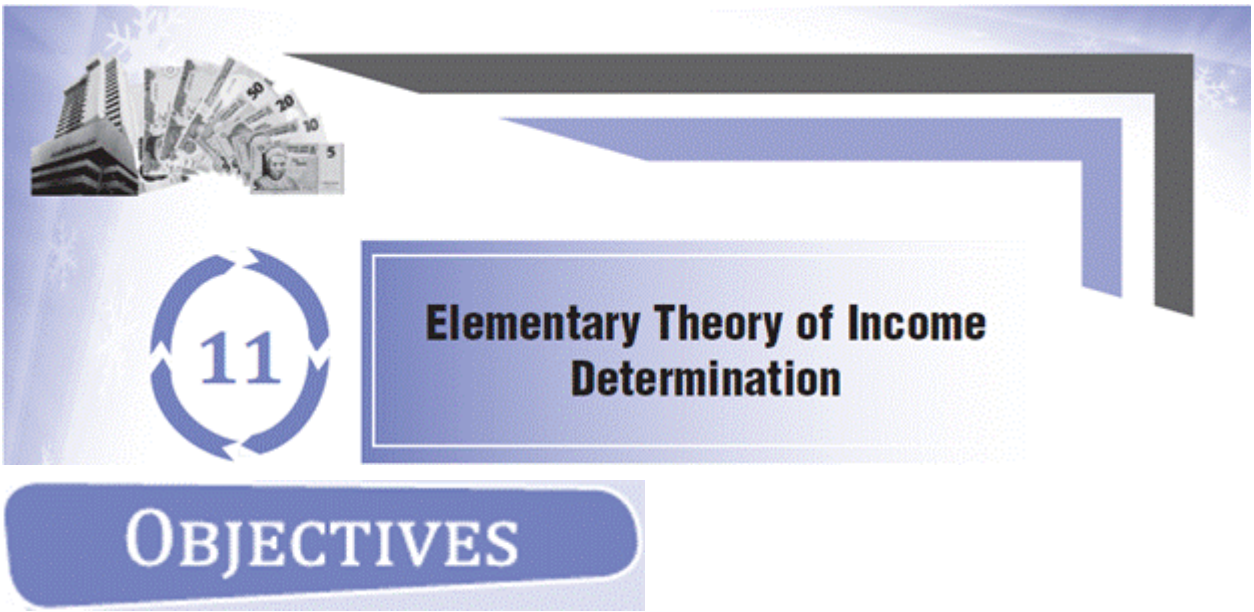
chapter 11



OBJECTIVES

At the end of the chapter, students should be able to:
â€¢ explain the circular flow of Income and Product;
â€¢ explain the consumption function and propensity to consume;
â€¢ calculate average propensity to consume, marginal propensity to consume;
â€¢ calculate average propensity to Save, marginal propensity to Save;
â€¢ explain the types of investment and their determining factors.

11.1 Introduction

Individuals that are engaged in a productive activity such as buying and selling earn income daily, weekly or monthly. Firms also earn income by engaging in activities of buying and selling of their products. In this book we have introduced the basic concepts of national income accounting. In this chapter, we shall identify the various sectors in the economy, explain the flow of inputs, outputs and income among such sectors. There are simple diagrams drawn to illustrate the different variants of the circular flow of income.
Apart from explaining such concepts like the consumption function, saving, investment and the multiplier, there is also assessment of their importance to growth of national income.
Some elements of algebra are introduced to make the chapter more understandable.

11.2 The Circular Flow of Income and Product

This can be defined as the interdependence between households and business enterprises. The basic assumption usually made here is that there are only two sectors in the economy, and these are; household or personal

sectors and the producing unit sector. A producing unit is defined as a firm manufacturing goods or a farm producing agricultural goods. The illustration below may make our explanation clearer.

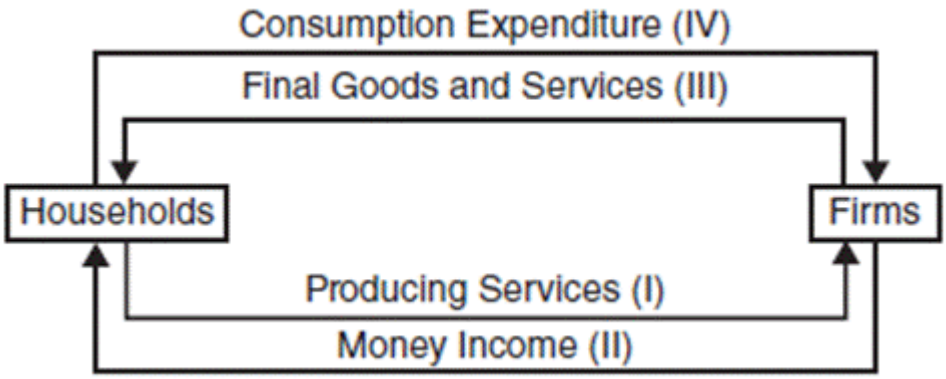


Figure 11.1(a) Circular flow of Income

In this illustration, the household or personal sector which owns productive services supplies them to the firm (see I). The firm in return pays for these productive services in the form of wages and salaries, rents and interests (see II). Although this constitutes money income to the households, it is an expenditure to the firm. The demand for the services of the household by the firm is a derived one as the firm uses the factor services to produce goods which are later sold to the households (see III). The household pays for such goods and services. Such payments made by the household to the firm constitute consumption expenditure to the household (see IV). We can also represent the circular flow of income as shown in the diagram below.

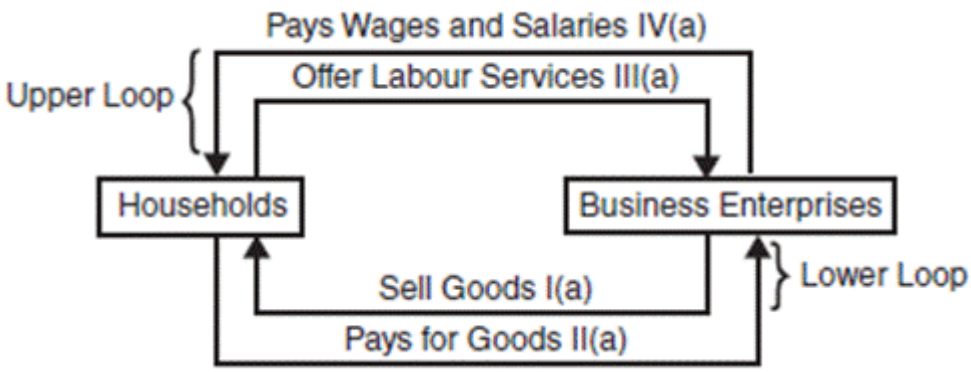


Figure 11.1(b) Circular flow of Income

This other variant of the circular flow of income is divided into two sections: The lower and upper loops. A look at the diagram shows that in the lower loop, firms sell goods to the household (see I a) while the household in return pays for such goods (see II a).

However, in the upper loop, household offer their services to the firm (see III a) for which the firm also pays (see IV a).

From these two diagrams, we can conclude that various goods in our markets are produced with the factor services of land, labour and capital, all of which are provided by the household and which generate income to the household in the form of wages and salaries, rents and interest. On the other hand, this

constitutes expenditure to the producer. The economic meaning of this is that expenditure generates income, as income in one sector of the economy is expenditure in the other.
The circular flow thus shows that money flows from one sector of the economy to the other in a complete circuit, while goods and factor services flow in the opposite direction in exchange. Some assumptions of this theory are that:
(i) The economy is closed. This is because there are no dealings with other countries. That is, there is no foreign trade. This is why there are neither imports nor exports;
(ii) The household spend all their income on consumer goods as soon as the income is received, and that firms sell all their output directly to the consumers, as soon as it is produced. There are, therefore, no intermediaries. There are also no savings. Where these assumptions are violated, the circular flow concept will break down. It is possible to use the circular flow of income diagram to compute the national income of a country. For this to be carried out, we can illustrate the circular flow of income as follows:

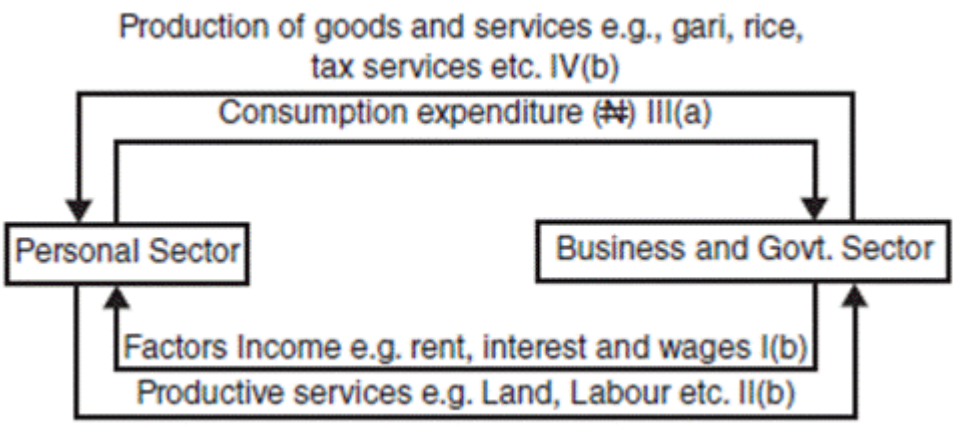


Figure 11.1(c) Circular flow of Income
If we consider I b for example, we shall arrive at the national income via the income approach. III b gives the national income via the output approach. The circular flow of income thus shows the relationship that exists between national income and product.

