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Introduction

The main growth model of Domar bears a certain resemblance to the model of Harrod. In fact, Harrod regarded Domar's formulation as a rediscovery of his own version after a gap of seven years.

Domar's theory was just an extension of Keynes' General Theory, particularly on two counts:

1. Investment has two effects:

- (a) An income-generating effect and
- (b) Productivity effect by creating capacity.

The short-run analysis governed by Keynes ignored the second effect.

2. Unemployment of labour generally attracts attention and one feels sympathy for the jobless, but unemployment of capital attracts little attention. It should be understood that unemployment of capital inhibits investment and hence reduces income. Reduction of income brings about deficiency in demand and hence unemployment. Thus the Keynesian concept of unemployment misses the root cause of the problem. Domar wanted to analyse the genesis of unemployment in a wider sense.

To understand the implications of Domar model, one should get familiar with the relations listed below:

1. Income is determined by investment through multiplier. For simplicity saving-income ratio (s) is assumed constant. This implies that

$$Y_{(t)} = I_{(t)}/s$$

where Y is the output, I is the actual investment and s is saving-income ratio (saving propensity) and (t) shows the time period.

2. Productive capacity is created by investment to the extent of the potential (social) average productivity of investment denoted by a . For simplicity, this is also assumed to be constant. In notation form the relation can be written as

$$Y_{(t)} - Y_{(t-1)} = I_{(t)}/a$$

where Y shows the productive capacity for output, α is the actual marginal capital-output ratio which is the reciprocal of “potential social average investment productivity” ($\alpha = 1/\sigma$). Therefore, Equation (2) can also be expressed as $\Delta Y_t = \sigma I_t$. This equation shows that the change in productive capacity is the product of capital productivity (σ) and investment. As such it reveals the productivity effect.

3. Investment is induced by output growth along with entrepreneurial confidence. The latter is adversely affected by “Junking” which means the untimely loss of capital value due to the unprofitable operation of older facilities. This may be due to the shortage of labour or invention of new products or labour-saving inventions. This assumption can be shown by the relation

$$\frac{\dot{I}(t)}{Y_{(t-1)}} = G \left[\frac{Y_{(t-1)} - Y_{(t-2)}}{Y_{(t-2)} - Y_{(t-3)}} \cdot d(t) \right]$$

where G is an increasing function of the rate of output acceleration, but a decreasing function of the “Junking ratio” $d(t)$.

If junking ratio is zero then investment increases at the same rate as output

4. Employment depends upon the ‘utilization ratio’ expressed as the ratio between actual output and productive capacity. It may be expressed as

$$\frac{N(t)}{L(t)} = H \cdot \left[\frac{Y^d(t)}{Y^s(t)} \dots \dots \dots \right], H > 0$$

Here N refers to employment and L to the labour force. H is the employment coefficient, Y^d the actual output and the productive capacity, (t) being the time period. This equation explains that the ratio of employment to labour force is determined by employment coefficient (H) and the ratio of output to productivity. The dots are meant to indicate the existence of other determinants of the employment ratio. If we assume that the employment coefficient takes the maximum value of unity (i.e., $H = 1$), then $Y_d(t) = Y^s(t)$

5. Past as well as present investment can generate productive capacity at a given ratio. But due to managerial miscalculation, the new investment projects will cause untimely demise of old project and plants. If “junking” exists, it would dampen the productivity of investment. This assumption is considered the central theme of Domar’s model. In the form of notations, it can be expressed as

$$K(t) - K_{(t-1)} = I(t) - [d(t) K(t)]$$

where K is capital, I shows investment, $d(t)$. $K(t)$ is the amount of capital junked, and $d(t)$ is the junking ratio.

Domar viewed growth from the demand as well as the supply side. Investment on the one side increases productive capacity and on the other generates income. Balancing of the two sides provides the solution for steady growth. The following symbols are used in Domar’s model.

Y_d = level of net national income or level of effective demand at full employment (demand side)

Y_s = level of productive capacity or supply at full-employment level (supply side)

K = real capital

I = net investment which results in the increase of real capital i.e., ΔK a = marginal propensity to save, which is the reciprocal of multiplier. a = (σ) is productivity of capital or of net investment.

