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METHODOLOGY OF SOCIAL AND ECONOMIC FORECASTING AS ORGANIZATIONAL AND MANAGEMENT SYSTEM

The article provides a classification of research tools that predict social and economic processes as organizational and management systems. The criteria that determine the usefulness of expert and factual methods depending on the duration and nature of forecasting economic growth are defined in the article. The author completed the classification with mixed prediction methods, which include Delphi method and analytic hierarchy process, Fuzzy-technology and barometric methods.
Key words: methodology of social and economic forecasting, expert and factual methods, extrapolation, correlation and regression analysis.

Problem definition. The processes of creation, functioning and development of complex natural and artificial; systems are accompanied with uncertainty, which is a consequence objectives being blurred, incomplete output information, subjective perceptions about the future processes and the evaluation criteria. Usage of appropriate social and economic forecasting methods and models reduces uncertainty. As a result subjective decisions are objectified. L. Vogel, A. Owens and M. Walsh in their well-known monograph "Artificial Intelligence and Evolutionary Modeling" wrote that logical behavior could be seen as a combination of both capacity to foresee by using techniques that predict the state of the environment and transformation of every prediction into an adequate response to a set objective. Such a conclusion defines the role of social and economic forecasting methods as a prerequisite for purposeful human activity in solving analysis and synthesis problems and for the selection of optimal alternatives.

Analysis of recent research and publications. Different aspects of the techniques and methodologies of social and economic forecasting have been a subject of research both foreign and domestic scientists. Significant contribution to a theoretical and practical scientific prediction base belongs to academicians V. Heyets, I. Lukinova, economists V. Besedin, Y. Goncharov, I. Evdokimova, I.V. Kryuchkova, B. Panasiuk, M. Pashuta, A. Savchenko, M. Yakubovskiy and others. At present this subject is widely covered in the works of local scientists, including: N. Zhuravleva, L. Kantorovich, I. Korkuna, A. Kuzmin, G. Lopushynskaya, S. Ozhegova, V. Parsyak, S. Pokropyvniy, G. Tarasyuk, F. Fedorenko, L. Schwab and others.

Formulation of the objectives. The aim is to complement the existing classification of methods and models of social and economic forecasting with new classification groups of mixed methods, which, in author's opinion, is essential in studying the methodology of forecasting.

Summary of the main statements. According to foreign and domestic experts, there are over 150 universal forecasting methods. In certain variations the number of basic forecasting methods are repeated in other methods. Also,

the number of special techniques developed taking into account the specific application is still higher than the universal techniques.

Studying the current practices of social and economic forecasting certifies that the methods of economic forecasting can be classified according to various criteria. This typology is based on specific criteria depending on the goals, objectives, subjects and objects, object problem, timing bias, methods, forecasting process and so on. The required property of each method is identified by the problem-targeted formulation criterion and the achievement of science objectives of social and economic forecasting.

Authors find it interesting that prediction methods and models allow to predict the likelihood of the object's future state and development based on internal and external relations of the projected object. The system and methods of forecasting are constantly being improved and updated.

Methodology of Social and Economic Forecasting is the subject of research done by many scientists, economists and forecasters. So, in one of the first books on domestic social and economic forecasting authors consider following general scientific forecasting methods: observation and experiment, analysis and synthesis, imagination and conjecture, induction and deduction, analogy and classification, genetic method, etc.

Depending on the type of necessary background information and the reliability of the possible obtained results, forecasting methods are divided into expert, factual. Authors propose to supplement the above classification with mixed-mode prediction, which combines features of expert and factual methods.

Expert forecasting methods are based on expert information and apply if the forecasing object is very simple or it is so complex that it is impossible to consider the impact of many factors.

More expert methods of social and economic forecasting were considered. Among the most common methods of individual peer review is "*interview" method*, which consists of the analytical method and the method of writing the script and self-forecasting. In this case, an expert conducts the direct survey with specialist, then an analytical method provides a comprehensive analysis of the projected economic phenomenon or process of preparing the relevant memorandum. *The method of writing a script* is based on the definition of the logic of the projected object under different conditions.

Unlike previous methods, self-forecasting defines an independent prognosis assessment and, therefore, the adoption of management decision is made based on it.

As part of the collective expert methods some methods should be emphasized. They are a method of committees and commissions, "brainstorming", focus groups, scenario building, "objectives tree", collective idea generation method, collective peer review method, morphological analysis and others.

Method of committees and commissions, which is a form of collective expertise, involves several experts. It is important that the experts, on the one hand, may be temporary, and, on the other hand, - constant.

This group of methods of social and economic forecasting also involves "brainstorming", which is called the method of "collective generation of ideas". It is used to identify possible future scenarios.

The method of focus groups, which is considered one of the qualitative methods of social research, is widely used in the world. The focus group is defined as an interview that is targeted on obtaining from the participants subjective information about how they relate to a particular problem, how they behave in a given situation. Group discussion is a basic mechanism of the focus group. Its organization shall be subject to such general rules as compliance with certain phases of group discussion, favorable atmosphere and comfort in its every state and others.

