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THE STATISTICAL NATURE OF ECONOMIC DATA

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Annotation
This article provides insights and comments on the statistical nature of economic data.

Keywords: statistical analysis, event, correlation analysis, regression analysis, time series analysis.

Introduction

Statistical analysis of economic data as the most important analytical tool of scientific research is based on the use of traditional and multidimensional statistical methods in order to adequately reflect the studied events and processes and to determine the laws that apply to them. The choice of statistical methods depends on the objectives of the study, the nature of the processes being studied, their specific features, characteristics and forms of manifestation. Traditional statistical methods are analysis of variance, correlation analysis, regression analysis, time series analysis, aimed at studying the volume, structure, variation, quantitative dependencies and dynamics of events and processes under certain conditions of space and time. The use of multidimensional statistical analysis methods is predetermined by the fact that economic systems consist of a large number of objects and depend on many characteristics that characterize them, which makes it difficult to determine the structure of these objects and the relationship between their parameters. Multidimensional statistical methods are based on the presentation of initial data in multidimensional geometric space and allow to identify latent (but latent) but objectively existing laws in the organizational structure and trends in the study of economic phenomena.

Economic-statistical modeling is based on the fact that the relationship between economic indicators and factors of production is stochastic in nature. Statistical modeling of the activities of economic entities plays a key role in studying the process of their development in time and space. These models are adapted to identify production trends and patterns. Even the most advanced statistical model is unable to

cover the entire interrelationship of economic events and processes. Accordingly, there will always be elements of uncertainty in the application of economic analysis and economic-statistical modeling. In general, one of the main conditions for the effectiveness of the application of economic-statistical modeling is that it is realistic and exactly consistent with the process. There are three main tasks that can be solved using multidimensional economic-statistical analysis:

1) reduce the size of the space of variables and build the most informative indicators (the method of the main components);

2) analysis of the structure of the set of features and identification of generalized factors (factor analysis);

3) study the structure of a set of objects (cluster and discriminant analysis). The stages of statistical analysis are as follows.

The reasons for the uncertainty of economic-statistical modeling can occur in the following cases:

When conducting economic and statistical observations, we come across information in the form of technical and economic indicators, the flow of materials. From this point of view, production is considered as a converter of input information, output information. Model - Misuse of link forms between indicators and evidence (Figure 1):