The demand side of the long-term effect of investment can be summarised through the following relation. This relation is a simple application of Keynes investment multiplier.

$$Y_d = 1/a \cdot I$$

This relation tells us (i) that the level of effective demand (Y_d) is directly related to the level of investment through the multiplier whose value is given by $1/a$. Any increase in the level of investment will directly increase the level of effective demand and vice versa. (ii) The effective demand is inversely related to the marginal propensity to save (a). Any increase in marginal propensity to save (a) will decrease the level of effective demand and vice versa.

The supply side of the economy in the Domar model is shown through the relation.

$$Y_s = \sigma K$$

This relation explains that the supply of output (Y_s) at full employment depends upon two factors: productive capacity of capital (σ) and the amount of real capital (K). Any increase or decrease in one of these two factors will change the supply of output. If the productivity of capital (σ) increases, that would favorably affect the economy's supply. Similar is the effect of the change in the real capital K on the supply of output.

For the economy's long-term equilibrium, the demand Y_d and supply Y_s sides should be equal. Therefore, we can write:

$$\text{or} \quad \begin{aligned} Y_d &= Y_s \\ \frac{I}{a} &= \sigma K \\ I &= a \sigma K \end{aligned}$$

This relation tells us that steady growth is possible when investment over a period of time equals the product of saving-income ratio, capital productivity and capital stock.

The demand and the supply equation in the incremental form can be written as follows: The demand side is:

$$\Delta Y_d = \Delta I / a \dots (1)$$

But the increment has not been shown in a because it is a constant in terms of the assumptions. Since $1/a$ is nothing but a and ΔI leads to ΔK , we can write the supply relation as follows:

$$\Delta Y_s = \sigma \Delta K$$

This equation shows that a change in the supply of output (ΔY_s) can be expressed as the product of the change in real capital (ΔK), and the productivity of capital (σ). Substituting the value of ΔK as I in the above equation, we get the supply side of the economy as

$$\Delta Y_s = \sigma I \dots (1)$$

From equations (1) and (2) we can derive the condition for steady growth. Using equations (1) and (2), we get

$$\text{or } \begin{aligned} \Delta Y_d &= \Delta Y_s \\ \frac{\Delta I}{\alpha} &= \sigma I \end{aligned}$$

and by cross-multiplying, we get

$$\frac{\Delta I}{I} = \alpha \cdot \sigma$$

$$\text{or that } \frac{\Delta Y}{Y} = \alpha \cdot \sigma$$

Equation (3) explains that if steady growth is to be maintained, the income growth rate $\Delta Y/Y$ should be equal to the product of marginal propensity to save (α) and the productivity of capital (σ). In the words of K.K. Kurihara "It is an increase in productive capacity (ΔY_s) due to increment of real capital (ΔC) which must be matched by an equal increase in effective demand (ΔY_d) due to an increment of investment (ΔI), if a growing economy with an expanding stock of capital is to maintain continuous full-employment.

Domar's condition of steady state growth can be explained with the help of numerical example. Suppose the productivity of capital (σ) is 25% and the marginal propensity to save is 12%, then the growth rate of investment (AHI) would be equal to a, a, i.e.,

$$\frac{25}{100} \times \frac{12}{100} = \frac{3}{100} \text{ or } 3\%$$

Thus income and investment must grow at the annual rate of 3% if steady growth rate is to be maintained.

Analysis of disequilibrium:

Disequilibrium (non-steady state) prevails

$$(i) \text{ When } \frac{\Delta I}{I} \text{ or } \frac{\Delta Y}{Y} > \alpha \sigma \quad (ii) \text{ When } \frac{\Delta I}{I} \text{ or } \frac{\Delta Y}{Y} < \alpha \sigma$$

Under the first situation, long-term inflation would appear in the economy because the higher growth rate of income will provide greater purchasing power to the people and the productive capacity ($\sigma\alpha$) would not be able to cope with the increased level of income. The first situation of disequilibrium will, therefore, create inflation in the economy.

The second situation, under which growth rate of income or investment is lagging behind the productive capacity, will result in over production. The reduced growth rate of income will put a constraint on the purchasing power of the people, thereby reducing the level of demand and resulting in over-production. This is the situation in which there would be secular stagnation. We have thus arrived at the same conclusion of instability of steady growth which we had derived from the Harrod model.

