

Investment Function

The investment function refers to investment-interest rate relationship. There is a functional and inverse relationship between rate of interest and investment. The investment function slopes downward. Symbolically,

$$I = f(r)$$

where, I = Investment (Dependent variable)

r = Rate of interest (Independent variable)

Meaning of Investment:

In ordinary parlance, investment means to buy shares, stocks, bonds and securities which already exist in stock market. But this is not real investment because it is simply a transfer of existing assets. Hence this is called financial investment which does not affect aggregate spending.

In Keynesian terminology, investment refers to real investment which adds to capital equipment. It leads to increase in the levels of income and production by increasing the production and purchase of capital goods. Investment thus includes new plant and equipment, construction of public works like dams, roads, buildings, etc., net foreign investment, inventories and stocks and shares of new companies.

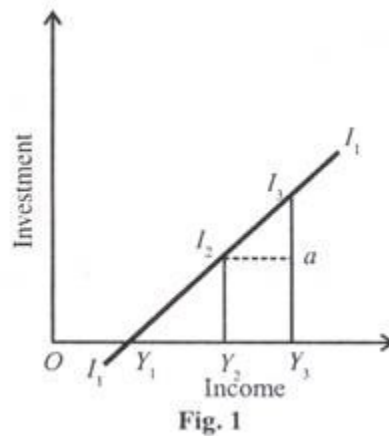
Symbolically, let I be investment and K be capital in year t, then $I_t = K_t - K_{t-1}$.

2. Types of Investment:

1. Induced Investment:

Real investment may be induced. Induced investment is profit or income motivated. Factors like prices, wages and interest changes which affect profits influence induced investment. Similarly demand also influences it. When income

increases, consumption demand also increases and to meet this, investment increases. In the ultimate analysis, induced investment is a function of income i.e., $I = f(Y)$. It is income elastic. It increases or decreases with the rise or fall in income, as shown in Figure 1.



I_1 I_1 is the investment curve which shows induced investment at various levels of income. Induced investment is zero at OY_1 income. When income rises to OY_3 induced investment is I_3Y_3 . A fall in income to OY_2 also reduces induced investment to I_2Y_2 .

2. Autonomous Investment:

Autonomous investment is independent of the level of income and is thus income inelastic. It is influenced by exogenous factors like innovations, inventions, growth of population and labour force, researches, social and legal institutions, weather changes, war, revolution, etc. But it is not influenced by changes in demand. Rather, it influences the demand. Investment in economic and social overheads whether made by the government or the private enterprise is autonomous.

Such investment includes expenditure on building dams, roads, canals, schools, hospitals, etc. Since investment on these projects is generally associated with public policy, autonomous investment is regarded as public investment. In the

long-run, private investment of all types may be autonomous because it is influenced by exogenous factors. Diagrammatically, autonomous investment is shown as a curve parallel to the horizontal axis as I_1I_1' curve in Figure 2. It indicates that at all levels of income, the amount of investment OI_1 remains constant.

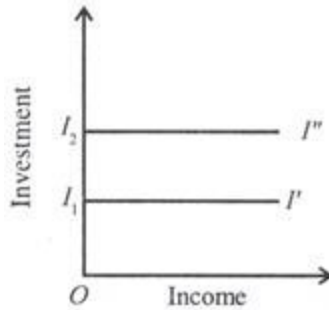


Fig. 2

The upward shift of the curve to I_2I_2' indicates an increased steady flow of investment at a constant rate OI_2 at various levels of income.

Determinants of Investment

Investment is determined by the MEC and rate of interest.

Marginal Efficiency of Capital (MEC)

The marginal efficiency of capital is the highest rate of return expected from an additional unit of a capital asset over its cost. If the rate of return on any prospective investment is greater than the cost of investment, the entrepreneur is bound to make the investment and vice versa. Thus, Marginal efficiency of a given capital asset is the highest return that can be yielded from the additional unit of that capital asset.

Keynes defined MEC as 'The rate of discount which makes the present value of the prospective yield from the capital asset equal to its supply price'.

i.e. Supply Price = Discounted Prospective Yield

It depends upon two factors:

1. Prospective yield to additional capital goods – it is the total net return expected from the capital asset over its lifetime.
2. their supply price or replacement cost

MEC is the ratio of these two elements.

