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Different Mathematical Functions

Sotimboeva Zarifakhon
Senior Lecturer of the Department of Higher Mathematics at Namangan State University

Annotation: This article about the production function of Cobb-Douglas is the technological ratio of the volume of labor resources and capital for the production of a certain amount of output. This model belongs to the two-factor model and was statically tested by the two Scientists Cobb and Douglas

Kew words: certain proportions allow, certain amount, Scientists Cobb and Douglas

Introduction

The two main factors of production are labor and capital. Their interaction in certain proportions allows you to create the final product.

The production function of Cobb-Douglas is the technological ratio of the volume of labor resources and capital for the production of a certain amount of output. This model belongs to the two-factor model and was statically tested by the two Scientists Cobb and Douglas. The production function of Cobb - Douglas reflects the dependence of the production of any commodity on the ratio of capital and labor. In general, the formula has the following form: y = A • Lb. • Ka, where: Y is the total volume of production, the real value of goods that were produced in a given year;

$$u(y) = F_0(y), \quad \Delta u(y) = F_1 \quad (y), \ldots, \Delta^{n-1}u(y) = F_{n-1}(y), \quad y \in S$$

$$\frac{du(y)}{d\,\overline{n}} = G_0(y), \quad \frac{d\Delta u(y)}{d\,\overline{n}} = G_1(y), \ldots, \frac{d\Delta^{n-1}u(y)}{d\,\overline{n}} = G_{n-1}(y), \quad y \in S,$$

$$u(x) = \sum_{k=0}^{n-1} \int_{\partial D} \left[\Delta^k \Phi_\sigma(y,x) \frac{\partial \Delta^{n-k-1}u(y)}{\partial n} - \Delta^{n-k-1}u(y) \frac{\partial \Delta^k \Phi_\sigma(y,x)}{\partial n} \right] ds. \quad x \in D$$

L - labor contribution, number of man - hours worked in the given period;
K is the amount of capital expended, the real value of equipment, machinery and buildings;
A is the total productivity of all factors;

Functions And Discussions

a and b are the elasticity of labor and capital (these values are determined by existing technologies). The development of the Cobb Douglas production function was carried out on the basis of statistical information. It showed that the share of labor input and capital input has been constant for many years in most developed countries. However, today many scientists question this position. An important role in calculating the expected volume of production according to the Cobb Douglas formula is played by the parameters a and b.

$$\Delta^n u(y) = 0, \ y \in D$$

$$u(y) = F_0(y), \quad \Delta u(y) = F_1 \quad (y), \ldots, \Delta^{n-1}u(y) = F_{n-1}(y), \quad y \in S$$

$$\frac{du(y)}{d\,\overline{n}} = G_0(y), \quad \frac{d\Delta u(y)}{d\,\overline{n}} = G_1(y), \ldots, \frac{d\Delta^{n-1}u(y)}{d\,\overline{n}} = G_{n-1}(y), \quad y \in S,$$

The elasticity of factors shows the impact of changing their ratio on physical production, taking into account the equality of other conditions. For example, if the value of a is 0.45, then a 1% increase in the use of labor resources will lead to an increase in output by approximately 0.45%. The coefficients can take three values: 1 a + b = 1. In this case, the production function has constant returns to scale. This suggests that at 2 a + b 3 a + b > 1. In this case, returns to scale decrease. With perfect competition and equal elasticity of capital and labor, the coefficients a and b reflect the shares of each factor in total production. The national economy is a complex system consisting of many elements and their interrelations. That is why difficulties

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arise in the construction of any ideal model. The main problems in using the Cobb - Douglas function fall into two areas: Dimensional analysis. Adherents of the Austrian school of economics criticized the model under consideration for the lack of precise indicators. Lack of microeconomic grounds.

Features

The Cobb-Douglas function consists of two key factors that are included in production: labor and capital. The proportional ratio of these components is a condition for creating a product. The considered function serves as a reflection of the technological ratio of labor and capital, as mandatory factors of production of any product in a certain volume.

In a narrow sense, the term "Cobb-Douglas function" denotes the dependence of constant returns on scale.

$$\left\{ y : y = (y_1, y_2, ..., y_m), y_i \in R, i = \overline{1, m-1},\ 0 < y_m < h, h = \frac{\pi}{\rho},\ \rho > 0, \right\}$$

$$y' = (y_1, y_2, ..., y_{m-1}, 0),\ r = |x - y|,\ s = |x' - y'|,\ \alpha^2 = s,$$

$$\Delta r^k \varphi_\sigma(y, x) = knr^{k-2}\varphi_\sigma(y, x) + \sum_{j=1}^{m} k(y_j - x_j)\left(\frac{\partial r^{k-2}}{\partial y_j}\right)\varphi_\sigma(y, x)$$

$$+ 2k\sum_{j=1}^{m} (y_j - x_j) r^{k-2} \frac{\partial \varphi_\sigma(y, x)}{\partial y_j} + \sum_{j=1}^{m} r^k \frac{\partial^2 \varphi_\sigma(y, x)}{\partial\ y_j^2}.$$

The production function, named after the economists Cobb and Douglas, is the first generalized production function. The use of this concept allows you to create models not only for small-scale processes, but also for entire sectors of the economy. Empirical confirmation of the considered function became an impetus for macroeconomic development, which made it possible to assess the production efficiency of the national economy.

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