Multiplier and Accelerator
(Determination of National Income Continued)

THE MULTIPLIER:

Keynes' Multiplier Theory gives great importance to increase in public investment and government spending for raising the level of income and employment. Both consumption and investment create employment. But both have complementary relationship with one another. When investment increases, consumption increases too and helps in creating employment. It is only when the level of full employment has been reached that investment and consumption become competitive instead of being complementary; then increase in one will reduce the other, one will be at the expense of the other.

Kahn's Employment Multiplier:

Kahn's Multiplier is known as Employment Multiplier, and Keynes' Multiplier is known as Investment Multiplier. According to Kahn's Employment Multiplier, when government undertakes public works like roads, railways, irrigation works then people get employment. This is initial or primary employment. These people then spend their income on consumption goods. As a result, demand for consumption goods increases, which leads to increase in the output of concerned industries which provides further employment to more people. But the process does not end here. The entrepreneurs and workers in such industries, in which investment has been made, also spend their newly obtained income which results in increasing output and employment opportunities. In this way, we see that the total employment so generated is many times more than the primary employment.

Suppose the government employs 300,000 persons on public works and, as a result of increase in consumer goods, 600,000 more persons get employment in the concerned industries. In this way, 900,000 persons have been able to get employment, that is, three times more people are now employed. In other words, Kahn's employment multiplier means that by the government undertaking public works many more times total employment is provided as compared with initial employment.

Keynes' Income or Investment Multiplier:

Keynes' income multiplier tells us that a given increase in investment ultimately creates total income which is many times the initial increases in income resulting from that investment. That is why it is called income multiplier or investment multiplier. Income multiplier indicates how many times the total income increases by a given initial investment.

Suppose Rs. 100 million are invested in public works and as a result there is an increase of Rs. 300 million in income. In this case, income has been increased 3 times, i.e., the multiplier is 3. If ΔI represents increase in investment, ΔY indicates increase in income and K is the multiplier, then the equation of multiplier is as follows:

$$K = \frac{\Delta Y}{\Delta I} \text{ ----------------------------------- (i)}$$

The multiplier is the numerical co-efficient showing how large an increase in income will result from each increase in investment. The multiplier is the number by which the change in investment must be multiplied in order to get the resulting change in income. It is the ratio of change in income to the change in investment. If an investment of Rs. 50 million increases income by Rs. 150 million, the income multiplier is 3 and if Rs. 200 million, the multiplier is 4 and so on.

In the following multiplier equation, the relationship between income and investment is determined through marginal propensity to consume:

$$K = \frac{1}{1 - mpc} \text{ -------------------------------------(ii)}$$

Where:

$$1 - mpc = mps$$

(mps: Marginal Propensity to Save)

Therefore, the third multiplier equation is:

$$K = \frac{1}{mps} \text{ ---------------------------------------(iii)}$$

It should be noted that the size of multiplier varies directly with the size of mpc. When the mpc is high, the multiplier is high and when the mpc is low, the multiplier is also low.

The multiplier works not only in money terms but also in real terms. In other words, the increase in income takes place not only in the form of money but in the form of goods and services.

Example 1:
mpc is ¾
Initial investment is Rs. 1,000 million

Required:
    (a) Multiplier,
    (b) Marginal propensity to save,
    (c) Increase in the level of national income, and
    (d) Conclusion.

Solution:
(a) Multiplier (*K*):

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

$$K = \frac{1}{1-\left(\frac{3}{4}\right)} = 4$$

(b) Marginal Propensity to Save (mps):

$$mps = 1-mpc$$

$$= 1 - \frac{3}{4}$$

$$= \frac{1}{4}$$

(c) Increase in the level of NI:

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

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

$$\Delta Y = 1000 \times 4$$

$$\Delta Y = 4000$$

(d) Conclusion:

From the above example, we can see that with an initial primary investment of Rs. 1,000 million, with an mpc at ¾ and multiplier at 4, gives rise to an increase of Rs. 4,000 million in the level of national income.