11.3 The Consumption Function or Propensity to Consume

The consumption function (or the propensity to consume) is defined as a schedule showing the various amounts that will be spent on consumption at different levels of income. We can, therefore say that it shows the functional relationship which exists between total consumption and gross national income. Since consumption outlays are mainly a function of income, we can represent the consumption function as:
$C = f(Y_d)$
Where
C = consumption
Y_d = disposable income
f = functional relationship
This relationship shows that C is dependent on Y. That is, Y is the

independent variable, and C the dependent variable.
However, the most common consumption function is that which is written as:
$C = a + bY_d$
Where:
C = consumption expenditure
a = autonomous consumption
b = marginal propensity to consume
Y_d = disposable income
The autonomous consumption is defined as the minimum level of consumption that must take place even when the level of disposable income in the economy is zero. That is, â€˜aâ€™ is some minimum level of purchasing. Thus,
if a = 25, b = 0.60 or 60%, Y_d = N1,000, then
C = N[25 + ïš²(0.60) Ã— (1000)}]
C = N25 + 600
C = N625.00
Therefore, actual consumption or consumption purchasing is N625.00
In the function $C = f(Y_d)$, we are not saying that income is the only determinant of consumption expenditure but that other factors are regarded as given. That is, they are held constant. Just like we had demand schedule and demand curve in the theory of demand and supply, we also have consumption schedule and consumption function graphs.
A hypothetical illustration of disposable income and consumption in an economy is shown below:

Income $Y_{(d)}$	Consumption $C = f(Y_d)$
0	20
30	48
60	65
90	85
120	110
150	125
180	150

This schedule shows that the consumption function relates spending to income.
Graphically, we can demonstrate the consumption function as follows:

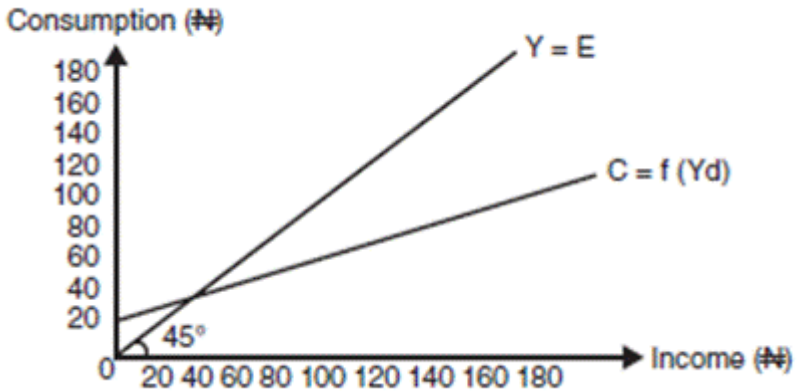


Figure 11.2(a) Consumption function

This graphical illustration shows that there is a direct relationship between consumption and income. Consumption can be described as an increasing function of income because as income increases, consumption also increases, but at a slower rate. The 45 degree-line is equidistant from both axes, so that at any point on the line, consumption expenditure which is alternatively called spending, equals disposable income.

Where the level of household income is very low, the household may spend more than their current income. This was the situation at (0, 20) above i.e. when income was zero, the consumption expenditure was N20.00.

When income increased to N30.00, consumption was N48.00, showing an excess of N18.00 over income. The implication of this is that income is not sufficiently large enough to meet consumption expenditure. The question that readily comes to mind here is, how is this excess financed? It is expected that people spend out of their previous savings or that they borrow from their relations or even the banks.

At higher levels of income however, the consumption expenditure of households may be smaller than their income. We can therefore, conclude that at low income level, all of the income is consumed while at high income level, a considerable proportion is saved. This leads us to the concept of savings which we shall discuss later in the chapter. The relationship between consumption and income can further be analysed by using either the concept of the average or marginal propensity to consume.

Average Propensity to Consume

This can be briefly defined as the proportion of total income that is spent on consumption. It is usually expressed as a percentage or proportion of income consumed. The average propensity to consume (APC) decreases as income increases, because the proportion of income spent on consumption decreases with increasing income. To arrive at the value of the APC, we divide total consumption expenditure (C) by the total income (Y). That is, APC = C/Y

Diagrammatically, we can represent the APC as:

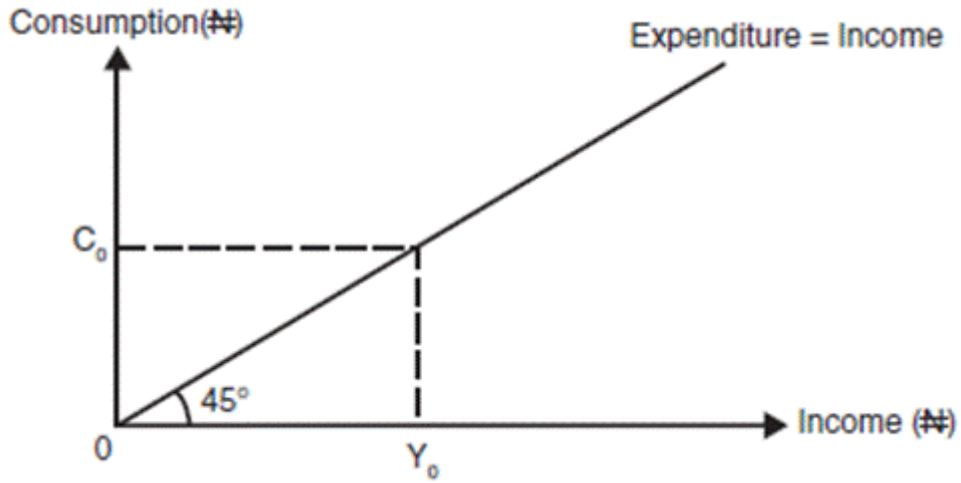


Figure 11.2(b) Consumption function

The slope of the 45-degree line reveals that income equals consumption expenditure.

Example: Assuming Miss Dadaâ€™s disposable income is N1,000 and she uses N900 for consumption purposes. We can calculate the APC as follows:

Disposable Income = N1,000.00

Consumption expenditure = N900.00

$$\text{APC} = \frac{\text{amount spent on consumption}}{\text{disposable income}}$$

$$\text{i.e. APC} = : \frac{900}{1000} \times 100\%$$

= 90% or 0.90.

The value of the APC (Average Propensity to Consume) and APS (Average Propensity to Save) must always be equal to 100% or unity. That is, APC + APS = 1. This is logical for example, Y = C + S; when each side is divided by Y, it gives:

$$\frac{Y}{Y} = \frac{C}{Y} + \frac{S}{Y}$$

1 = APC + APS

This shows that APS = 1 â€“ APC. Thus, in our example above, the APS = 10% or 0.10.

We can define the APS as that proportion of total income that is not spent on immediate consumption but saved till a future date.

If Miss Dada spent N900 out of her N1,000 it then implies that only N100 was saved. The

APS may thus be calculated by dividing the amount saved by disposable income. That is,

$$\frac{\text{Amount saved}}{\text{Disposable income}} = \frac{100}{1000} \times \frac{100}{1}$$

= 10% or 0.10.

If we now add 90% to 10% we have 100%. However, we use decimal notation, the APC = 0.90; and APS = 0.10, the addition of the two i.e. 0.9 and 0.1 must equal unity. This again confirms that APC + APS = 1.