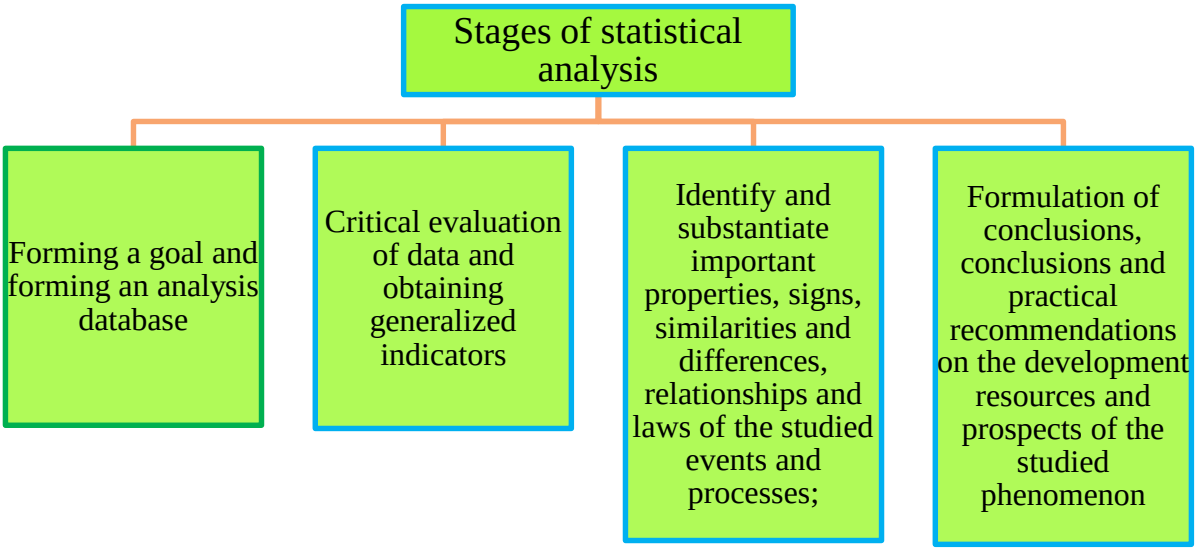

Figure 1- Stages of statistical analysis

One of the important steps in creating econometric models is to select the factors and indicators involved in the model. An alternative to the statistical substantiation of the model in modern conditions, where the mobility of economic systems is increasing, is to give it adaptive properties. The goal of flexible methods is to create self-correcting economic and mathematical models that can reflect time-changing conditions, take into account the information value of different members of the time sequence, and provide an accurate estimate of the future.

The idea of statistical evaluation of total population parameters based on sample data is that the sampling characteristic of any parameter is not clear, but the approximate value of the same parameter in the overall parameter is approximate. In practice, as a rule, an interval estimate is used, in which, with a certain probability, a confidence interval in which the approximate parameter of the population is located is formed by adjusting the sample estimates according to the magnitude of the representation error. Testing a statistical hypothesis is a probabilistic conclusion that certain parameters of a sample reflect (or do not represent) population parameters. The mathematical component of the process of testing statistical hypotheses in many respects ensures the adequacy of solving economic problems. Economic and statistical analysis should take into account the economic and statistical principles of its implementation. Economic principles include (Figure 2):

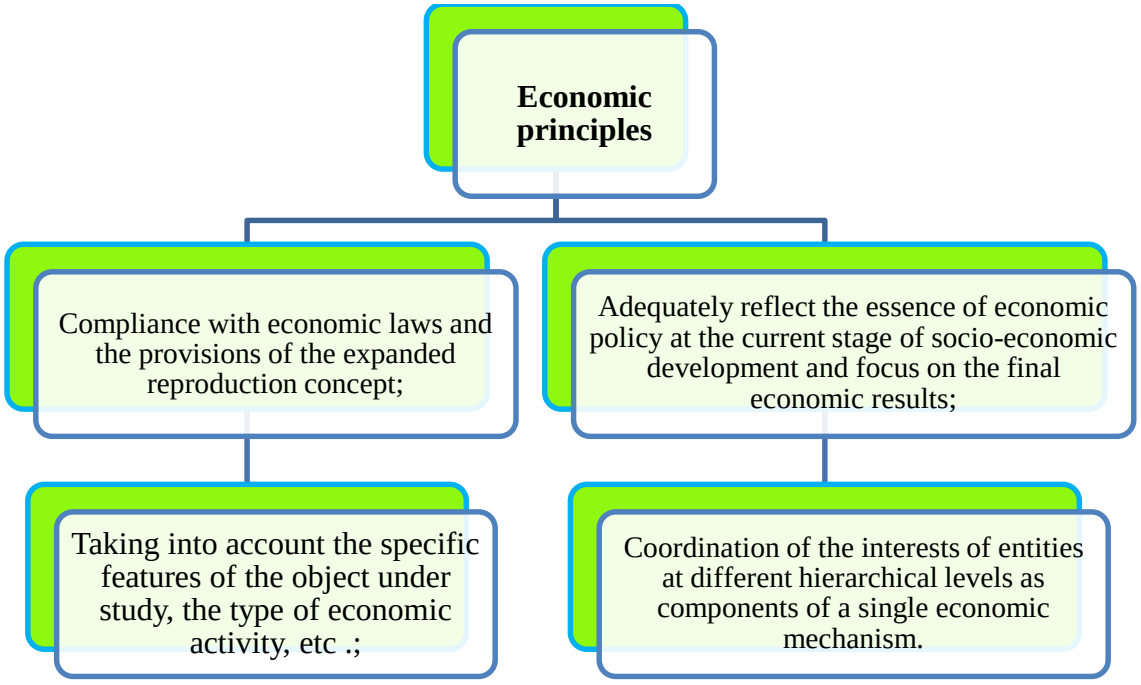

Figure 2. Economic principles

One of the main statistical principles of conducting a science-based analysis that adequately reflects the cause-and-effect relationships and dependencies in statistics and dynamics, the development trends of real events and processes, is the homogeneity of this statistical population.