Example 2:

Calculate mpc, mps and multiplier (K):

mpc	mps	K
4/6	?	?
½	?	?
?	¼	4
?	1/7	?
1	?	?
0	?	?

Solution:

$$mpc = 1-mps; \ mps = 1-mpc; \ K = \frac{1}{1-mps}; \ K = \frac{1}{mps}$$

mpc	mps	K

4/6	$\frac{2}{6}\left(1-\frac{4}{6}\right)$	$3\left(\frac{1}{1-\frac{4}{6}}\right)$
½	$\frac{1}{2}\left(1-\frac{1}{2}\right)$	$2\left(\frac{1}{1-\frac{1}{2}}\right)$
$\frac{3}{4}\left(1-\frac{1}{4}\right)$	¼	4
$\frac{6}{7}\left(1-\frac{1}{7}\right)$	1/7	$7\left(\frac{1}{1-\frac{6}{7}}\right)$
1	0	α (infinity)[*]
0	1	1[**]

[*] If the mpc is 1, the mps will be zero and the multiplier will be infinity; and a given dose of investment (let say, Rs. 1,000 million) will automatically create full employment.

[**] If the mpc is 0, the mps will be 1 and the multiplier will be 1 so that total increase in income will just equal the increase in primary investment.

Keynes multiplier theory is also very helpful in the determination of national income. In his book, *'General Theory of Employment, Interest and Money'*, he has contradicted the viewpoint of the classical economists. He is of the opinion that if an economy operates at a level of equilibrium it is not necessary that there should be a high level of employment in a country. It is just possible that there may be millions of people unemployed. So according to Keynes, if any country wishes to achieve level of employment, it can only do so through the changes in the magnitude of investment.

According to Keynes' theory, there are two main methods of measuring the equilibrium level of NI, i.e.:

(a) The AD-AS Approach, and

(b) The Saving Investment Approach

(a) AD-AS Approach: For explaining the determination of level of income in a two-sector economy, we assume an economy in which there is no international trade, no government role and in which corporations retain no earnings. In this simplest model of economy, the level of income is determined at a point where the AD intersects the AS. It is depicted as below:
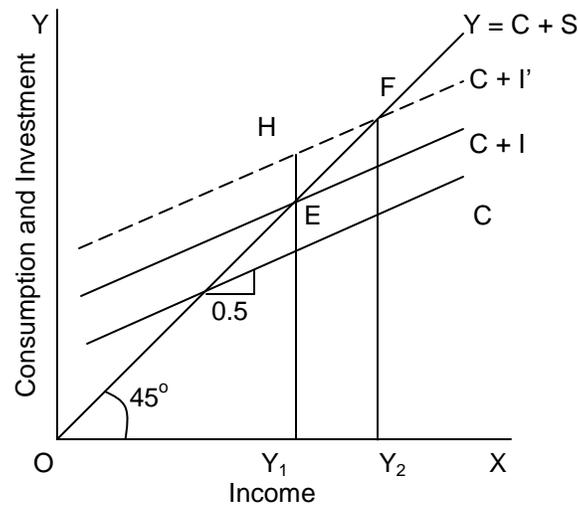

Figure 1 – Multiplier Effect (a)

In the above diagram, the national income is determined at the point where AD curve (C+I) cuts the AS curve (C+S), i.e., at E. The multiplier effect is also shown in this diagram. The curve C represents the mpc which is assumed to be ½. That is why the slope of curve C is 0.5. Since the AD curve (C + I) cuts the 45° angle line at E, OY_1 is the level of income determined. If now investment is increased to EH (ΔI) we can find out the increase in income (ΔY). As a result of investment EH, the AD curve shifts upwards to C + I'. This new AD curve cuts the AS curve (45° angle line) at F, so that OY_2 income is determined. Thus, income increases by Y_1Y_2 as a result of investment increase of EH, which (Y_1Y_2) is double of EH.