Marginal Propensity to Consume

Economists are particularly interested in the extent to which consumption expenditure changes in response to a given change in income. The relationship existing between changes in consumption and changes in income is what is referred to as the MPC (marginal propensity to consume). If we represent a change in consumption by Î”C and a change in income by Î”Y, then,

$$MPC = \frac{\Delta C}{\Delta Y}$$

The MPC thus shows how much of the last naira worth of income is spent for consumption purposes. The MPC can also be seen as the rate of change in the APC as income increases. The MPC can be shown symbolically as:

$$\frac{C_1 - C_0}{Y_1 - Y_0} = \frac{\Delta C}{\Delta Y}$$

It can graphically be shown as:

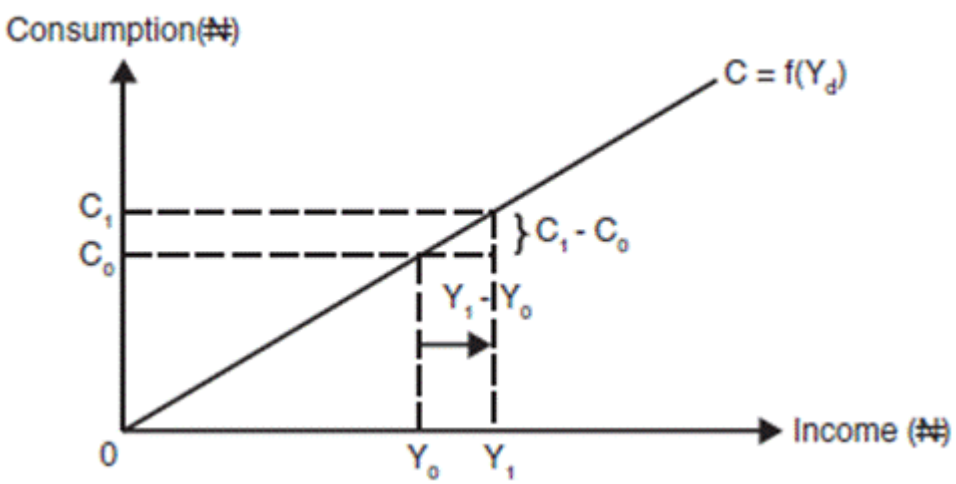


Figure 11.3 Consumption function

Example: If Mr. Niyi Bakareâ€™s basic salary increases from N800.00 per month to N1,000.00, while his consumption expenditure increases from N640.00 to N800.00, we can calculate his MPC. From the information given in the question we have:

Y_0 = N800, Y_1 = N1,000,

Î”Y = Y_1 â€“ Y_0 = N1000 â€“ N800 = N200

C_0 = N640, C_1 = N800,

Î”C = C_1 â€“ C_0 = N800 â€“ N640 = N160

But the marginal propensity to consume is given as:

$$MPC = \frac{\Delta C}{\Delta Y}$$

$$\frac{C_1 - C_0}{Y_1 - Y_0} \text{ thus, } \frac{160}{200} = 0.8$$

The Marginal Propensity to Consume is indicated by the slope of the consumption function at the relevant point. Given a consumption function for example,
$C = bY_d$ or
$C = a + bY_d$.
The behavioural coefficient, that is, â€˜bâ€™ in any of the two equations represents the MPC. For instance, in the equation below:
$C = 35 + 0.75\ Y_d$
The MPC = 0.75 or 75%.
If the MPC measures a change in consumption expenditure as a result of a change in income, the essential difference is that while the MPC measures absolute change in income, the income elasticity of demand measures a percentage change in demand resulting from a percentage change in income. For example, if Mr. Okaforâ€™s salary goes up by N200 while his consumption expenditure increases by N150. Then the MPC is

$$\frac{150}{200} = \frac{3}{4} = 0.75$$

It is not possible to calculate the income elasticity of demand here because the information at our disposal is not sufficient. In addition to the above, we need to know the original levels of consumption and income. Therefore, the MPC is not synonymous with the income elasticity of demand.
If we consider Mr. Bakareâ€™s example where we calculated the MPC to be equal to 0.8, it is possible to calculate the income elasticity of demand here, because we know the original levels of both income and consumption.
By definition, **income elasticity** of demand is:

$$n_y = \frac{\Delta D}{D} \div \frac{\Delta Y}{Y}$$

Where: Î”D = change in demand
D = original demand
Î”Y = change in income
Y = original income
n_y = income elasticity of demand
then, $n_y = \frac{\Delta D}{D} \times \frac{Y}{\Delta Y} = \frac{Y \Delta D}{D \Delta Y}$
Notice that D is equivalent to C here, hence:

$$n_y = \frac{Y\Delta C}{C\Delta Y}$$

Original $Y_0 = 800$
$C_0 = 640$
Î”C = C_1 â€“ C_0 = 800 â€“ 640 = 160
Î”Y = Y_1 â€“ Y_0 = 1000 â€“ 800 = 200

$$n_y = \frac{800}{640} \times \frac{160}{200} = 1$$

Thus,
Y = 1
Since 0.80 is not equal to 1, that is, 0.8 â‰ 1; then there is a distinction between the marginal propensity to consume and income elasticity of demand.
Even though any increment in income is either spent or saved, the fraction that is consumed and the one that is saved must total 100% i.e. the marginal propensity to save and marginal propensity to consume should add up to unity. Therefore, we can say that the marginal propensity to save is the complement of the marginal propensity to consume since our only choice with disposable income is either to spend or save it.
The marginal propensity to save is the ratio of change in savings (Î”S) to change in income (Î”Y). Thus,

$$MPS = \frac{\Delta S}{\Delta Y}$$

This is derived as follows:
Î” in income = Î” in C + Î” in S
Î”Y = Î”C + Î”S.

Individuals	(i) If Y =	(ii) Then C =	(iii) APC = $\frac{C}{Y}$	(iv) MPC = $\frac{\Delta C}{\Delta Y}$	(v) Hence S = Y – C	(vi) APS = $\frac{S}{Y}$	(vii) MPS = $\frac{\Delta S}{\Delta Y}$
Nike	180	120	$\frac{120}{180}$	0.6	60	$\frac{60}{180} = 0.33$	0.33
Angela	280	180	$\frac{180}{280}$	$\frac{60}{100} = 0.6$	100	$\frac{100}{280}$	$\frac{40}{100} = 0.40$
Feyi	380	240	$\frac{240}{380}$	$\frac{60}{100} = 0.6$	140	$\frac{140}{380}$	$\frac{40}{100} = 0.40$
Sola	480	300	$\frac{300}{480}$	$\frac{60}{100} = 0.6$	180	$\frac{180}{480}$	$\frac{40}{100} = 0.40$
Amina	580	360	$\frac{360}{580}$	$\frac{60}{100} = 0.6$	220	$\frac{220}{580}$	$\frac{40}{100} = 0.40$
Dunni	680	420	$\frac{420}{680}$	$\frac{60}{100} = 0.6$	260	$\frac{260}{680}$	$\frac{40}{100} = 0.40$

Table 11.1 Derivation of the propensity to consume and propensity to save

schedules

If we divide each side by Y as follows:
Y = C + S

$$\frac{Y}{Y} = \frac{C}{Y} + \frac{S}{Y}$$

Then, 1 = MPC + MPS; giving
MPC = 1 â€“ MPS.
If the marginal propensity to consume is constant as income changes, the marginal propensity to save also remains constant.
However, if the marginal propensity to consume falls as income increases, the marginal propensity to save will rise. The marginal propensity to consume is assumed to be positive and less than one.
The economic meaning of this is that when income increases, the whole of it is not spent on consumption. That is some part of it is saved for future investment. Therefore, 0 < MPC < 1. This implies that consumption is an increasing function of income and it increases by less than the increase in income.
Note that on the schedules:
(i) Y = C + S
S = Y â€“ C
(ii) Columns (i) and (ii) form the consumption function schedule.
(iii) The values of C have been derived by substituting the value of Y into the equation. C = 12 + 0.6Y which is the propensity to consume schedule.
The function C = 12 + 0.6Y is arrived at as follows:
Given the MPC as 0.60 and assuming a general consumption function of the form C = a + bY; use Nikeâ€™s figure and substitute for C, a, b and Y as follows:
Where C = 120
a = ?
b = 0.60
Y = 180
Thus, 120 = a + (0.60) (180)

$$120 = a + \frac{60}{100} \times \frac{180}{1}$$

120 = a + 108
a = 120 â€“ 108
a = 12
Hence, the function is C = 12 + 0.6Y.
We can test for the validity of this function.
Assuming we use Feyiâ€™s figure where Y = 380;
C = 240; given b = 0.6, then a = ?
C = a + bY
240 = a + (0.6) (380)

$$240 = a + \frac{6}{10} \times \frac{380}{1}$$

240 = a + 228
a = 240 âˆ’ 228
a = 12
Given C = 12 + 0.6Y, this confirms that our consumption function is in order.
It is possible to derive this from the consumption function.
C = a + bY.....(1)
but Y = C + S .....(2)
if we substitute C in equation (2), we shall have:
Y = a + bY + S .....(3)
Collect similar terms as follows:
Y â€“ bY = a + S
Factorise the left hand side as shown below:
Y(1 âˆ’ b) = a + S
Make S the subject of the formula. It means that
S = âˆ’a + Y(1 âˆ’ b)
Notice that b = MPC, hence 1 â€“ b is the MPS. Since MPC + MPS = 1;
S = âˆ’a + (1 âˆ’ b)Y
Since we have found b to be 0.60, then 1 âˆ’ b =
MPS = 1 â€“ 0.60 = 0.40.
Thus, S = âˆ’12 + 0.40Y.
(iv) Unlike the average propensity to consume and the average propensity to save, the marginal propensity to consume and the marginal propensity to save are constant for all levels of income. MPC = 0.60 while MPS = 0.40. The values of APC and APS vary.

Importance of the Marginal Propensity to Consume

(i) While the marginal propensity to consume for the poor is higher, the marginal propensity to consume for the rich is low. This is why developing nations have higher marginal propensity to consume than developed nations.
(ii) When income increases, the marginal propensity to consume falls more than the average propensity to consume. Conversely, when income falls, the marginal propensity to consume also rises but at a slower rate than the former. These types of changes are only possible during cyclical fluctuations. Whereas in the short run, the marginal propensity to consume is fixed and less than the average propensity to consume.
(iii) An economic significance of the marginal propensity to consume lies in filling the gap between income and consumption through planned investment to maintain the desired level of income.
(iv) Another importance lies in the theory of the multiplier.

