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МАТЕМАТИЧНІ МЕТОДИ, МОДЕЛІ ТА ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ В ЕКОНОМІЦІ

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CONCEPT OF ECONOMETRICS AND MAIN STAGES OF ECONOMETRIC ANALYSIS

ПОНЯТТЯ ЕКОНОМЕТРІЇ ТА ОСНОВНІ ЕТАПИ ЕКОНОМЕТРИЧНОГО АНАЛІЗУ

ANNOTATION
The article is deals with substantiation of mathematical economic forecasting in the course of determining the meaning of the concept of econometrics and studying econometric analysis main stages. The study proved the importance of mathematical forecasting of the economy combined with intuitive one. In this work the essence of the concept of econometrics is showed, and the complex examination of the main stages of econometric analysis is done. Practical recommendations for mathematical forecasting of the economy are offered in combination with intuitive forecasting. Elaborated suggestions allow us to understand the ways to improve the competitiveness of the national economy and provide its purposeful development in the long term period by enhancing mathematical analysis.

Keywords: econometrics, mathematical analysis, economic modeling, economic forecasting, econometric analysis stages.

АНОТАЦІЯ
Стаття присвячена обґрунтуванню математичного прогнозування економіки у ході визначення суті поняття економетрії та вивчення основних етапів економетричного аналізу. В ході дослідження доведено важливість застосування математичного прогнозування економіки у поєднанні з інтуїтивним. У роботі розкрито суть поняття економетрії, здійснено комплексний розгляд основних етапів економетричного аналізу. Запропоновано практичні рекомендації щодо здійснення математичного прогнозування економіки та його поєднання з інтуїтивним прогнозуванням. Розроблені пропозиції дають можливість зрозуміти шляхи підвищення конкурентоспроможності вітчизняної економіки та забезпечити її цілеспрямований розвиток в довгостроковому періоді за рахунок активізації математичного аналізу.

Ключові слова: економетрія, математичний аналіз, економічне моделювання, прогнозування економіки, етапи економетричного аналізу.

АННОТАЦИЯ
Статья посвящена обоснованию математического прогнозирования экономики в ходе определения сущности понятия эконометрии и изучение основных этапов эконометрического анализа. В ходе исследования доказана важность применения математического прогнозирования экономики в сочетании с интуитивным. В работе раскрыта сущность понятия эконометрии, осуществлено комплексное рассмотрение основных этапов эконометрического анализа. Предложены практические рекомендации по осуществлению математического прогнозирования экономики и его сочетание с интуитивным прогнозированием. Разработанные предложения дают возможность понять пути повышения конкурентоспособности отечественной экономики и обеспечить ее целенаправленное развитие в долгосрочном периоде за счет активизации математического анализа.

Ключевые слова: эконометрия, математический анализ, экономическое моделирование, прогнозирование экономики, этапы эконометрического анализа.

Problem formulation. The issue of economic development is important because the development of the whole society depends on its level. The task of researchers in the field of economic theory is a search of tools of changing economic situations in the desired direction based on their forecasting and prediction of future values of economic indicators. An important task of economic analysis is modeling of economic phenomena development and processes in various conditions. In carrying out economic modeling a person is guided by emotions and intuition, resulting in the introduction of flexible and adaptive systems. However, intuitive forecasting often leads to irrational decision-making, which causes the emergence of the economic crises. For a formal description of the most important links between economic variables and objects and to obtain new knowledge about the object in the economy it is important to apply mathematical methods. Using mathematics allows to reflect the statements of economic theory, formulate its concepts and conclusions. For the economy as a whole and making effective economic decisions it is particularly important to find a balance, outlining the relationship between the use of mathematical and intuitive economic forecasting.

Analysis of recent researches and publications. Classical scientists, such as W. Petty, G. King and Charles Davenant, who made initial attempts

in quantitative research in economics, were the first who started to use systematically facts and figures to study economic processes. Use of quantitative methods in the economy gained significant importance due to the development of statistical theory, accompanied by the emergence of scientific works by F. Galton, Karl Pearson, and F.Edgeworth. It is difficult to overestimate the contribution of G. Moore, the author of scientific work, which according to many scientists, can be called the first econometric book. The work by W. Leontiev, E. Slutskyi, R. Frish, T. Haavelmo, J. Tinbergen, L. Klein, and P. Chomp were fundamental to science. Among contemporaries, it is worth noting A. Leshchynskyi, T. Klebanov, S. Borodich, and A. Korolev. These and other scientists were seeking answers to questions that reveal the meaning of the concept of econometrics and explore the main stages of econometric analysis. Without underestimating their contribution to the development of science in general and particularly econometrics, it should be mentioned that the modern economics is as dynamic as it has never been. To solve the new economic issues it is not enough to use only intuitive or only mathematical forecasting. It is important to find a way to combine these two methods to meet current economic conditions. This again confirms the relevance of the research subject.