It is clear, therefore, that the multiplier is 2. It is also calculated as below:

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

$$K = \frac{1}{1 - \frac{1}{2}}$$

$$K = 2$$

(b) <u>**Saving-Investment Approach:**</u> In order to simplify the analysis of income determination we imagine an economy (1) where there are no taxes levied by the government, (2) the corporations retain no earnings, and (3) there are no changes in the level of prices. The equilibrium level of NI is determined at a point where planned or intended saving is equal to planned or intended investment, or in other words, where the saving intersect the investment. It is further explained with the help of following diagram:
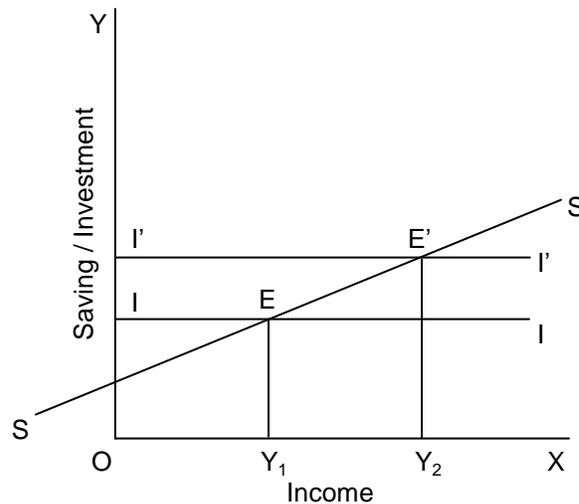

Figure 2 – Multiplier Effect (b)

The above diagram shows the multiplier effect of an increase in investment on the equilibrium level of income. SS is the supply curve and II is the investment curve showing the total level of investment of OI. These two curves intersect each other at the equilibrium point E where is income is OY_1. If now there is a change in investment from OI to OI', i.e., an increase of II', then the II curve will shift to the position of I'I' and the two curves I'I' and SS intersect each other at the new equilibrium point E', where the income is OY_2. Now it is clear that when mps is ½, an increase in investment by II' (let say Rs. 10 million) has led to the increase in income by Y_1Y_2 (let say Rs. 30 million). Obviously the value of the multiplier is equal to 3.

Limitations of Multiplier:

   (a) <u>**Efficiency of production:**</u> If the production system of the country cannot cope with increased demand for consumption goods and make them readily available, the incomes generated will not be spent as visualised. As a result, the mpc may decline.

   (b) <u>**Regular investment:**</u> The value of the multiplier will also depend on regularly repeated investments. A steadily increasing investment is essential to maintain the tempo of economic activity.

   (c) <u>**Multiplier period:**</u> Successive doses of investment must be injected at suitable intervals if the multiplier effect is not to be lost.

(d) Full employment ceiling: As soon as full employment of the idle resources is achieved, further beneficial effect of the multiplier will practically cease.

Leakages of Income Stream and Their Effect on the Multiplier:
As we know that as income increases, consumption does not increase to the same extent or proportionately, because a part of the income is saved. The part of the income that is saved is as if a leakage from the flow of income stream. These leakages obstruct the growth of national income. In the absence of these leakages, mpc would have been unity. The consumption expenditure would have increased 100 per cent of the increase in income and there would have been full employment. The following are the principal leakages:

(a) Paying off debts: It generally happens that a person has to pay a debt to a bank or to another person. A part of his income goes out in repaying such debts and is not utilised either in consumption or in productive activity. Income used to pay off debts disappears from the income stream. If, however, the creditor uses this amount in buying consumer goods or in some productive activity, then this sum will generate some income, otherwise not.

(b) Idle cash balances: It is well known that people keep with them ready cash which is neither used productively nor in purchasing consumer goods. Keynes has mentioned three motives for holding ready cash for liquidity preference, viz., transactions motive, precautionary motive and speculative motive. This means that the re-spent part of income goes on decreasing. In this way, a part of the initial expenditure leaks out of the income stream.