Some Determinants of the Consumption Function

(i) Change in income: If income increases, the consumption function will rise. Since the marginal propensity to consume of all lower income earners is higher, they will spend more. This will shift their marginal propensity to consume upwards. That is, as a movement to the left as shown below in

figure 11.4(a):

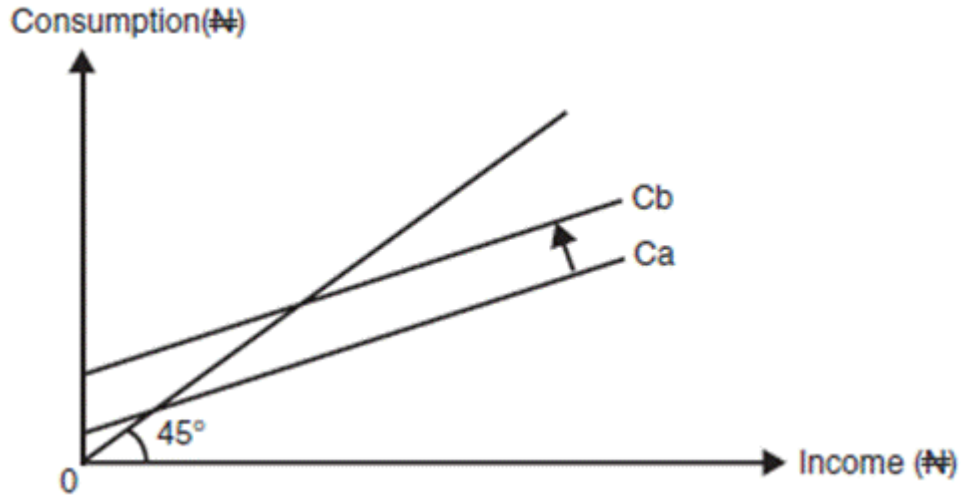


Figure 11.4 (a) Consumption function

However, if inflation or increased price follows a wage increase announcement, then the wage rate may fall and tend to shift the consumption function downwards.

That is a shift to the right as shown below in figure 11.4(b):

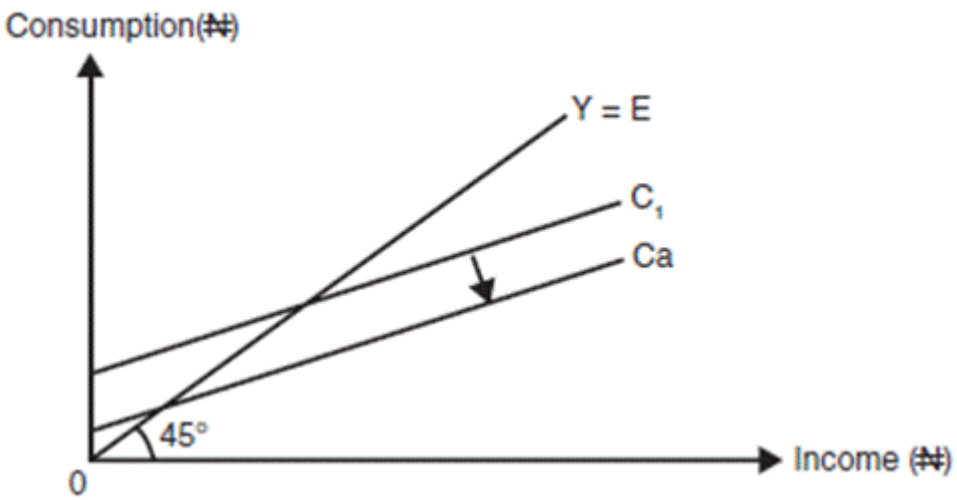


Figure 11.4 (b) Consumption function

As at the year 1986, there was economic recovery fund which led to a reduction in the consumption function. The resultant effect was on output and the level of employment.

(ii) Attitude towards saving: Where people prefer to consume later in the future to doing it now, they will tend to save for such days. This will no doubt reduce their consumption function. For instance, then, the consumption function will no doubt be reduced.

(iii) Change in fiscal policy: This is concerned with more tax relief allowance. For instance, in January 1987, the personal relief allowance of workers was increased while others such as dependent relative, wife and children allowances were similarly increased. All these will shift the consumption function to the left. While such policies, such as the removal of petroleum subsidy, will no doubt reduce the consumption function.

(iv) Change in the rate of interest: An increased interest rate may encourage people to save more of their income; thereby reducing the consumption function. Consumers will also not buy on hire purchase; neither will they like to borrow money from financial institutions. All these have negative impacts on the consumption level. However, the contrary will be the case where there is a reduction in the rate of interest.
(v) Future expectation: Where people envisage a higher price in the future, they increase present consumption. If people anticipate war for example, they are likely to hoard some essential commodities with a view to selling them at higher prices during the war.
(vi) Financial policies of corporations or companies: When corporations decide to plough back a greater percentage of their profits, the consumption function will be reduced because the policy of the companies will imply a reduction in the income of the investors hence, their consumption function.

11.4 Savings

This is defined as the excess of current income over current consumption expenditure. It may also be defined as that part of household income that is not used to purchase goods and services, or pay taxes. Thus, if we represent income by Y, savings by S, consumption by C and the current period by t.
Then $S_t = Y_t$ â€“ C_t
This is obtained from
$Y_t = C_t + S_t$
From here, we can conclude that savings is a function of income. That is, $S_t = f(Y_t)$. People save for future consumption or in order to bequeath unto their children or relations in future time. At higher levels of income, consumption expenditure of households will be smaller than their income.
It is possible to show the extent of savings on a linear consumption function as in Figure 11.5.

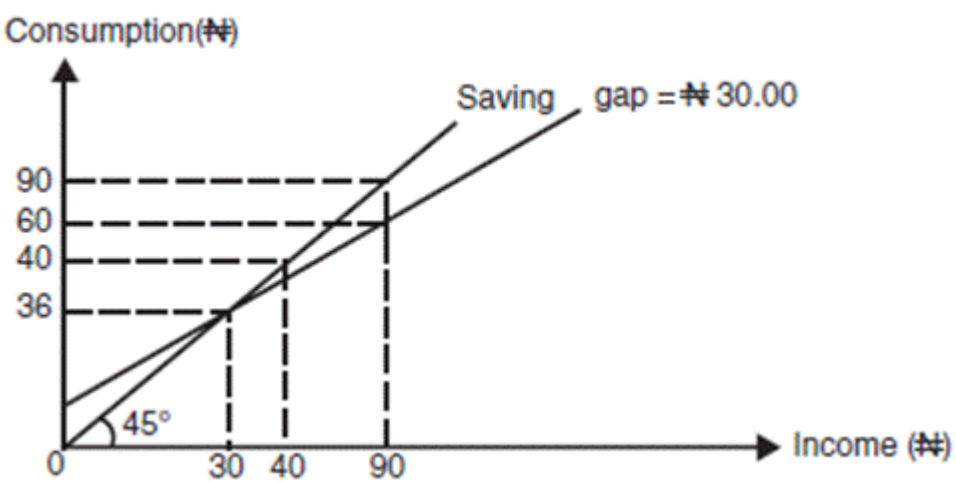


Figure 11. 5 Saving on a linear consumption function
Where the consumption function intersects the 45-degree line, we have a â€˜break even pointâ€™; that is, the point where spending equals income thus showing a net saving of zero. This is the point â€˜Mâ€™ in our illustration. To the left of this point, dissavings occur, whereas to its right,

there is a net positive savings.
For instance, at an income level of N30, consumption equals N36; there is therefore a negative savings of N6. However, at the income level of N90, only N60 is consumed while the remaining N30 is saved. That is, Y = N90; C = N60 and S = N30. The gap between income and the consumption function is a measure of the amount of savings. This is why it is referred to as the savings gap.

Derivation of Savings Functions

The relationship between savings and income can be expressed as an equation: but one has to start from the consumption function.
Given that consumption function is:
$C = a$ Ã· bY_d .....(1)
and that $Y = C + S$ .....(2)
Substitute for C in equation (2) and make S the subject of the formula.
That is, $Y = a + bY_d + S$.
Collect similar terms, thus,
Y â€“ $bY_d = a + S$
Factorize as $Y(1$ â€“ $b) = a + S$
S = â€“a + (1 â€“ b)Y
The savings function is thus the inverse of the consumption function. Since 1 â€“ b = the marginal propensity to save; then S = âˆ’a + MPS Y. For example, if a = 12; and MPS = 0.40, then we have S = âˆ’12 + 0.4Y.
(Note that this is our earlier example) it is also possible to illustrate this.