Method of constructing scenarios is based on the sequencing the states of the object under different forecasted changes of the object's background. So there are two aspects of characterizing the scenarios as a means of social and economic forecasting:

- identification and evaluation of scenario forecasting objects' main parameters;
- recognition of the impact that management decisions make on the development of future scenario forecasting objects.

If we analyze the international experience, it turns out that most of the information is taken from the scenarios that are developed both by individual experts and consulting and research firms. To sum up the essence of this method, writing scenarios is interpreted as a forecasting method that establishes a logical sequence of events that take place with the forecasting object.

The method of morphological analysis selects the most appropriate solution from a range of alternatives. It should be used in predicting fundamental research. This method involves a number of techniques that provide a systematic review of the characteristics that the projected object has.

The method of collective peer review is another social and economic forecasting method. It is based on the principles of detecting expert opinion about the prospects of the prediction object. Usage of this method is based on the hypothesis that experts have sufficient ability to assess the importance and significance of the problem, perspective of the development of specified research direction, time implementation of the particular event, feasibility of selecting one of the ways in which the object will be developed, etc.

As a result, all the mentioned methods include judgemental scientific assessment which is based on rational expectations. Often development of market economy is charac by high volatility, because scientific methods in science social and economic forecast make it impossible to adequately reflect the situation in which the object is projected.

In addition to the methods of scientific assessments in social and economic forecasting there are formalized (factual) methods.

Factual methods of social and economic forecasting are based on the use of the actual materials that characterize changes of individual or all parameters of the forecast object. Within this group the main methods are functions extrapolation, correlation and regression methods.

Factual group of methods include statistical and proactive forecasting methods. Statistical methods should be understood as economic-mathematical methods that are used in forecasting time series of dynamics parameters of

economic phenomena. Their nature and interpretation are decribed in works of the economists.

Extrapolation method refers to statistical group and needs particular consideration. Simple extrapolation of long-term trends is based on the assumption that all the factors that caused trends in the past will stay throughout the duration of the forecast or will change relatively to a particular curve. Extrapolation on empirical data is used to develop short and medium-term forecasts that are based on linear, quadratic, power, exponential, and other functions.

In economics most common extrapolation methods are extrapolation based on the analytical performance series, extrapolation based on current mean and extrapolation of trends.

The method of designing a trend is usually based on the assumption that the change in a variable started in past will stay in future. It is used in projected gross national product, gross domestic product, exports, imports, etc.

Well-known scholars in the field of prognostics G. Prysenko and E. Ravikovych class methods of correlation and regression analysis, forecasting methods based on ARIMA and VAR- models, an error correction model (cointegration) to To econometric methods of prognostics.

Econometric methods have an essential difference from methods of time series. Time series methodsr describe the changes of the studied parameters as a function of previous trends. Econometric models use economic theory that establishes the dependence of the studied parameters from the changes that occur in other parameters. In some cases both types of methods may be similar, especially if the trend of the time series is modeled using growth curves. However their interpretation is different.

Exploring the econometric methods of social and economic forecasting, note that the regression analysis should be used to analyze the forms of communication. It establishes quantitative relationships between random variables of investigated stochastic process. The method of regression analysis is part of the theory of correlation.

Correlation analysis as one of the econometric social and economic methods studies correlations between random variables. Two random variables α and β are called correlation related if one of their expected values changes due to the change of the other variable. Pair correlation allows us to determine the relationship between two measures.

Mathematical modeling belongs to the formal (factual) methods of social and economic forecasting. In science the term “model” refers to the conventional image of the study object. Social and economic forecasting explains model as economic or social processes.

Certain models of social and economic forecasting are used in different classifications based on optimization criterion or best expected result.

For example, using the time factor models can be:

- statistical - limitation is set for one particular period of time during the planned period. As a result, either costs or the final product is minimized;

- dynamic – limitation is established for several time segments with minimizing and/or maximizing the entire planning period.

Econometric models are also used in social and economic forecasting. Most popular models are factor, structural and combined.

Factor modeles are used to describe the dependence of the level and dynamics of an economic indicator from the level and dynamics of amplitudes - economic indicators that affect this indicator. Such models may include a different number of variables and corresponding parameters.

Structural models describe the relationships between the individual elements that form a single unit or an aggregate. They are also structural balance models, they decompose a unit into its constituent elements and the relationship of these elements is studied. These models have a matrix form so that they are applied for analysing and forecasting the linkages. The most common form of structural balance model is an interbranch balance of production and product distribution.

Based on nomenclature of products and raw materials models can be:

- one-commodity model - a model uses one demand limitation that is set eiter on the production of the whole branch or on the amount of the raw material that is ised in production;
- multi-commodity model - two or more limitations are set.

Professor V. Kasyanenko has his own point of view on models. He believes that models can be divided into abstract and tangible (physical) models. He noted that a physical model is the material object of the same nature as the original object. Such models are widely used in engineering science. Mathematical models are a part of abstract models. They represent a system of mathematical relationships between dimensions that characterize the simulated object. If the characteristics of the model have specific numerical value, such model is called a numerical model. The model presented in the form of a logical expression is a logical model, and the one presented graphically is a graphical model.

