Solow's Growth Model

Introduction:

The Solow Growth Model, developed by Nobel Prize-winning economist Robert Solow, was the first neoclassical growth model and was built upon the Harrod-Domar model. The Solow model is the basis for the modern theory of economic growth.It ensures steady growth in the long run period without any pitfalls. He pointed out that Harrod-Domar's model was based on some unrealistic assumptions like fixed factor proportions, constant capital output ratio etc. Solow has dropped these assumptions while formulating his model of long-run economic growth.

In Harrod-Domar's model growth, the economy attains a "knife-edge balance of equilibrium" in growth in the long-run period. But Solow has shown that if technical coefficients of production are assumed to be variable, the capital labour ratio may adjust itself to equilibrium ratio in course of time. The knife edge equilibrium between Warranted rate of Growth (Gw) and Natural Rate of Growth (Gn) will disappear if this assumption (fixed factor proportion) is removed. Solow has provided solution to twin problems of disequilibrium between Gw and Gn and the instability of capitalist system.

In short, Prof. Solow has tried to build a model of economic growth by removing the basic assumptions of fixed proportions of the Harrod-Domar model. By removing this assumption, according to Prof. Solow, Harrodian path of steady growth can be freed from instability.

Assumptions:

Solow's model of growth is based on the following assumptions:

1. Only one single composite commodity, national output, is produced.
2. The production takes place according to the linear homogeneous production function of first degree of the form, i. e., there are constant return to scale.
3. There is full employment in the economy.
4. There are two factors of production -capital and labour.

5. Labour and capital are substitutable for each other.
6. Technical progress does not influence the productivity and efficiency of labour.
7. There is flexible system of price-wage interest.

Following these above assumptions, Prof. Solow tries to show that with variable technical co-efficient, capital labour ratio will tend to adjust itself through time towards the direction of equilibrium ratio. If the initial ratio of capital labour ratio is more, capital and output will grow more slowly than labour force and vice-versa.

To achieve sustained growth, it is necessary that the investment should increase at such a rate that capital and labour grow proportionately i.e. capital labour ratio is maintained.

Explanation:

This model assumes the production of a single composite commodity in the economy. Its rate of production is denoted by Y (t) which represents the real income of the community. A part of the output is consumed and the rest is saved and invested somewhere. The proportion of output saved is denoted by s. Therefore, the rate of saving would be s Y (t). The capital stock of the community is denoted by K(t). The rate of increase in capital stock is given by dk/dt and it gives net investment.

Since investment is equal to saving so we have the following identity:

$K = sY$ …… (1)

Since output is produced by capital (K) and labour (L), so the production function is given by

$Y = F(K, L)$ …… (2)

Putting the value of Y from (2) in (1), we get

$K = s F(K, L)$ ……. (3)

Equation (3) represents the supply side of the system. Now we are to include demand side too. As a result of exogenous population growth, the labour force is assumed to grow at a

constant relative rate n. In the absence of technological change, n is Harrod's Natural rate of Growth. Thus,

$$L(t) = L_0 e^{nt} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Where

L is available supply of labour

On the assumption that full employment is perpetually maintained, we can insert the value of L from equation (4) into equation (3) and obtain,

$$K = sF(K, L_0 e^{nt}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

This is the basic equation which determines the time path of capital accumulation or rate of investment that must be followed if all available labour is to be employed.