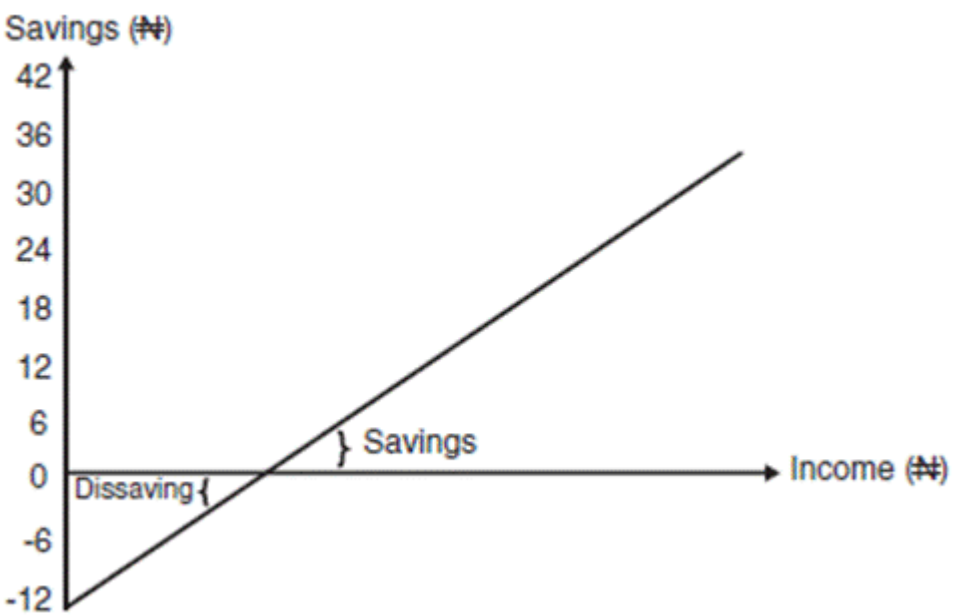


Figure 11.6 Savings Function

Example

Given an autonomous consumption of N35, marginal propensity to consume of 65% and disposable income of N300; we can calculate savings. Having established that: S = âˆ’a + (1 âˆ’ b)Y.
We now substitute for a, b and Y as follows:

S = â^’35 + (1 â^’ 0.65) (300)
S = â^’35 + (0.35) (300)

$$S = -35 + \frac{(35)}{100}\frac{(300)}{1}$$

S = â^’35 + 35 Ã— 3 = â^’35 + 105
Thus, savings S = N70.00.
If savings = N70, then consumption must be equal to N230.

11.5 Investment

Simply defined, investment means the addition to capital. It can also be viewed as current sacrifice made with the prospect of future gain. Examples include the buying of a car, the building of a house etc. Investment is not the same thing as the transfer of assets, therefore, the buying of shares, stocks and bonds should not be seen as investment but rather as mere transfers. Investment can be undertaken by either the government or the individual. Investment performs two basic functions:
(i) It increases a nationâ€™s stock of wealth; that is, its productive capacity;
(ii) It constitutes a current demand for resources. Capital investment, for example, generates profits and employment.
Generally, the level of investment depends upon two very crucial notions. The first is the marginal efficiency of capital, i.e. the anticipated rate of return on investment, the second is the cost of capital, i.e. the rate of interest, which we can equally call the cost of raising funds to invest; this may include bonds, borrowing from financial institutions etc. Where the marginal efficiency of capital is greater than the cost of capital, then investment can take place. This is why, in the illustration, below the volume of investment and the rate of return on investment are inversely related. Hence, the lower the marginal efficiency of capital (MEC), the lower the volume of investment.

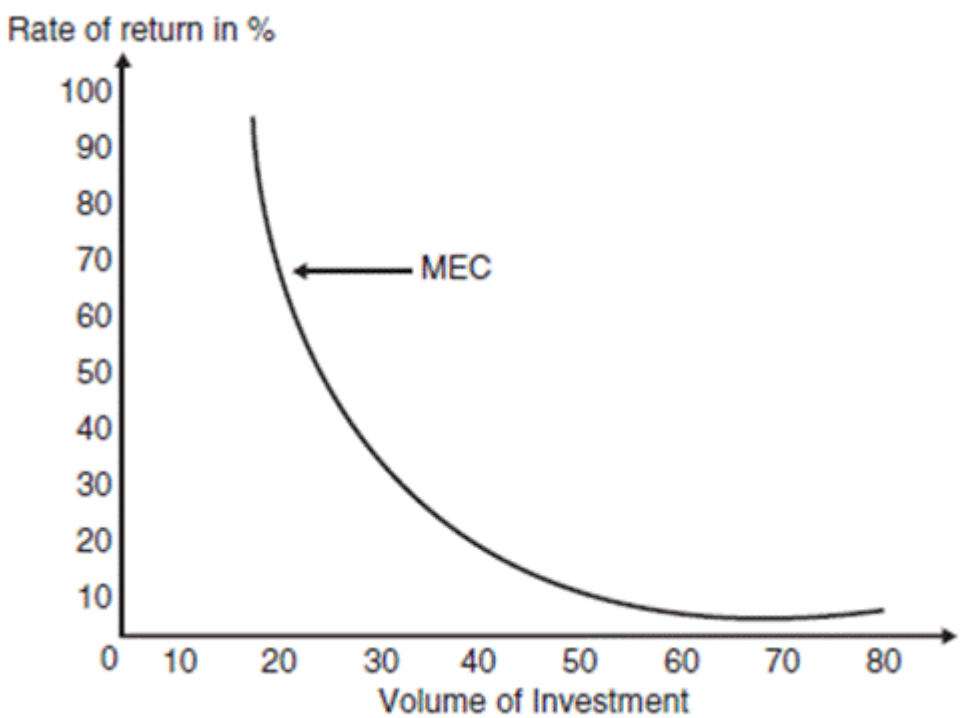


Figure 11.7 Investment as a function of the rate of return

Types of investment

(i) Induced investment: This is that type of investment which is income or profit motivated. That is, the level of investment here is dictated by various economic conditions. For instance, if income increases, consumption demand will also increase. This is because the level of investment has to be increased to satisfy the needs of the people. Induced investment is therefore, directly related to income. More income implies more investment. Investment here is income elastic.

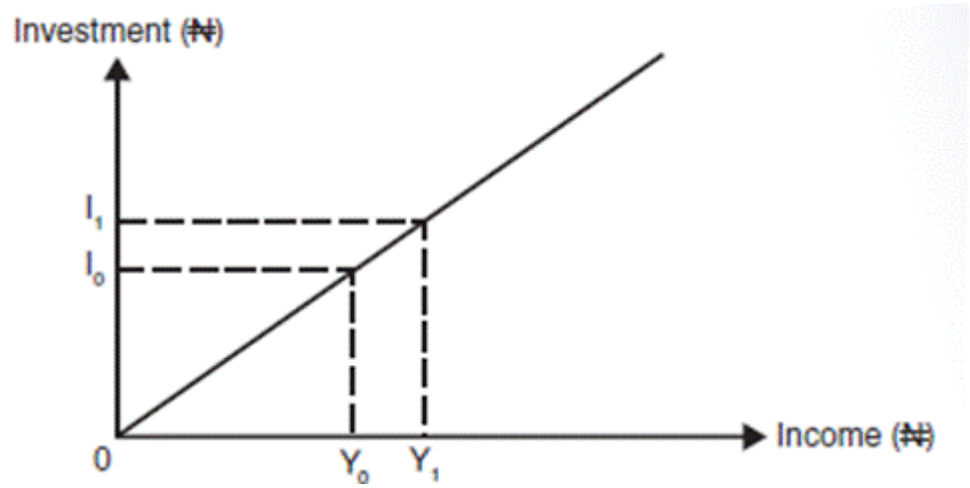


Figure 11.8 Induced Investment

(ii) Autonomous investment: This type of investment is undertaken without reference to the level of income. That is, it does not depend on the level of income; autonomous investment is usually kept constant. This can be represented diagrammatically as shown below, if investment is plotted along the Y axis and income along the X axis.

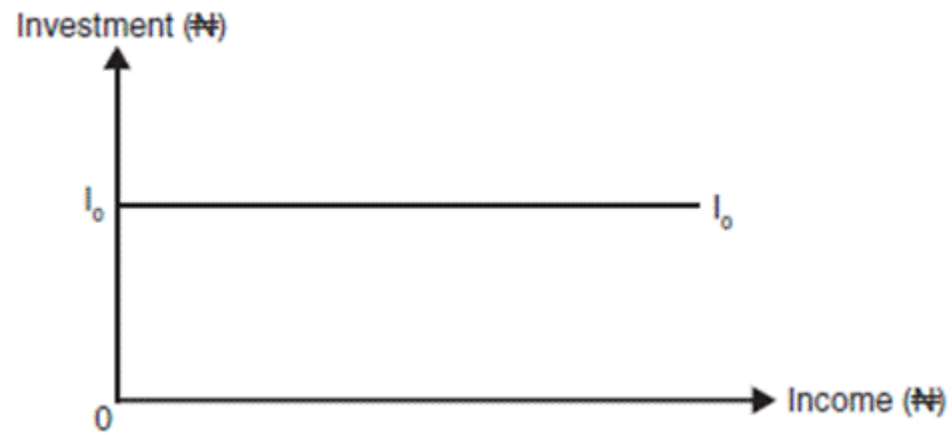


Figure 11.9 Autonomous Investment

Economic factors have little to do with autonomous investment. The level of this type of investment is determined by exogenous factors which may include war, changes in weather, population growth, labour force, etc. Autonomous investment is regarded as public investment. Therefore, investment in the liquefied natural gas project, Kainji Dam, hospitals, schools, petrochemical plants, etc., are good examples of autonomous

investment.
(iii) Replacement investment: This refers to that part of investment that is just sufficient to offset the annual wear and tear or the depreciation of the capital stock. This becomes necessary if the firm is to continue to be in the operation. We should note that although replacement investment does not add to capital stock, it adds to productive capacity.