Mathematical relationships are an important criterion for economic and mathematical models. If all mathematical dependences within a model are only linear, such models are called linear. In economics, there are many dependencies that have essentially non-linear properties. In this case, nonlinear models are used.

In addition to the methods of mathematical modeling, computer simulation is also used. It should be seen as the construction and study of social and economic models in computer systems. Simulation is done to identify and improve their performance. It requires strictly formal parameters of the studied process.

Authors believe that such classification should contain a group of mixed methods, because they include expert (subjective) and formal (factual) methods of prognostics. This group includes: “Delphi” method, hierarchy analysis, factor - effective method, Fuzzy- technologies, barometric methods etc.

The most popular method is “Delphi” method, which is used to identify and assess the likelihood of certain events to occur. The method allows to generalize the expert opinions into a coherent group opinion. The peculiarity of this method is that it provides the anonymity of the experts, the results of the previous survey are used and statistical analysis of survey results is made.

Analytic hierarchy process is an interesting method from analytical point of view. It gives an opportunity to solve difficult management problems. This method is often referred to as a mathematical procedure for hierarchical representation of the elements to determine the merits of any issues It decomposes a problem into simpler parts. It also processes judgments of individuals who make decisions based on pairwise comparisons criteria of propriety. Such a solution enables to estimate the level of interaction between the elements within the hierarchy.

While formal forecasting methods are applied based on the assumption that the future is a continuation of the past, barometric methods are based on the fact that the future can be predicted on the basis of events occurring now.

Barometric methods use statistical indicators of time series. In conjuncture with one another they indicate the direction, in which economy, industry or specific production will develop. These time series are barometers of economic change. In business cycle analysis and forecasting of economic activity the basic concept of statistical indicators is going through the business cycle during successive but different time intervals.

One of the modern methods which belongs to the group of mixed methods is fuzzy-echnology. From an economic point of view it is regarded as a set of theoretical foundations, methods, algorithms, procedures and software based on the use of fuzzy knowledge and expert assessments for a wide range of tasks.

To sum up, there are several **conclusions**:

Having studied the practices of social ans economic forecasting, it is evident that economic forecasting methods can be classified according to various criteria. This typology is based on specific criteria depending on the goals, objectives, subjects and objects, object problem, the nature, timing bias, methods of organizing forecasting process, etc.

Forecasting methods should be subdivided into expert, factual and mixed (author offered to include the Delphi technique, analytic hierarchy process, Fuzzy- technology and barometric methods). On the one hand, the author agreed that it is appropriate to apply expert forecasting methods if there is lack or absence of retrospective data. Mathematical methods can be used to assess events based on past experience, for medium- and long-term prediction of discontinuous processes.

On the other hand, the factual methods of social and economic forecasting are based on actual use of the materials that characterize changes in time of the individual or entire set of characteristics (parameters). In this group of methods the main methods are functions extrapolation and cross-correlation regression methods.

It leads us to a conclusion that in modern economic literature related to social and economic forecasting there is no detailed characteristics of the methods and prognostics models menthioned in this article. Such variety of forecasting methods and different requirements make the problem of choosing the most appropriate method necessary to be solved.

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МЕТОДОЛОГІЯ СОЦІЛЬНО-ЕКОНОМІЧНОГО ПРОГНОЗУВАННЯ ЯК ОРГАНІЗАЦІЙНО-УПРАВЛІНСЬКОЇ СИСТЕМИ

Резюме
У статті подано класифікацію дослідницького інструментарію прогнозування соціально-економічних процесів як організаційно-управлінської системи. Визначено критерії, за якими визначається доцільність застосування експертних і фактографічних методів в залежності від терміну прогнозування та характеру економічного розвитку. Автором доповнено класифікацію змішаними методами прогнозування, до яких віднесено методи Дельфі та аналізу ієрархій, Fuzzy-технології та барометричні методи.
Ключові слова: методологія соціально-економічного прогнозування, експертні та фактографічні методи, екстраполяція, кореляційний та регресійний аналіз.

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МЕТОДОЛОГИЯ СОЦИАЛЬНО-ЭКОНОМИЧЕСКОГО ПРОГНОЗИРОВАНИЯ КАК ОРГАНИЗАЦИОННО-УПРАВЛЕНЧЕСКОЙ СИСТЕМЫ

Резюме
В статье приведена классификация исследовательского инструментария прогнозирования социально-экономических процессов как организационно-управленческой системы. Определены критерии, по которым определяется целесообразность применения экспертных и фактографических методов в зависимости от срока прогнозирования и характера экономического развития. Автором дополнена классификация смешанными методами прогнозирования, к которым отнесены методы Дельфи и анализа иерархий, Fuzzy-технологии и барометрические методы.
Ключевые слова: методология социально-экономического прогнозирования, экспертные и фактографические методы, экстраполяция, корреляционный и регрессионный анализ.