

APPLICATION OF NONLINEAR REGRESSION MODELS

Mullabayev Baxtiyarjon Bulturbayevich

Namangan Engineering Construction Institute
Associate Professor, Doctor of Philosophy in Economics (Phd),
Namangan, Republic of Uzbekistan

Bekjanova Laylo Baxromovna

Namangan Engineering Construction Institute
Student of the 2-Mj-20 group of the Faculty of Economics and Management

Annotation: This article provides ideas and feedback on the use of nonlinear regression models.

As mentioned above, there are two classes of nonlinear regressions:

- non-linear regression with respect to the factor, but linear with respect to the parameters;
- nonlinear regressions on parameters.

Dependencies can be represented by a secondary polynomial:

- payment for physical labor depending on age;
- yield from the amount of applied fertilizers;
- profit from the number of channels that run applications in the queue system, etc. A classic example of a hyperbolic model is the Phillips curve, which is a graphical representation of the inverse relationship between inflation and unemployment. (Figure 1).

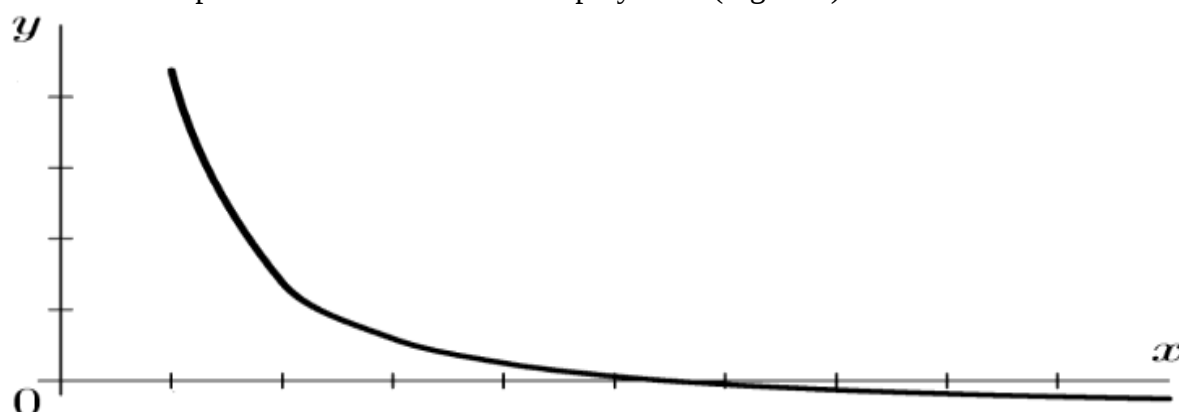


Figure 1. Phillips curve

X – total unemployment rate (in percent)

Y - Annual wage growth rate (in percent)

Albanian William Phillips (1914-1975), Australian economist, in England.

The Phillips curve was obtained in 1958 for England on the basis of empirical data from 1861-1957.

An example of the application of logarithmic models can be used to describe the share spent on durable goods (Engel curve) as a function of total costs. Ernst Engel (March 26, 1821 - August 12, 1896) - German economist and statistician, director of the Prussian Statistical Office in Berlin. It can be seen that the Engel curves for income and consumption of these goods (depending on their category) are as follows (Figure 2):