Value of MEC can be found with the following equation:

$$SP = R_1 / (1+i) + R_2 / (1+i)^2 + R_3 / (1+i)^3 + \dots + R_n / (1+i)^n$$

Where, SP is supply price, R_1, R_2, \dots, R_n are the annual prospective yields from the capital assets and i is the rate of discount or the MEC.

MEC as a rate of discount can be understood from the following example. Let SP = Rs.3000 of an asset. Its life is 2 years and it is expected to yield an income of Rs. 1100 in the first year and Rs. 2420 in the second year. After substituting these values in the above formula and solving for i , we get $i = 10\%$.

Thus, MEC depends upon the prospective yield and supply price. A fall in prospective yield will lead to lower MEC and vice versa. Given the prospective yield if supply price rises, MEC will fall and vice versa.

Value of Capital Asset:

According to Keynes, value of a capital asset is equal to the sum of the expected prospective yields discounted at the current rate of interest. i.e. –

$$V = R_1 / (1+r) + R_2 / (1+r)^2 + R_3 / (1+r)^3 + \dots + R_n / (1+r)^n$$

Where V is the value of asset, R_1, R_2, \dots, R_n are the annual prospective yields from the capital assets and r is the rate of interest. V is the true present market value of the asset.

Thus,

Present value of the asset = Sum of prospective yields discounted at the rate of interest rate

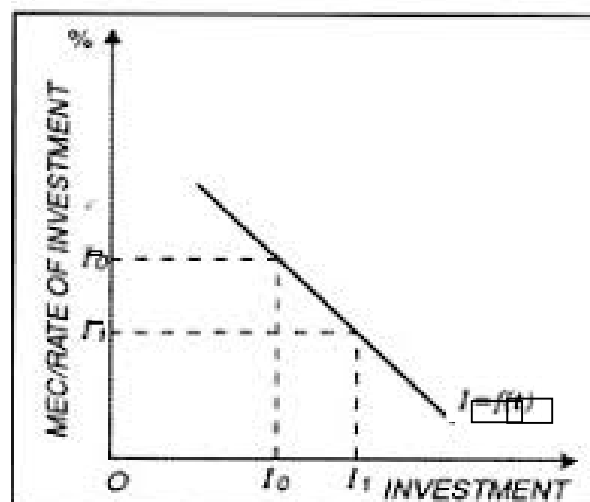
Supply Price = Sum of prospective yield discounted by the marginal efficiency of capital.

If rate of interest < MEC, investment will be profitable, and it will increase.

If rate of interest > MEC, thus investment will decrease because it will not be profitable.

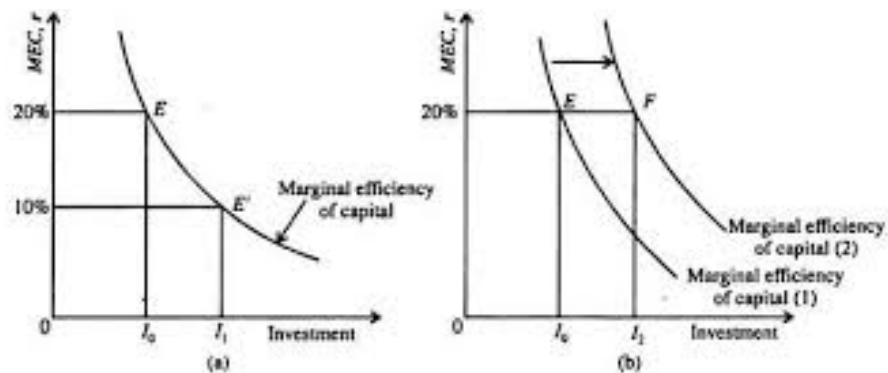
Therefore, equilibrium investment is achieved when rate of interest = MEC.

The following figure shows the MEC curve. It is downward sloping, showing inverse relation between the investment and MEC. Point where MEC is equal to rate of interest, Investment demand is determined.



As capital investment in a capital asset rises, its expected annual returns (R) decline because the prices of goods produced with that asset decline. Also, its supply price rises because demand for the capital asset has increased.