(c) Imports: The part of the money spent by country for importing goods also leaks out of the country's income stream. It does not encourage or support any business or industry in the country. This is specially so if the imports do not help the trade and industry of the country or if they are not used for export promotion. The net import is a leakage.

(d) Purchase of existing securities: Some people purchase securities (saving certificates) from others and the seller of securities can hoard this money. This money also leaks out of the income stream. This may also be valid in case of purchase of shares, debentures, bonds, insurance policy, or some other financial investment. If this invested money is not used in productive areas, there will be a leakage in the income stream.

(e) Price inflation: Inflationary situation is also responsible for leakage. In such a situation, investment does not help in generating employment or increasing income. If there is already full employment in the country, increase in investment, far from increasing demand for consumer goods, it decreases it as a result of which employment in the consumer goods industries contracts and

demand for capital goods decreases. Whatever increase in income there is, it is spent in high prices and it does not help in creating income and employment.

As a result of leakages of income from the main income stream of the country, the multiplier effect of the primary or initial investment in increasing income is reduced. If somehow these leakages are plugged, the multiplier effect of investment in generating income and employment would increase. If they cannot be plugged altogether, they should be reduced or the propensity to consume should be increased or propensity to save should be reduced, otherwise the new investment will not have full effect in increasing income and employment.

Importance of Multiplier:
Keynes' principle of multiplier has a great role in removing the Great Depression of 1929-34. These days governments are actively interfere in the economic affairs of the community through multiplier. Its importance is further explained as below:

1. The multiplier principle *focuses on the importance of public investment*, which is the key to remove unemployment during the days of depression. An investment of Rs. 1 million can create income and employment worth many times, and can help the government to remove unemployment from the country.

2. During the days of depression, the private entrepreneurs are discouraged to invest in the economy. Therefore, to fill this gap, *the government comes forward and undertakes the investment* in her own hands. Hence, the demand for consumer goods increases and also the level of NI and employment increases on account of the working of the multiplier.

3. When the demand for goods increases and incomes rise owing to government investment, the *profit expectations of the entrepreneurs go up* and as a result the MEC rises.

4. When the government makes investment in public works to fight depression and unemployment, *private investment is encouraged* on account of the operation of the multiplier. The confidence of private investors is restored, and hence helps in further removing the economic depression of the country.

Assumptions of Multiplier:
The following certain essential conditions / assumptions for the operation of multiplier:

1. *The supply curve of output should be elastic.* In other words, when demand for certain goods or services increases, its supply can be increased without much difficulty.

2. *There is excess productive capacity in consumer goods industries*, so that the supply of goods can be easily increased when demand increases.

3. **The supply of raw materials and working capital should also be elastic.**

4. **There should be 'involuntary unemployment'.** That is, there are people who want work at the prevailing wage rate, but are not getting it.

Criticism on Keynes' Multiplier Theory:
Many economists including the classical economists and the economists from third world countries have strongly criticise the Keynes' Multiplier Theory. It is explained in brief as below:

1. Keynes' multiplier theory assumes that the supply of output, raw materials and working capital is elastic, i.e., it can be increased whenever required. But, according to critics, this condition cannot be fulfilled in an under-developed country (UDC), where there is a continuous vicious cycle of poverty. The whole economy is based on agriculture, and there is a dearth of capital equipment, skill labour and technology. **The existing industries cannot fulfil the increased demand. Moreover, the government is so poor to invest in public works.**

2. According to Keynes' multiplier theory, there is excess productive capacity in consumer goods industries. But according to critics, **there is a little excess productive capacity in poor countries**; therefore, this theory cannot be applied to UDCs.

3. Another condition of Keynes' theory is that there should be *'involuntary unemployment'*. That is, there are people who want work at the prevailing wage rate, but are not getting it. Whereas, **in UDCs, there is 'disguised unemployment'**, and most of the workers are self-employed, therefore, this condition cannot be fulfilled in such countries.