Factors Determining the Level of Investment

(i) Rate of interest: This is perhaps the most important factor that determines the level of investment in an economy. The rate of interest here may refer to either the cost of capital i.e. what one pays on loans, or the expected rate of return on a project. If we consider the former, the higher the interest rate, the lower will be the level of investment. This is because people want to invest to be able to earn high profits later. If the cost of capital will erode the expected profit, investors may not be willing to undertake investment in such projects. On the other hand, a fall in the interest rate will make the capital more attractive compared with labour. This will encourage substitution of capital for labour and hence, encourage investment decisions. Investment is thus inversely related to the rate of interest.
(ii) Government policy: The government policy may affect investment decisions in two ways. First, is providing financial base; and second, is through the tax system. The provision of finance may also take one of two forms â€“ provision of loans or outright grants.
(iii) The level of current profit: This may affect the level of investment in two ways. The first is that current profit may be ploughed back into the business; while the second is that high levels of profit serve as a morale booster for further investment. Thus, if the level of current profit is high, it is likely that the investment expenditure will also be high.
(iv) Expectations: If it is envisaged that the return on investment will be high in the future, for instance, greater demand for the goods and services of a firm imply a higher future profit, then, investors might be willing to invest in such areas. We must, however, warn that accurate calculations or forecasts must be made.

11.6 Elementary Theory of the Multiplier

This concept was discovered by R.F. Khan. He defined it as the ratio of a change in national income to the change in expenditure that brings it about. That is, it explains the cumulative effect of a change in investment on income via its effect on consumption expenditure. Thus, the basic question that the multiplier seeks to answer is: what will happen to the equilibrium income and output position if planned investment changes?
For instance, given a marginal propensity to consume 0.80, what will happen to the level of an economyâ€™s equilibrium income, if investment expenditure changes from N100 m to N140 m?
Given the value of the marginal propensity to consume or the marginal propensity to save, we can always derive the value of the multiplier. The lower the value of marginal propensity to consume, the lower the value of the

multiplier. The multiplier is usually represented by K and defined thus:

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

$$\text{or } \frac{1}{1 - \frac{\Delta C}{\Delta Y}} \text{ because } MPC = \frac{\Delta C}{\Delta Y}$$

Again, since 1 â€“ MPC = MPS, then

K = 1/MPS
It is the reciprocal of the marginal propensity to save. Therefore, the smaller the marginal propensity to save, the greater the value of the multiplier (K); is always greater than one (1).

Derivation of the Multiplier Formula

We have earlier confirmed that
Y = C + S.....(1)
Later in this chapter, we shall also show that
S = I .....(2)
If this is so, then,
Y = C + I .....(3)
But C = a + bY.....(4)
Substitute for C in equation (3)
Y = a + bY + I .....(5)
Collecting similar terms, we shall have:
Y â€“ bY = a + I .....(6)
Factorisation gives Y(1 â€“ b) = a + I .....(7)
Make Y the subject of the formula

$$\text{Thus, } Y = \frac{1}{1 - b} \times (a + I) \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Since the central problem of the multiplier is to find out what will happen to income (Y), if investment (I) changes, then, we proceed as follows:
Let Y change by Î”Y and I by Î”I,
Then, we shall have

$$Y + \Delta Y = \frac{1}{1 - b} \times (a + I + \Delta I) \ldots\ldots\ldots (9)$$

and since we are interested in the changes, we deduct original Y from equation 9. Thus:

$$FFY + \Delta Y - Y = \frac{1}{1-b} \times (a + I + \Delta I - a - I)$$

(10)

$$\Delta Y = \frac{1}{1-b} \times (\Delta I) = \frac{\Delta I}{1 - MPC} = \frac{\Delta I}{MPS}$$

(11)

$$\text{but } \frac{1}{1-b} = \frac{1}{1 - MPC} \text{ or } \frac{1}{MPS}$$

$$\text{Thus, } \Delta Y = \frac{1}{1 - MPC} \times (\Delta I) = \frac{\Delta I}{1 - MPS}$$

(12)

$$\text{Therefore, } K = \frac{\Delta Y}{\Delta I} = \frac{1}{1 - MPC} \text{ .....(13)}$$

Where K = multiplier

$$\text{Hence, } K = \frac{1}{1 - MPC} \text{ or } \frac{1}{MPS} \text{ ..... (13a)}$$

Using equation 12, we can now solve our earlier problem in this section. Given Î”I = N(140 â€“ 100) m = N40 m and MPC = 0.8 and

$$\Delta Y = \frac{\Delta I}{1 - MPC}$$

$$\Delta Y = \frac{1}{1 - 0.8} \times \Delta I$$

$$\Delta Y = \frac{1}{1 - 0.8} \times (40)m$$

Then,
Notice that K = 5 here.

$$\Delta Y = \frac{1}{0.2} \times (40)m$$

Î”Y = (5) (40) = N200.00 m
In this example, the multiplier is 5. The interpretation is that the change in investment has changed the economyâ€™s equilibrium purchasing by five times the change in the purchasing component, which is investment here. For instance, change in investment is N40 m while the multiplier is 5, hence the change in income is N(5 Ã—40) m = N200.00 m.
Therefore, an increase of N40m in investment has raised the economyâ€™s purchasing power by N200.00m. Given the change in investment as N100.00, and different MPC, we can calculate the rise in national income.
A fall in the level of income will lead to a larger fall in the equilibrium level of national income. The size of the fall will, however, depend on the marginal propensity to consume. We must not, however, have the impression that only a change in investment expenditure will have multiplier effects.
Change in the propensity to consume, for instance, has multiplier effects. If we introduce the government sector, any change in the level of government sector will also have a multiplier effect. While investment and government multipliers are the same, we should note that there are different formulas for calculating each of these. However, the above is all we need for this level. Similarly, in an open economy, changes in the export or import components will have multiplier.
In a nutshell, acceleration principle (A = Î”I/Î”I â†’ Î”I = AÎ”Y) shows that an increase in

Table 11.2 The Effect of the Multiplier on National Income

Rise in Investment	MPC	MPS	Multiplier	Rise in National Income
100	$\frac{1}{6}$	$\frac{5}{6}$	1.2	120
100	$\frac{2}{6}$	$\frac{4}{6}$	1.5	150
100	$\frac{3}{6}$	$\frac{3}{6}$	2	200
100	$\frac{4}{6}$	$\frac{2}{6}$	3	300
100	$\frac{5}{6}$	$\frac{1}{6}$	6	600

income causes an increase in investment.
Thus, income is the cause while investment is the effect; whereas in the multiplier theory, an increase in investment causes an increase in income, investment is thus, the cause while income is the effect.

11.7 Equality of Savings and Investment Functions

Given that Y = C + S .....(1)
and Y = C + I .....(2)
Where Y = Income
C = Consumption expenditure
S = Savings
and I = Investment expenditure
it is possible to show that S = I.
We proceed by solving equations 1 and 2 simultaneously. Let us use the substitution method first. From equation 1,
C = Y â€“ S .....(3)
Then, substitute for C in equation 2.
Thus, Y = Y â€“ S + I
Y â€“ Y = S + I
That is, 0 = â^'S + I
A slight rearrangement gives
S = I .....(4)
If we use the elimination technique, we shall also arrive at the same equation thus,
C + S = Y .....(5)
C + I = Y .....(6)
Subtract equation 6 from equation 5,
Thus, C + S = Y

$$\frac{-C+I=Y}{S-I=0} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(7)$$

We should note that both savings and investment are residuals of income. Although the classical economists hold the view that S = I because they believed that whatever was not spent on consumer goods was actually saved. We modern economists however, do not, accept the notion that S = I because it is our belief that not all the money saved is consequently invested; more so that the decisions to invest and save are taken by two different sets of people and with different aims. For instance, while people save for future consumption or to bequeath, entrepreneurs invest in order to earn profit. The only thing that these two sets have in common is that the rate of interest plays a dominant role in determining the level of each. While the rate of interest varies directly as the level of savings i.e. r and S, thus resulting in a positively sloped linear graph, the level of investment varies inversely as the rate of interest i.e. r and i/T and hence, the attendant negatively sloped linear graph. If we superimpose one on the other, just like in the case of demand and supply, we shall have the diagram below which shows the savingsinvestment equality.