The solution of unsolved aspects of the problem. The aim of the article is substantiation of mathematical economic forecasting, determining the meaning of the concept of econometrics and studying econometric analysis main stages.

The objective of the research is study the meaning of the concept of econometrics, the implementation of a comprehensive review of the econometric analysis basic stages, and proving of the importance of applying mathematical economic forecasting combined with intuitive one.

The main material research. Econometrics is a relatively new branch of economics, formed by the combination of theoretical economics, mathematics, and statistics. Widely and literally it means a "measuring in the economy". More specifically, scientists, particularly A. Leshchynskyi whose interpretation we agree with, determine econometrics as a separate scientific discipline, which includes theoretical results, tools, techniques, methods and models that are designed to provide specific quantitative values to quality regularities based on economics theory, statistics, and mathematical and statistical methods [1, p. 4].

Definition of econometrics should be more expanded, says O.E. Luhinin who defines econometrics as a training course designed to explore the relationship between economic indicators, using a wide variety of economic models based on various economic and mathematical methods [2, p. 9].

According to R.V. Ruska, econometrics is a trend of economic and mathematical analysis, which is a statistical measurement of parameters characterizing a certain economic concept; defining the relationship and prospects of an object or phenomenon, developing specific economic conclusions [3, p. 11].

Econometrics studies the models and methods of quantitative evaluation of models parameters that characterize the relationship between economic indicators at the macro- and micro economics. That is why the process of studying economic phenomena and processes by econometrics methods is known econometric modeling, says V.T. Dolia in his work [4, p. 6].

Economics helps to identify laws and relationships that exist in the economy for its further objective description and analysis. Using the economic statistics, based on theory and practical experience all the information about the economic processes in the real economy is accumulated. Mathematical economics is a formulated economic theory, which studies the relationships between economic variables on general (not quantitative) level. Whereas econometrics, combining economic theory, statistics and mathematical economics, is an applied economics and mathematical discipline, which studies the methods of the quantitative measurement of interactions between economic indicators and trends of their use in economic researches and practical economic activity.

The object of econometrics may be both a separate company or firm and the economy of various areas of economic activity, the economy of the states and the world as a whole. Methods of construction and study of mathematical and statistical models of economics, quantitative research of economic phenomena, explaining and forecasting of economic processes are the subjects of econometrics. The purpose of econometric research is analysis using econometric methods and models of true economic systems and processes that occur in them. The main objective is evaluation of the econometrics model parameters considering the peculiarities of the incoming economic information, check compliance of models with studied phenomena and forecasting of economic processes.

Intuitive methods of evaluation and forecasting of economic processes based on the experience and wisdom of some specialists, turned out to be helpless under the pressure of circumstances; there is a need of simultaneous solving of the huge number of complicated economic issues. Thus, it is high time to use strict scientific approaches in economics. The main reason for the birth of econometrics as a science is the emergence of competition and complexity of socio-economic phenomena and processes so much that it became impossible to control market relations by intuitive methods. This led to an objective need of scientifically substantiated methodologies in research and analysis of economic processes [5, p. 69].

It is clear that it was difficult for society to switch immediately into the application of statistical techniques and mathematical tools in solv-

ing economic problems. Long-term and gradual process caused the need to look for a balanced method for decision-making in the economy based on the intuitive and mathematical forecasting.

To solve the economic problems of different levels of complexity at different levels of economic activities various econometric models are used in the econometric modeling process. At the macroeconomic level by means of econometric studies regularities in manufacturing, distribution, redistribution and final use of gross domestic product are being researched. It should be noted that an important role is played by the peculiarities of formation and distribution of the state budget, the implementation of chosen tax policy, implementation of insurance, lending, savings business and so on. Econometric research on microlevel is focused on the scientific substantiation of administrative decisions made at the enterprises of different ownership. Thus it is essential to take into account the peculiarities of the environment and its ongoing impact. The models are also used for analysing economic and socioeconomic indicators which characterize the corresponding economic system, for forecasting their subsequent variation or for imitation of possible scenarios of socioeconomic development of the system researched, assuming that certain indicators can be changed.