4. According to critics, **this theory can only be applied to economically advanced and highly industrialised countries, and cannot be applied to under-developed countries**, which are pre-dominantly agricultural countries. In UDCs, the heavy plant and machineries, and skilled labour are not easily available and the supply cannot be increased quickly.

THE ACCELERATOR:
The multiplier describes the relationship between investment and income, i.e., the effect of investment on income. The multiplier concept is concerned with original investment as a stimulus to consumption and thereby to income and employment. But in this concept, we are not concerned about the effect of income on investment. This effect is covered by the *'accelerator'*. The term *'accelerator'* should not be confused with the accelerator in cars. It does not make the investment to grow faster and faster.

The term *'accelerator'* is associated with the name of J.M. Clark in the year 1914. it has been proved a powerful tool of economic analysis since then. Keynes, astonishingly, has

altogether ignored this concept. That is why, the concept of accelerator is not considered the part of Keynesian theory.

According the principle of accelerator, when income increases, people's spending power increases; their consumption increases and consequently the demand for consumer goods increases. In order to meet this enhanced demand, investment must increase to raise the productive capacity of the community. Initially, however, the increased demand will be met by over-working the existing plants and machinery. All this leads to increase in profits which will induce entrepreneurs to expand their plants by increasing their investments. Thus a rise in income leads to a further induced investment. The accelerator is the numerical value of the relation between an increase in income and the resulting increase in investment.

(Figures in Rs. '000)

Years	Demand	Required Stock of Capital	Replacement Cost	Net Investment	Gross Investment
2007	500	5 machines 1500	1 machine 300	0 machine	300
2008	500	5 machines 1500	1 machine 300	0 machine	300
2009	800	8 machines 2400	1 machine 300	3 machines 900	1200
2010	1000	10 machines 3000	1 machine 300	2 machines 600	900
2011	1000	10 machines 3000	1 machine 300	0 machine	300
2012	800	8 machines 2400	1 machine 300	− 2 machines 600	− 300

Cost per machine: Rs. 300,000 per machine

In the above example, suppose we are living in a world, where the only commodity produced is cloth. Further suppose that to produce cloth Rs. 100,000, we require one machine worth Rs. 300,000, which means that the value of the accelerator is 3 (i.e., the capital-output ratio is 1:3). That is, if demand rises by Rs. 100,000, additional investment worth Rs. 300,000 takes place. If the existing level of demand for cloth remains constant, let us say, at Rs. 500,000, then to produce this much cloth we need five machines worth Rs. 1.5 million. At the end of one year, let us suppose, that one machine becomes useless as a result of wear and tear, so that at the end of one year, a gross investment of Rs. 300,000 must take place to replace the old machine in order that the stock of capital is capable of producing output worth Rs. 500,000.

In the third period, i.e., the year 2009, demand rises to Rs. 800,000. To produce output worth Rs. 800,000, we need 8 machines. But our previous stock consisted of only 5 machines. Thus if we are to produce output worth Rs. 800,000, we must install 3 new machines, worth Rs. 900,000. The net investment for the year 2009 will be Rs. 900,000

and with the replacement cost of one machine Rs. 300,000, our gross investment jumps from Rs. 300,000 in the year 2008 to Rs. 1.2 million in the year 2009. A 60 per cent increase in demand led to a 400 per cent increase in gross investment. Here we have a glimpse of the powerful destabilising role of accelerator.

Assumptions of the Accelerator:

1. Under the principle of accelerator, it is assumed that **there is no excess capacity existing in the consumer goods industries**. No machines are lying idle and shift working is not possible.

2. **In capital goods industries, it has been assumed that there is an existence of surplus capacity.** If there is no excess capacity in capital goods industries, increased demand for machines could not lead to increase in the supply of machines.

3. **Output is flexible.** The machine-making industry or capital goods industry can increase its output whenever desired.

4. **The size of the accelerator does not remain constant over time.** It value will be affected by the businessmen's calculations regarding the profitability of installing new plants to make more machines on the basis of their probable working life.

5. **The demand for machines will remain stable in the future,** although the increase in demand has suddenly cropped up.