Choice Type Questions

1.	(a)	**2.**	(b)	**3.**	(c)	**4.**	(a)	**5.**	(b)	**6.**	(a)
7.	(c)	**8.**	(c)	**9.**	(c)	**10.**	(b)	**11.**	(c)		

II Hints to Short Answer Type Questions

1. Equilibrium output occur when the desired amount of output demanded by all the agents in the economy exactly equals the amount produced in a given time period.
2. Only two components namely: aggregate demand for consumer goods (C), and aggregate demand for investment goods (I)
3. Functional relationship between aggregate consumption expenditure and aggregate disposable income, expressed as ***C = f (Y)*** ;shows the level of consumption (C) corresponding to each level of disposable income (Y)
4. The value of the increment to consumer expenditure per unit of increment to income; termed *b* such that 0 < b < 1.
5. The ratio of total consumption to total income i.e. $\frac{C}{Y}$
6. The saving function shows the level of saving (S) at each level of disposable

   Income(Y). The increment to saving per unit increase in disposable income (1 - *b)* is called the marginal propensity to save.
7. Expenditures that do not vary with the level of income. They are determined by factors other than income such as business expectations and economic policy
8. Aggregate expenditures in excess of output lead to a higher price level once the economy reaches full employment. Nominal output will increase, but it merely reflects higher prices, rather than additional real output.

9. The marginal propensity to consume is the determinant of the value of the multiplier. The higher the (MPC) the greater is the value of the multiplier.
10. The more powerful the leakages are, the smaller will be the value of multiplier.
11. Three components namely, household consumption(C), desired business investment demand (I) and the government sector's demand for goods and services (G).
12. Imposes taxes on households and business sector, effects transfer payments to household sector and subsidy payments to the business sector, purchases goods and services and borrows from financial markets
13. The foreign sector's contribution to aggregate expenditures; derived by subtracting imports from exports i.e. net exports.
14. The greater the value of propensity to import m**,** the lower will be the autonomous expenditure multiplier.
15. If the aggregate demand is for an amount of output greater than the full employment level of output, then we say there is excess demand. Excess demand gives rise to 'inflationary gap'. On the other hand, If the aggregate demand is for an amount of output less than the full employment level of output, then we say there is deficient demand. Deficient demand gives rise to a 'deflationary gap' or 'recessionary gap'. Recessionary gap also known as 'contractionary gap'.

III Hints to Long Answer Type Questions

I. The length of the answer should relate to the marks allotted.

II. The answer should be structured in three parts in the following style.

(a) Explain the economic fundamentals underlying the action/issue by integrating the course material in innovative ways; not necessarily confined to one unit. This part provides an opportunity for students to explain their understanding of the underlying theory. The examiner may easily discern the level of cognition of the student. This should be a compulsory component with a reasonably high proportion of marks earmarked.

(b) Analyse the issue at hand (given the framework and tools) and explain the policy position by applying the fundamentals as explained in (a) above.

(c) Substantiate with illustrations from current economic scenario

IV Application Oriented Questions

1. (a) The money value of output equals total output times the average price per unit. The money value of output is (7,000 x 5) = ₹ 35,000.

(b) In a two sector economy, households receive an amount equal to the money value of output. Therefore, the money income of households is the same as the money value of output i.e₹ 35,000.

(c) Total spending by households (₹ 35,000 x 0.8) i.e. ₹ 28,000.

(d) The total money revenues received by the business sector is equal to aggregate spending by households i.e. ₹ 28, 000.

(e) The business sector makes payments of ₹ 35000 to produce output, whereas the households purchase only output worth ₹ 28,000 of what is produced. Therefore, the business sector has unsold inventories valued at ₹ 7000. They should be expected to decrease output.

2. (a) Consumption for each level of disposable income is found by substituting the specified disposable income level into the consumption equation.

Thus, for Y = ₹ 4,000, C = ₹ 500 + 0.80(₹ 4,000) = ₹ 500 + ₹ 3,200 = ₹ 3,700.

Likewise C is ₹ 4,500 when Y = ₹ 5,000, and ₹ 5,300 when Y = ₹ 6,000.

