STATISTICAL INVESTIGATION OF TIME SERIES RELATIONSHIPS

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The article focuses on the questions of statistical investigation of time series relationships. Methods of fluctuations synchronism analysis, cointegration and causality are presented in the article. Among which are advanced methods in modern science that are able to improve the quality of statistical researches.

On the one hand, developing of time series analysis methodology goes by the way of improvement of simple and already existing methods. On the other hand, more formalized and complex methods are proposed.

Synchronism analysis is a specific method, because it neither depicts the coincidence of fluctuations (strength and direction), nor the correlation in the usual way. We have proposed and applied two-way joining to develop the methodology of synchronism analysis. It allows combining objects, using both the information from the lines and columns of correlation matrix. Anisochronous fluctuations of production between countries every year provide mutually beneficial exporting from countries with a comparatively high harvest to countries with a comparatively low harvest. Redistribution of food reserves in accordance with given principle promotes reduction of social tension that is considered as instrument for diversification, and providing of food security and fighting with hunger.

More extensive research can be done, if there is a priory evidence of economic relations between particular data series. Modifying of time series (differencing, extracting deterministic trend or using the time as a factor in a model) is not the best way to prepare data for analysis. Clive Granger and Robert Engle found a new approach for analysis of time series relations and proposed a new term "cointegration". If the data is cointegrated, error correction models (ECMs) are estimated; otherwise, vector autoregressive (VAR) models are estimated in first differences.

Even though many economic series are routinely found to be cointegrated, it should be emphasized that cointegration is a very special phenomenon indeed. Cointegration occurs because economic data share with common stochastic trends, which are eliminated by cointegrating linear combinations. Common stochastic trends are usually expressed as a linear combination of the shocks of a system. Economic data is cointegrated because they respond to shocks together. But some series are known to be downwardly rigid; therefore, while they move together with others to positive shocks, they would respond differently to negative shocks.

When the components of time series are cointegrated, the data series is called to have hidden cointegration. Surprisingly valuable information on their dynamics can be gathered from the approach. It becomes possible to investigate long-run relationship among non-cointegrated non-stationary data series.

A new role of statistics arises in the sphere of economic model building, where causal models are analyzed and estimated with mathematical and statistical methods. Modern increasing of amount and quality of statistical data and developing of methods and models create new opportunities for causality investigation in statistics.

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