In the following diagram, part (a) shows the relation between MEC, rate of interest and investment. At a point where rate of interest is equal to MEC, investment level will be determined. In order to raise investment, interest rate must fall. However, Keynes observed that interest rate is sticky in the short run, thus, it is constant. Therefore, at a constant rate of interest, investment can increase only when MEC rises i.e. when MEC curve shifts to the right. MEC can increase if the profit expectations rise. As shown in part (b) of the diagram, as MEC shifts to the right investment increases from I_0 to I_1 .



Factors causing shift in MEC:

1. Changes in expectations: A change in profit expectations causes a change in MEC. Animal spirit, which is nothing but the optimism and the pessimism of the businesspersons about future profit, decides the level of investment.
2. Expected demand for products
3. Technology and innovation: The introduction of new improved technology and new products makes it necessary to build new plants or install new capital equipment.
4. User cost of capital: This includes the real rate of interest, rate of depreciation, corporate income tax etc. The lower the user cost, higher will be the returns on the investment and the investment will rise.
5. Availability of credit

6. Fiscal Policy: If the government carries out unproductive expenditure and finances it with the borrowings then it increases the rate of interest crowds out the private investment. But if the government increases the public expenditure on infrastructure that will crowd in the private investment and the gross investment rises.

7. MPC: If MPC rises, MEC rises, too.

Investment Multiplier

The concept of multiplier was first of all developed by F.A. Kahn in the early 1930s. But Keynes later further refined it. F.A. Kahn developed the concept of multiplier with reference to the increase in employment, direct as well as indirect, as a result of initial increase in investment and income.

The essence of multiplier is that total increase in income, output or employment is manifold the original increase in investment. For example, if investment worth Rs. 100 crores is made, then the income will not rise by Rs. 100 crores only but a multiple of it.

The multiplier is the ratio of increment in income to the increment in investment. If ΔI stands for increment in investment and ΔY stands for the resultant increase in income, then multiplier is equal to the ratio of increment in income (ΔY) to the increment in investment (ΔI).

Therefore

$$k = \Delta Y / \Delta I$$

where k stands for multiplier.

We know that –

$$Y = C+S \dots\dots\dots (1)$$

or

$$Y = C+I, \text{ (since } S = I\text{)..... (2)}$$

Thus,

$$\Delta Y = \Delta C + \Delta I\text{..... (3)}$$

In Keynesian consumption function, i.e. –

$$C = a+bY$$

a is constant. Therefore, change in consumption can occur when there is change in income. Thus,

$$\Delta C = b\Delta Y\text{..... (4)}$$

Substituting (4) into (3) we have –

$$\Delta Y = b\Delta Y + \Delta I$$

$$\Delta Y - b\Delta Y = \Delta I$$

$$\Delta Y (1-b) = \Delta I$$

$$\Delta Y = \Delta I$$

=

As b stands for MPC,

$$= k = \frac{1}{1-b}$$

It is clear from above that the size of multiplier depends upon the marginal propensity to consume of the community. The multiplier is the reciprocal of one minus marginal propensity to consume or the reciprocal of marginal propensity to save. Higher the marginal propensity to consume (b) (or lower the marginal

propensity to save), the greater will be the value of multiplier. For example, if marginal propensity to consume (b) is 0.8, investment multiplier is

$$\frac{\Delta Y}{\Delta I} = \frac{1}{1-0.8} = \frac{1}{0.2} = 1 \times \frac{10}{2} = 5$$

If MPC or b = 0.75, multiplier is

$$= \frac{\Delta Y}{\Delta I} = \frac{1}{1-0.75} = \frac{1}{0.25} = \frac{100}{25} = 4$$

Working of the Multiplier:

How a new investment brings about a multiple increase in income by increasing consumption is clear from the following example. This example gives us what may be described as a 'motion picture' of income propagation under certain assumptions.

Assuming the marginal propensity to consume as $\frac{1}{2}$, let us assume further that there is an investment of Rs. 20 crore in public works. The MPC being $\frac{1}{2}$, K (multiplier) will be $[1/1-\frac{1}{2}=2]$ An investment of Rs. 20 crore will increase the total income by Rs. 40 crore.

When an original investment of Rs. 20 crore is made, half of it will be spent on consumption by the income recipients (because MPC = $\frac{1}{2}$, Rs. 10 crore out of Rs. 20 crore will be spent on consumption in the first round).