The traditional method of checking homogeneity (in a variable analysis) is based on the definition of the Student t-criterion, the condition of its classical application is the normality of the distribution of the observations and the equality of variances. Economic objects are multidimensional, and only the sum of the properties of the

interaction is able to reflect to a certain extent the division of objects into groups on the objective criterion.

In many cases, the indicators under study are influenced by many factors. In particular, not all of them can participate in the model or are not economically feasible. A full range of indicators and factors can be described as follows:

$$y = f(/ x_1, x_2, ..., x_k / x_{k+1}, x_{k+2}, ..., x_m / x_{m+1}, x_{m+2}, ..., x_n /) \quad (2.1)$$

This econometric model is considered significant if the first group includes factors that are not numerous in number, but have a strong influence on the change of "it". It is also advisable that more of the remaining factors fall into Group 2 and less into Group 3.

The study of the dynamics of economic events (changes over time) is a complex and time-consuming research process, because the initial values of the time series are formed under the combined influence of many factors acting in different directions. The temporal series structure consists of four components: the main trend (trend), cyclical, seasonal, and random, which led to the formation of two main directions of time series analysis. Within the first direction, the deterministic and random components of the time series are separated. In economic research, the deterministic component of the time series typically includes the first three components: the trend, the seasonal component, and the cyclic component. In the analysis of economic time series, multiplicative models are often used that represent the product of deterministic and random components.

Thus, the demand for statistical tools in the study of the activities of economic entities is predetermined by the stochastic principle of the economic system and the processing of large arrays of multidimensional data created by different economic units. The complex application of statistical methods allows to describe different areas of analysis, ie the study, forecasting of the structure, dynamics, identification and description of relationships, which, in turn, fully reveals the essence of analysis, laws, trends in the studied events and processes.

The decisive criterion of the information content of the properties is the amount of loss. Despite its external attractiveness, such an interpretation of the information criterion has significant shortcomings, the main of which can be called a specification that is difficult to overcome the level of losses in the research being conducted. Attempts to assess this level by entering the value of possible errors and linking it to a priori probability do not help to perform a criterion-based check.

Limited practical use of such a criterion leads to the need to use methods that have been validated and available in statistical studies. In particular, in the study of relationships based on the implementation of the method of analysis of key

components and factors, the model includes general non-collinear factors that reproduce and explain its properties, reflecting a number of economically dependent initial characteristics. That is, the dimensionality of the original feature area is reduced by the interdependence of the original properties. However, it should be borne in mind that the use of key components and common factors makes it very difficult to economically interpret the model parameters.

The second direction of time series analysis is based on dividing it into two main elements: trend and variability (deviation of levels or time points from the trend of individual periods). That is, the second element of the analytical approach is represented by cyclical, seasonal, and random components. In this case, the task of statistical analysis can be formed in two ways: 1) "clearing" the trend from fluctuations, measuring its parameters; 2) detection and measurement of different types of oscillations in the time series.

Economic time series modeling is a tool for predicting the events and processes being studied. One method of statistical forecasting is to calculate forecasts based on trends and oscillations of time series. This technique is based on extrapolation, ie. assuming that the trend and oscillation parameters are maintained until the forecast period. The use of the extrapolation method has limitations related to the inertial conditions of economic systems, the reliability and variability of the parameters of the trend equation, and the length of the lead period.

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