(b) Saving is the difference between disposable income and consumption. It is the difference between the consumption line and the 45 line at each level of disposable income

Using the calculation from part a) above, we find that saving is ₹ 300 when Y is ₹ 4,000; ₹ 500 when Y is ₹ 5,000 and ₹ 700 when Y is ₹ 6,000.

(c) Autonomous consumption is the amount consumed when disposable income is zero; autonomous consumption is ₹ 500, i.e the consumption expenditure when the consumption line C intersects the vertical axis and disposable income is 0. Since autonomous consumption is unrelated to income, autonomous consumption is ₹ 500 for all levels of income.

(d) Induced consumption is the amount of consumption that depends upon the level of income. Consumption is ₹ 3,700 when disposable income is ₹ 4,000. Since ₹ 500 is autonomous (i.e consumed regardless of the income level), ₹ 3,200 out of the ₹ 3,700 level of consumption is induced by disposable income. Similarly, Induced consumption is

₹ 4,000 when disposable income is ₹ 5,000, and ₹ 4,800 when disposable income is ₹ 6,000.

3. The value of the multiplier (k) is found by relating the change in output (ΔY) to the initial change in aggregate spending. The value of the multiplier is directly related to the level of MPC, i.e., the greater the MPC, the larger the value of the multiplier. The value of the multiplier is found from the equation k = 1/ (1 − MPC).

(a) Thus, when MPC is 0.2, the multiplier is 1.25

(b) When MPC is 0.5, the multiplier is 2

(c) When MPC = 0.80, the multiplier is 5

4. The equilibrium level of output can be found by equating output and aggregate spending i.e. by solving Y = C + I + X-M for Y

Y = C + I + X- M

Y = 700 + 0.8Y + 1200 + 100

Y − 0.8Y = 700 + 1200 + 100

0.2Y = 2000

Y =2000/.2 = 10,000

5. (a) Y = C + I + G+X- M

Y= 100 + b (Y – 50 –t Y) +50+50 +10-5-0.1Y

Y= 100+ 0.8 (Y-50-0.25Y) +105 -0.1Y

Y= 100+0.8Y-40-0.2Y +105-0.1Y

Y= 165 +0.8Y-0.2Y-0.1Y

Y=165+ 0.5Y

Y-0.5Y=165

Y=165/0.5

Y= 330

OR

$$Y = \frac{1}{1-b(1-t)+m}(a - b\,T + I + G + X - \bar{M})$$

$$Y = \frac{1}{1-0.8(1-0.25)+0.1}(100 - 0.8(50) + 50 + 50 + 10 - 5)$$

$$Y = \frac{1}{0.5}(100 - 40 + 105)$$

Y= 165/0.5= 330

Foreign trade multiplier= $\frac{1}{1-b(1-t)+m} = \frac{1}{1-0.8(1-0.25)+0.1} = 2$

Equilibrium value of imports can be obtained by substituting the equilibrium income in the import function. Thus,

M = 5 +0.1 Y= 38

(b) Required increase in government expenditure to attain ₹ 50 increase in income can be obtained as under

ΔY = Foreign trade multiplier $\times \Delta G$

$\Delta Y = \frac{1}{1-b(1-t)+m}\Delta G \Rightarrow \Delta Y = 2.\ \Delta G$

ΔG = 50/ 2= 25

6. (a) Y= 50+0.8(Y-.20Y) +180+190,

Ye= 420/.36= 1166.66 Crores

(b) T=0.2 (1166.66) = 233.332 Crores

G=190< T= 233.332, thus, budget is not in balance. There exists a budget Surplus

(c) Change in Y= Change in I/ (1-b+bt) = 120/ (1-.8+.16) = 120/.36= 333.33Crores, So new Y equilibrium:

Y new= 1166.66+333.33 = 1499.99 Crores

7. (a) Y = AE

Y= C + I + G + (X – M)

Y= 50+0.6(Y-T) + I + G + (X – M)

240+.55Y=Y

Ye= 533.33 Crores

(b) X-M=20- .05(533.33) = -6.66 Crores

(c) Change in I= 35

Change in Y= 35/(1-b+m) =35/ (1-.6+.05) = 77.77 Crores

Thus, Ye= 533.33+77.77 =611.1 Crores

X-M @ Ye= 611.1= 20-.05(611.1) =10.555 Crores