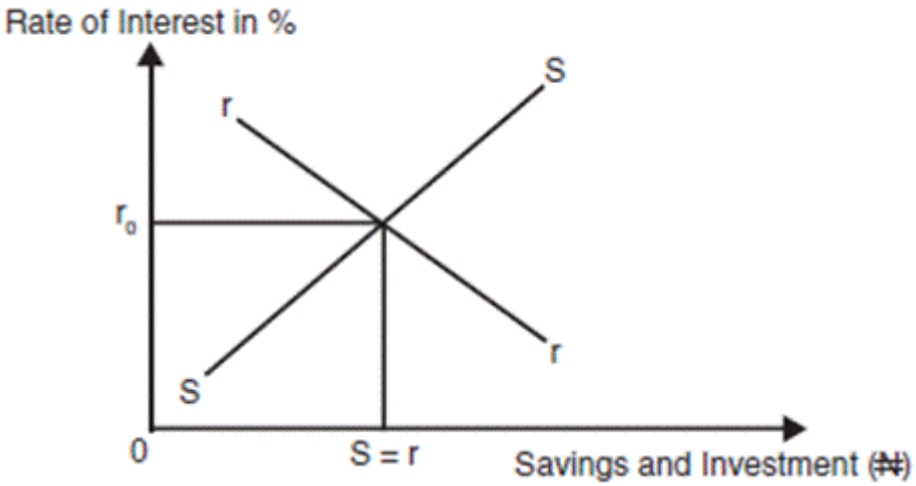


Figure 11.10 Savings-investment equality

Equation 1 shows that total income available to the society at a particular time equals the total volume of goods consumed, together with the amount of money saved in the banks. Equation 2, on the other hand, shows that total income available in the society at a particular time equals the total volume of goods produced in the society for consumption plus the total volume of investment that takes place within the society at the period under discussion.

Table 11.3 Savings and Investment Function

Income ₦'000	Savings ₦'000	Investment ₦'000	Movement of Income
60	20	10	)
120	0	20	)
180	20	30	)Expansion
240	40	40	Equilibrium
300	60	50	)
360	80	60	)
420	100	70	)Contraction
480	120	80	)
540	140	90	)
600	160	100	)

11.8 Determination of the Equilibrium Level of Income

From elementary economic theory, we know that the economy will be in equilibrium when total spending (consumption) equals total output. In other words, all goods and services produced in an economy must be equally bought, hence we can say that at the equilibrium level of income, aggregate demand equals aggregate supply. (Agg. dd. = Agg. ss.)

Given the above explanation then, an equilibrium level of income will be attained when Y = C + I since supply is an offshoot of investment and aggregate demand arises from consumption

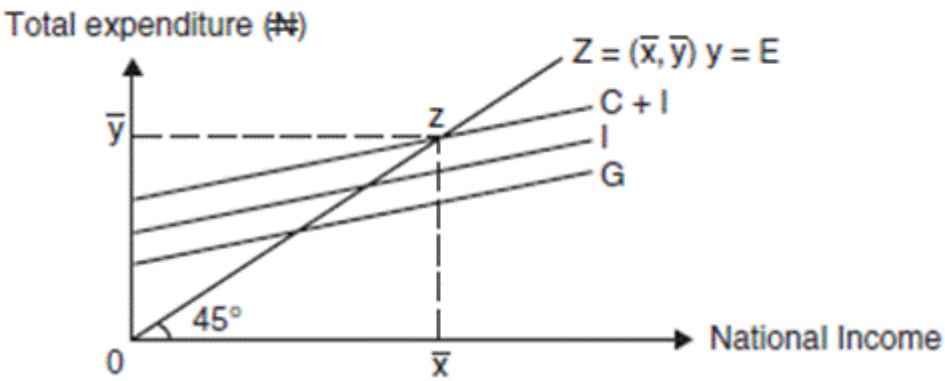


Figure 11.11 Equilibrium level of Income

From our illustration, the level of consumption expenditure plus investment lies above the consumption function. In fact, it is also parallel to it. This is because the investment function is parallel to the consumption function. The equilibrium point signifies that spending is maximised. It is thus, the point of intersection of C + I schedule with the 45-degree line. This is the point Z = (X, Y) in the above diagram. While the total level of output is represented by the 45-degree line, (hence, the aggregate supply), the aggregate demand is represented by C + I.

Therefore, at the point Z, expenditure (E) equals income (Y). That is, F = Y.

We can increase the level of demand by introducing government purchases (G) into our analysis.

This is to ensure full employment. Under this situation, we shall have Y = C + I + G which can be depicted as Figure 11.12.

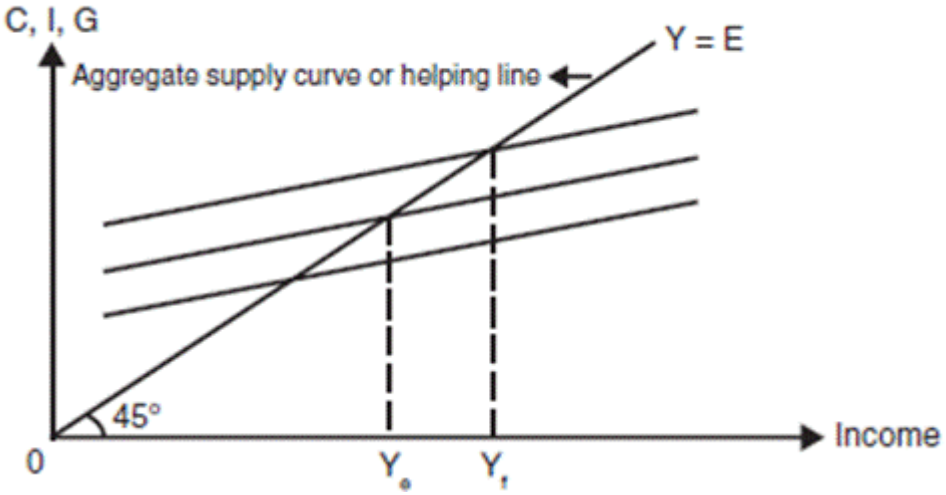


Figure 11.12 Full Employment

The point E now depicts the new level of equilibrium income. It is possible to determine the equilibrium level of income, using the savings and investment function (see table 11.3 for example). The economic implication of the table is that as long as investment is greater than savings, income will continue to increase until the equilibrium level of income i.e. N240 is attained. Where S = I = N40,000 each. After this point (see Fig. 11. 13 below), savings exceeds investment; and the equilibrium is reached when income contracts and again reaches N240. Let us demonstrate this situation graphically.

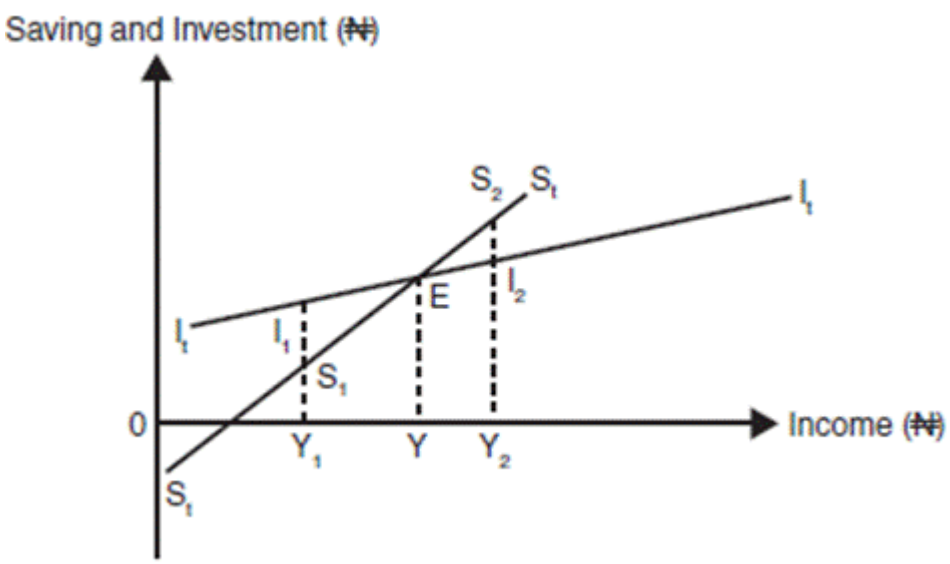


Figure 11.13 Savings exceeds Investment

S_tS_t is the savings curve and I_tI_t the investment curve. The equilibrium level of income is at the point of E, where $S_t = I_t$. whichever of these two methods is used, we would always arrive at the same point.

Example

Given autonomous consumption as N20 m and the marginal propensity to save as 0.20, investment expenditure N100 m and government spending as

N120 m;
(i) Calculate the equilibrium level of income;
(ii) Assuming that government expenditure is reduced by N20 m, calculate the new equilibrium level of income;
(iii) If the marginal propensity to save now increases to 25% while all other variables remain unaffected, calculate the equilibrium level of income;
(iv) Using the information in (iii) above and investment expenditure increased to N10 m, find the equilibrium income;
(v) Derive and find the value of investment multiplier.
(vi) What is the effect of this on the national income?
(vii) Will your result have been the same if investment expenditure was reduced by N20 m instead of N10 m?