Summary of Main Points:

The main points of the Harrod-Domar analysis are summarised below:

1. Investment is the central variable of stable growth and it plays a double role; on the one hand, it generates income and on the other, it creates productive capacity.
2. The increased capacity arising from investment can result in greater output or greater unemployment depending on the behaviour of income
3. Conditions concerning the behaviour of income can be expressed in terms of growth rates i.e. G , G_w and G_n and equality between the three growth rates can ensure full employment of labour and full-utilisation of capital stock.
4. These conditions, however, specify only a steady-state growth. The actual growth rate may differ from the warranted growth rate. If the actual growth rate is greater than the warranted rate of growth, the economy will experience cumulative inflation. If the actual growth rate is less than the warranted growth rate, the economy will slide towards cumulative inflation. If the actual growth rate is less than the warranted growth rate, the economy will slide towards cumulative deflation.
5. Business cycles are viewed as deviations from the path of steady growth. These deviations cannot go on working indefinitely. These are constrained by upper and lower limits, the 'full employment ceiling' acts as an upper limit and effective demand composed of autonomous investment and consumption acts as the lower limit. The actual growth rate fluctuates between these two limits.

Diagrammatic Representation:

Refer to Figure 17.3 where income is shown on the horizontal axis, Saving and Investment on vertical axis. The line $S(Y)$ drawn through the origin shows the levels of saving corresponding to different levels of income. The slope of this line (tangent α) measures the average and marginal propensity to save. The slopes of lines Y_0I_0 , Y_1I_1 , Y_2I_2 measure the acceleration coefficient v which remains constant at each income level of Y_0 , Y_1 , and Y_2 .

At the initial income level of Y_0 , the saving is S_0Y_0 . When this saving is invested, income rises from Y_0 to Y_1 . This higher level of income increases saving to S_1Y_1 . When this amount of saving is reinvested, it will further raise the level of income to Y_2 . The higher level of income will again raise saving to S_2Y_2 . This process of rise in income, saving and investment shows the acceleration effect on the growth of output.

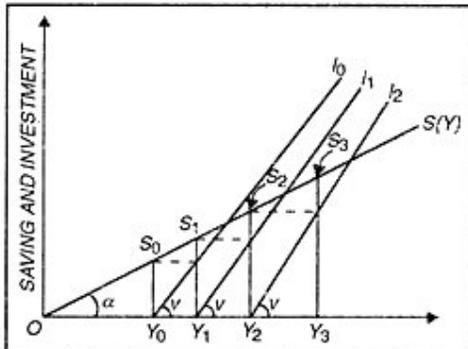


Fig. 17.3 The Harrod Model : Acceleration and Growth

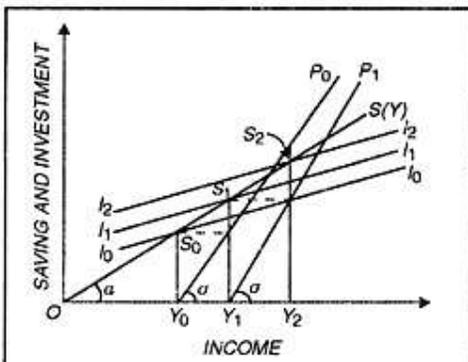


Fig. 17.4 Domar Model : Productivity of Capital and Growth

Now we give the diagrammatic exposition of the Harrod model with the help of Figure 17.4.

In this figure, income is shown on horizontal axis, saving and investment on vertical axis. The line $S(Y)$ passing through the origin indicates the level of saving corresponding to different levels of income. I_0I_0 , I_1I_1 and I_2I_2 are the various levels of investment. Y_0P_0 and Y_1P_1 measure the productivity of capital corresponding to different levels of investment.

The lines Y_0P_0 and Y_1P_1 are drawn parallel so as to show that productivity of capital remains unchanged. This diagram shows that the level of income is determined by the forces of saving and investment. The level of income Y_0 is determined by the intersection of saving line $S(Y)$ and the investment line I_0I_0 .

At the level of income Y_0 , the saving is Y_0S_0 . When the saving Y_0S_0 is invested, it will increase the income level from OY_0 to OY_1 . The productive capacity will also rise correspondingly. The extent of the income increase depends upon the productivity of capital, which is measured by the slope of the line Y_0P_0 (α).

Higher is the level of income higher the productive capacity. Similarly, when the level of income is OY_1 the level of saving is S_1Y_1 . With investment of S_1Y_1 income will further rise to the level Y_2 . This increase in income means expansion of purchasing power of the economy. But the coefficient of capital productivity would remain constant, this being an important assumption of Domar's model.