Regardless of whether econometric models relate to macroeconomic processes or their components, they have some common features, such as:

– it is assumed that the behavior of economic variables is determined with the help of compatible and simultaneous operations with a certain number of economic relations;

– we accept the hypothesis by virtue of which the model can simplify the complex reality, however the main important characteristics of the object should be taken into consideration;

– in the process of model construction it is assumed that due to achieved with its help understanding of the real system it will be possible to predict its development in the future and perhaps manage the economic well-being.

To ensure the process of econometric modeling, it is necessarry to do a number of stages such as:

1. To select a specific form of analytical dependence between economic indicators (model specification) on the basis of economic theory.

2. To make the collection and preparation of statistical information .

3. To evaluate models parameters.

4. To conduct validation of the model parameters and ensure in its adequacy.

5. To apply the models for development forecasting of economic processes in order to further manage them [1, p. 12].

That is, in the process of econometric modeling we form the objective of research, collect the necessary static information, select a general model type (including the formation of outbound links and model's limitations), perform a statistical analysis of a model and evaluation of its parameters, check the model's adequacy, and lead the economic interpretation and practical use of the model.

In order to make an econometric model adequate, it is necessary to use quality theoretical analysis of existing relationships combined with the available empirical data. A theoretical aspect is usually reflected in the model specification, which is an analytical form of econometric model. Grouping of separate relationships as a model plays a great role in the construction of models, because any mathematical model is only a simplified formalized reflection of a real object. An ability of its construction is to combine as much brevity of the model parameterization as possible with sufficient adequacy of description of those aspects of reality modeling which are of interest. A number of links that are included in the model depends on the conditions under which the model is built, and the completeness of explanation, which we aspire to.

The main problems of econometric modeling are specification, identification, and verification. To solve these and other problems in the process of econometric modeling we should:

1) establish the ultimate goal of modeling and define a set of factors and indicators that fully characterize the model, its place and role in the study of economic processes;

2) choose a general type of the model;

3) analyse the economic meaning of the process, formulation and formalizing of the model's information basis;

4) answer the question whether there is any relationship between the studied variables, what structure and form of these relationships is, and how to measure their density;

5) determine the overall type and structure of relationship between variables, acceptable solutions in the form of a certain parametric complex of functions;

6) calculate the estimates of unknown parameters included into the econometric model, and their credibility;

7) make a comparison of actual and calculated data, verification the adequacy of the model, estimation of accuracy and stability of received relationship equations, building forecasting and scenarios of development.

To make a mathematical model effective in the study of economic processes, it must correspond to the following requirements:

– be based on the economic theory and display meaningful regularities of the processes;

– truly reflect the structure and function of real economic system;

– comply with specific mathematical terms, namely, have a solution and agreed dimensions [3, p. 21].

It is also important to remember that today there are more than 150 forecasting methods and techniques, each of which has its own pecu-

larities, depending on the purpose and level of research. Methods vary in scientific substantiation and purpose. Choosing forecasting techniques is done according to the nature of the object and the requirements that apply to information providing.

Conclusions. In the system of modern economic models economic forecasting should be based on a combination of intuitive (expert) and formal (mathematical) methods. This will enable to consider the impact of many factors, even in case of great complexity of the object's forecasting. With this balance can effectively predict the phenomenon, the emergence of new economic and technical means and solutions. Due to such balance it is possible to effectively predict the phenomena, the emergence of new economic and technical means and solutions. The study of economic phenomena using such models enables to solve the issue of the choice of pricing policy and prospects for economic development even more effectively. There is an opportunity to make substantiated conclusions about the prospects of results of science and technology progress, elaborate plans of separate types of economic activity and industry.

It can be definitely claimed that today for economic phenomena and processes forecasting we need to be more adaptive, flexible and original. Globalization of public relations is accelerating human development. It makes find new ways to ensure long-term development of the economy in general and businesses in particular. Econometrics which is direct mathematical forecasting makes it possible to find these methods of accurate forecasting. However, in current economic conditions econometric forecasts will be more effective in combination with intuitive ones.

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