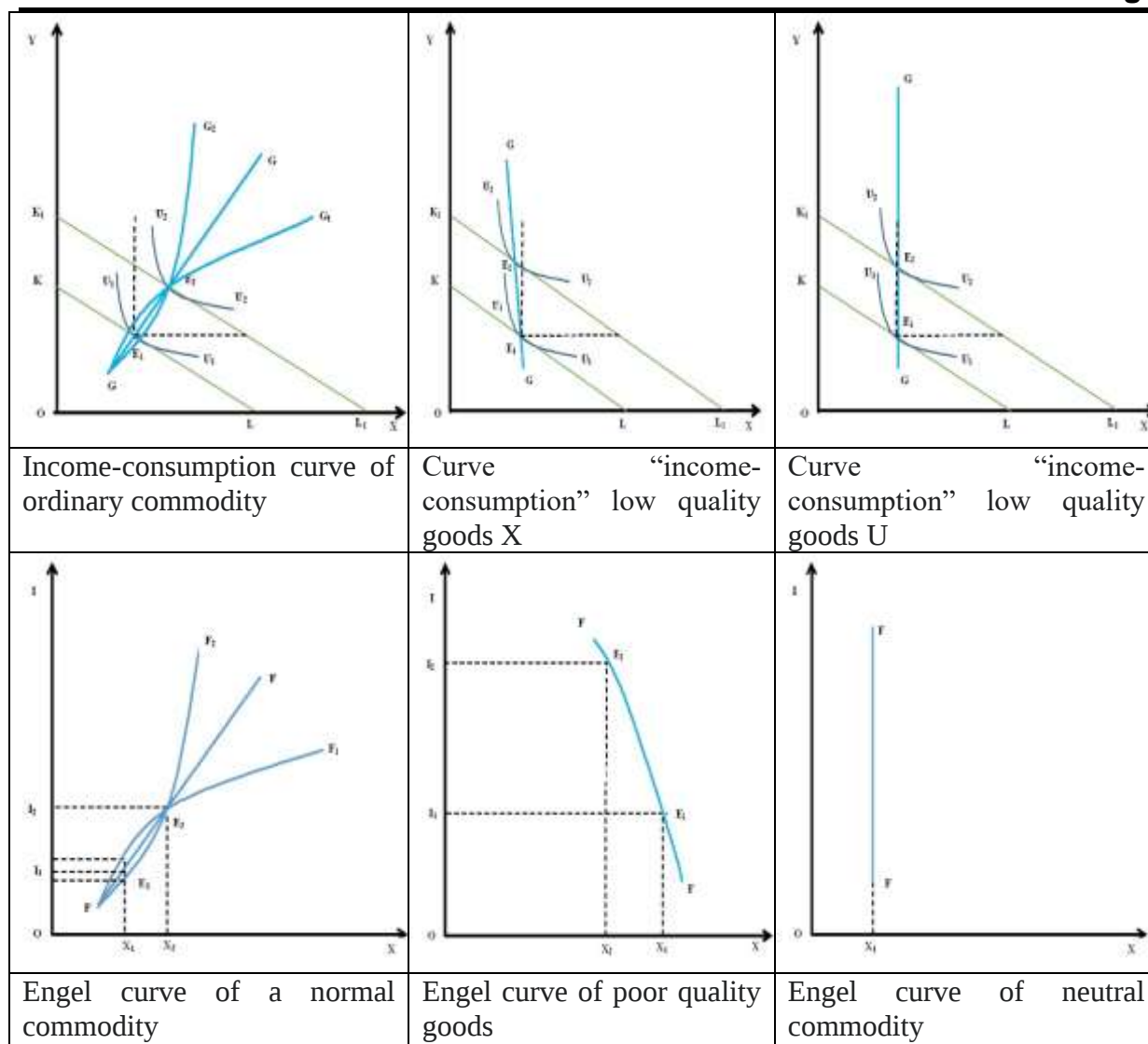


Figure 2. Engel curves of total costs

Level regression has been widely used in the study of production functions, demand and consumption. The production function of U.S. gross domestic product according to 1960-1995 data. $Y = 2,248K^{0,404}L^{0,803}$.

Y – U.S. gross domestic product;

K – capital;

L – labor.

Polynomial, hyperbolic, and logarithmic models are rendered linear with variables. Appropriate methods are then applied to evaluate the parameters and test the hypotheses. In terms of parameters, some nonlinear models can be reduced to a linear form (Table 1).

Table 1

Examples of nonlinear models and bringing them into a linear model

No	Model	Bringing a linear model
1	$y = ab^x$	$\ln y = \ln a + x \ln b$
2	$y = e^{a+bx}$	$\ln y = a + bx$

3	$y = \frac{1}{a + bx}$	$\frac{1}{y} = a + bx$
4	$y = ax^b$	$\ln y = \ln a + b \ln x$

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