In the second round, income shall increase by Rs. 10 crore. In the third round, income shall expand by Rs. 5 crore, in the fourth by Rs. 2.5 crore, in the fifth by Rs. 1.25 crore, and so on, till it has increased to Rs. 40 crore, i.e., 2 times the original investment. Thus, we note there is an infinite geometric series of the descending variety, viz., Rs. 20 cr. + Rs. 10 cr. + Rs. 5 cr. + Rs. 2.5 cr. + Rs. 1.25 cr..... and so on adding up to Rs. 40 crore. We see that the multiplier is equal to the ratio of the increase in income to the increase in investment, i.e., Rs. 40cr/20cr = 2. Therefore, the multiplier is 2.

Multiplier Assumptions:

- (i) That there is no change in the marginal propensity to consume during the adjustment process, which remains more or less constant.
- (ii) That there is no induced investment (i.e., accelerator is not operating).
- (iii) That the new higher level of investment is maintained long enough for the completion of the adjustment process.
- (iv) That the output of consumer goods is responsive to effective demand for these.
- (v) That there is complete absence of government activity like taxation or expenditure.
- (vi) That there is no time lag between the receipt of income and its expenditure.
- (vii) That there is a closed economy.

Importance of Multiplier:

1. It established the immense importance of investment as the major dynamic element in the economy. Not only did it indicate the direct creation of employment, it also revealed that income was generated throughout the system like a stone causing ripples in a lake.
2. The knowledge of multiplier is of vital importance during the course of business-cycle studies and for its accurate forecasting and control.
3. It is a useful analytical tool for following suitable employment policies.
4. With the use of this concept, the approach has radically changed from 'no intervention' to the growth of the public sector in practically all the countries of the world.

Leakages in the Working of Multiplier:

We have learnt about the timeless and instantaneous multiplier. But in actual practice the working of the multiplier is affected by a large number of considerations. We see that the whole of the increment in income is not spent on consumption nor is it entirely saved. Therefore, the value of the multiplier is neither one nor infinity. This is because there are several leakages from the income-stream as a result of which the process of income propagation is slowed down.

Important leakages are as follows:

1. Saving:

Saving constitutes an important leakage to the process of income propagation. If the whole of the increment in income was to be spent on consumption (i.e., if MPC is one) then, 'once-for-all' increase in investment would go on creating additional consumption so that the full employment would ensure. This is not the case in actual practice, because a part of the increased income is not spent on consumption but saved and 'peters out' of the income stream, thereby limiting the value of the multiplier. In fact, the whole of saving forms a sort of leakage and higher the propensity to save, the lower is the value of multiplier. Further, for various reasons these savings constitute an important leakage.

2. Debt Repayment:

It has been observed that part of the income received by the people in the economy may be used for paying off old debts to the banks and individuals, who may, in turn, fail to spend. As such, the consumption is not stimulated and the value of the multiplier is thereby reduced.

3. Imports:

If there is an excess of imports over exports, part of the increased income as a result of increased investment will go to increase income in the foreign countries at least in the short period. It is argued that in the long period, the increased income in the foreign countries will go to increase the demand for exports and thus will have beneficial effects on the income of the country importing goods. But this may or may not be the case, as it presupposes free trade. In this way

imports and the money spent on the imported goods constitute an important leakage.

4. Price Inflation:

Price inflation constitutes another important leakage from the income stream of an economy. As long as there is unemployment of resources and factors of production, increase in investment will have expansionary effects. But once that full employment or near full employment of the resources has been attained, increase in investment will go to raise prices and the cost of the factors of production, because at this level the factors of production become scarce and a competition ensues between the consumer goods industries and investment goods industries for securing the scarce resources even at higher prices. Thus, as a result of price inflation a major part of the increased income is dissipated instead of promoting consumption, income and employment.

5. Hoarding:

Hoarding or the tendency of the people to hold idle cash balances forms another leakage. If the people have high liquidity preference and a tendency to keep idle cash balances they will diminish the expenditure on consumption in the economy, thereby restricting the value of the multiplier.

6. Purchase of Stocks and Securities:

Sometimes, people purchase old stocks and securities with the newly created income and do not spend it on increased consumption. Some of them purchase new insurance policies. Thus, this type of financial investment severely restricts the value of the multiplier, as the increased incomes, instead of being spent on consumption, are spent on nominal (not real) investments.