Solution

(i) Since government expenditure is involved, then we have:
Y = C + I + G
but C = a + bY
a = 20; b = MPC = 1 â€“ MPS.
since MPS = 0.20 then MPC = 0.80
C = N20 m + 0.80 Y
I = N100 m
G = N120 m
Y â€“ 0.80Y = 20 + 100 + 120

$$0.20Y = 240$$

$$Y = \frac{240}{0.20}$$

$$= 240 \times \frac{100}{20}$$

$$Y = ₦1200 \text{ m.}$$

(ii) Initial government expenditure = N120m. If it is now reduced by N20 m, then

G = N(120 âˆ’ 20)m.

From $Y = C + I + G.$

$$Y = 20 + 0.80Y + 100 + 100$$

$$Y - 0.80Y = 220$$

$$0.20Y = 220$$

$$Y = \frac{220 \times 100}{20}$$

$$Y = ₦1100 \text{ m}$$

(iii) If the â€˜marginal propensity to saveâ€™ has increased to 0.25, then the â€˜marginal propensity to consumeâ€™ will be 0.75.

$$Y = 20 + 0.75Y + 100 + 120$$
$$Y - 0.75Y = 240$$
$$0.25Y = 240$$
$$= \frac{240 \times 100}{25}$$
$$Y = ₦960 \text{ m.}$$

(iv) If investment has increased to N110 m, and the â€˜marginal propensity to consumeâ€™ equals 0.75, then:

$$Y = 20 + 0.75Y + 110 + 120$$
$$Y = 0.75Y + 250$$
$$Y - 0.75Y = 250$$
$$0.25Y = 250$$
$$Y = \frac{250 \times 100}{25}$$
$$Y = ₦1000 \text{ m}$$

(v) Let us represent change in investment by Î”I and Y by C + I + G.

$$\text{Then, } Y = C + I + G \ldots\ldots\ldots\ldots\ldots\ldots(1)$$
$$Y = a + bY + I + G \ldots\ldots\ldots\ldots\ldots\ldots(2)$$
$$Y - bY = a + I + G \ldots\ldots\ldots\ldots\ldots\ldots(3)$$
$$Y(1 - b) = a + I + G \ldots\ldots\ldots\ldots\ldots\ldots(4)$$
$$Y = \frac{1}{1 - b}(a + I + G) \ldots\ldots\ldots\ldots\ldots\ldots(5)$$

There is now an increase in investment i.e. Î”I which will definitely lead to Î”Y.

Thus, Y + Î”Y = a + bY + I + Î”I + G (6)

$$Y + \Delta Y = \frac{1}{1 - b}(a + I + \Delta I + G) \ldots\ldots(7)$$

Subtracting equation 5 from 7 leaves us with

$$\Delta Y = \frac{1}{1-b}\Delta I$$

$$\Delta Y = \frac{1}{MPS}\Delta I$$

$$K = \frac{\Delta Y}{\Delta I} = \frac{1}{MPS}$$

Since MPC = 0.80; then MPS = 0.20 since MPS + MPC must add up to unity.

$$K = \frac{\Delta Y}{\Delta I} = \frac{1}{0.20} = \frac{1}{\frac{20}{100}} = \frac{100}{20}$$

Investment multiplier = 5.

(vi) The value of investment multiplier is 5, while the change in investment spending is N10 million. The effect is, therefore, that national income will increase by N(10 Ã— 5) million = N50 million.

(vii) If investment expenditure was reduced by N20 m, then national income would have reduced by N(20 Ã— 5) million, that is N100 million. Where the economy is open, we have imports and exports. Let us represent import and export by M and E, respectively.

Then,

Y = C + I + G + E â€“ M

If we know the values of E, M and all the other variables, then, we can find the equilibrium level of income.

Summary

This chapter examined the elementary theory of income determination, under which the following were examined:

The circular flow of income and product

This is the process whereby money passes from households to firms in return for goods and services produced by the firms; and money passes from firms to households in return for factor services provided for the firms. There are three basic assumptions usually made in the theory of circular flow of income. These are:

(i) There are only two sectors in the economy, namely (a) the household and (b) the firms;

(ii) The economy is closed, hence no foreign trade is involved;

(iii) The households spend all their money as soon as it is received while the firm

also sells all its outputs directly to the household.

The consumption function and propensity to consume

This shows the various amounts that will be spent on consumption at different levels of income. It is symbolically represented as: C = a + By

The average propensity to consume: This propensity is that proportion of total income that is spent on consumption, and it is symbolically represented as

$$APC = \frac{C}{Y}.$$ Its value is usually less than one.

The marginal propensity to consume: This measures the relationship between changes in consumption and changes in income. Symbolically it is

$$MPC = \frac{\Delta C}{\Delta Y}$$ and with the condition 0 < MPC < 1.

The marginal propensity to save: This measures the relationship between changes in savings and changes in income. That is,

$$MPS = \frac{\Delta S}{\Delta Y},$$ with the condition 0 < MPS < 1.

But MPC + MPS = 1. The marginal propensity to consume and the marginal propensity to save are usually constant for all levels of income.

Importance of the marginal propensity to consume

The marginal propensity to consume is important because: It is useful in calculating the multiplier effect; it fills the gap between income and consumption and when income falls, the marginal propensity to consume falls but more than the average propensity to consume.

Determinants of the marginal propensity to consume

The determinants of the marginal propensity to consume are: changes in income, attitude towards savings, changes in fiscal policy, changes in the rate of interest, future expectations, financial policies of corporations or companies.

Savings

(i) Savings is defined as that part of household income which is not used to purchase goods and services or to pay taxes. It is represented as: S_t = Y_t â€“ C_t

(ii) Along the helping or 45-degree line, income equals consumption expenditure.

Derivation of savings function

If C = a + bY

Then S = âˆ’a + (1 â€“ b)Y.

Since Y = C + S

It means that:

Y = a + bY + (1 â€“ b)Y â€“ a

Y = a + bY + Y â€“ bY â€“ a

Y = Y

Investment

(i) This is defined as addition to capital. It is not synonymous to transfers.

Investment increases the level of a countryâ€™s wealth, and it leads to increased output and employment.

Types of investment

(i) Induced investment

(ii) Autonomous investment

(iii) Replacement investment

Determinants of investment

(i) Rate of interest

(ii) Government policy

(iii) Level of current profit

(iv) Expectations

Elementary theory of multiplier

(i) This is the number by which the changes in investment must be multiplied in order to present us with the resulting change in income.

(ii) Its value is the reciprocal of the marginal propensity to save. That is,

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

Equality of savings and investment functions

Y = C + S .....(1)

Y = C + I .....(2)

Solve the two equations simultaneously. Thus, S = I

Determination of the equilibrium level of income

(i) The income is at equilibrium when expenditure equals income. That is, E = Y.

(ii) It may also be determined where S = I

Class Activities

(i) The teacher should not only draw diagrams showing the two major sectors of the economy but should also explain the relationship between them properly to students. Students should define the important key concepts learnt in this chapter.

(ii) The teacher should explain the concept of investment multiplier and then use numerical examples to demonstrate its importance to the growth of national income.

Revision Questions

Objective Questions

1. Which of the following is not a determinant of investment ?

(a) Rate of interest

(b) Government policy

(c) Expectations

(d) Induced investment

2. The following except one are the types of Investment

(a) Induced investment

(b) Economic factor investment

(c) Autonomous investment

(d) Replacement investment

3. One of the determinants of consumption function is

(a) Change in income

(b) Attitude towards saving

(c) Change in fiscal policy

(d) All of the above

4. MPS + MPC = ?

(a) 0

(b) 1

(c) 6

(d) 9

5. Change in consumption divided by change in income gives ---

(a) Multiplier

(b) Marginal propensity to consume

(c) Marginal propensity to save

(d) All of the above

Essay Questions

1. Define the term â€˜consumption functionâ€™. Are there differences between the average propensity to consume and the marginal propensity to consume?

If yes, outline such differences.

2. What is an investment? Is induced investment synonymous with autonomous investment? Discuss the determinants of investment.

3. (a) Explain the concepts of the multiplier.

(b) Confirm the statement that â€˜the lower the marginal propensity to consume, the lower the value of the multiplierâ€™.

4. (a) State the differences between the marginal propensity to consume and the income elasticity of demand.

(b) Prove that the value of investment multiplier is equal to that of the government multiplier.

(c) Assuming there is a closed economy where autonomous investment is #60m; calculate consumption expenditure if K = 5 and Y = 130.

5. (a) If C = 20 + 0.75Y, show that S = âˆ’20 + 0.025Y.

(b) Show that MPC + MPS = 1

(c) Distinguish between the factors that determine consumption and investment levels.

(d) Illustrate the circular flow of income and describe its workings.

Glossary

Consumption function: This is a schedule showing the various amounts that will be spent on consumption at different levels of income.

Autonomous consumption: This is defined as the minimum level of consumption that must take place even when the level of disposable income in the economy is zero.

Marginal propensity to consume: This is the relationship existing between changes in consumption and changes in income.

Marginal propensity to save: This is the ratio of change in savings to change in income.

Savings: This is defined as the excess of current income over current consumption expenditure.

Investment: This is the current sacrifice made with the prospect of future gain.