All these factors constitute potential leakage from the income stream resulting from an expansion of new investment. This new income under such circumstances, does not give rise to secondary consumption expenditures. It is, therefore, highly desirable that to have the desired results of multiplier, these leakages should be plugged. To the extent these leakages from the income stream can be controlled, the original increase in investment will have greater multiplier effects.

Criticism:

The main points of criticism against the concept of multiplier as given by Keynes are that:

- (i) It assumes an instantaneous relationship between income, consumption and investment—it is a timeless phenomenon.
- (ii) It is of static nature which is unsuited to the changing process of the dynamic world, it fails to reckon the influence of time lags and its results are obtained only under static conditions.
- (iii) It ignores the influence of induced consumption on induced investment, i.e., there is a relationship between the demand for capital goods and the demand for consumption goods, i.e., the demand for capital goods is a 'derived demand',
- (iv) Further, its sole emphasis on consumption is also not proper. It would be more realistic to speak of a 'marginal propensity to spend' rather than to consume,
- (v) Again, Haberler feels that this multiplier theory is an un-verified hypothesis because Keynes offers no adequate proof except a number of vague observations.
- (vi) Prof. L.R. Klein has pointed out that empirical studies in respect of the behaviours of aggregate consumption in relation to aggregate income, show that actual trends in spending have a much more complicated relationship which may be non-linear and the assumption of linear relation between aggregate consumption and aggregate income is open to question.
- (vii) Again, consumption is not the function of income alone and the marginal propensity to consume is not constant as was assumed by Keynes as the basis of multiplier.

Effect of investment multiplier on the income and output:

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:

(b)

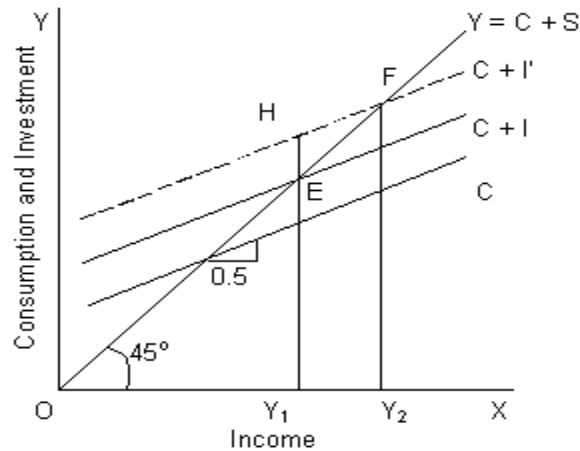


Figure 1 – Multiplier Effect (a)

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 $\frac{1}{2}$. 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.

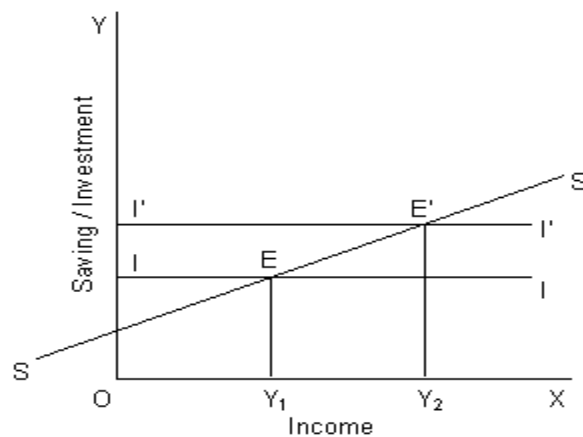
It is clear, therefore, that the multiplier is 2. It is also calculated as below:

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

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

$$K = 2$$

(b) Saving-Investment Approach: 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:



The above diagram shows the multiplier effect of an increase in investment on the equilibrium level of income. SS is the savings 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 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 mpc is $1/3$, 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.

Reverse Operation of Multiplier:

If investment in the economy falls, investment curve will shift downwards. This will cause national income to fall. Similar effect will be seen if there is increase in savings. In case of rise in savings, saving curve will shift upwards. This will cause national income to fall. This situation is called as 'Paradox of Thrift'. In many societies, savings is considered as a virtue. But in reality, savings reduce the consumption expenditure causing fall in national income and employment. This is more evident in the times of depression.