

Judgmental Macroeconomic Forecasting on the Basis of Probability Estimation of the Economic Indicators

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Abstract

The paper deals with the opportunity of Judgmental Macroeconomic Forecasting for the behavior of the economic systems and processes on the basis of the estimation of a priori, a posterior and conditional probabilities of the relevant economic indicators. This approach shows a path of economic crisis forecasting that should be an essential tool for policy makers in order to avoid or to mitigate the consequences of a possible economic crisis. The method will be especially useful for small countries with transient economy in order to create an optimal strategy of country's development during the crisis.

Keywords: Bayesian methodology, crisis, cybernetic understanding, judgmental forecasting, macroeconomic systems, "noise"

JEL: C1, C53

Introduction

It is well known that one of decisive factors of successful management of economic processes is correct forecasting of future events. The risk level, the future development of economic events associated with uncertainty has considerably increased for the last decades, which was caused by different objective and subjective reasons, such as the changes in political geography in Europe and the emergence of the multi-polar world, the development of new information and communication technologies, the expansion and acceleration of tendencies of globalization, which allegedly creates prerequisites of equality of different people and countries, but actually aggravates the real conditions for many poor countries and so on. The modern world is characterized, on the one hand, by the latest developments of political and economic thought. However, on the other hand, it is characterized by political, financial and economic crises and uncontrollable macroeconomic indicators and political processes despite the efforts of the world community, leading politicians and scientific and analytical centers of the world. Certainly, the prevention of undesirable phenomena and/or mitigation of their effects requires the development and implementation of effective forecasting methods on the basis of which effective management will be possible.

The available methods of economic forecasting generally use the deterministic methods that were developed by Karl Marx (Marx, 1849; Screpanti & Zamagna, 1993; Callinicos, 2010) and that perform the analysis of business cycles, for example, in the form of Kondratyev's waves (Korotaev & Tsirel, 2010; Barnett, 1998; Devezas, 2006), or the Z-score formula for predicting bankruptcy (Altman, 2000), and so on. However, as a rule, everything is reduced to an incident ex-

planation, and the attempt of forecasting of the future suffers failure. This is natural as real political and economic processes are stochastic, and such processes cannot be predicted by the deterministic methods based on "regularities" which are usually found on the observation of the latest events. Certainly, in special cases it is possible to obtain the satisfactory results of prognostication. For example, short-term micro forecasting of financial and economic indicators of the companies by using the quantitative methods of the analysis of temporary ranks yield quite acceptable results (Armstrong, 2001; Hanke & Wichern, 2005). Also, in some cases, based on the analysis of the political conjuncture, it is possible to predict the results of the electoral company in one or other country, and so on as Gallup, Inc. Levada Center and other analytical companies do. But such processes belong to the so-called "predicted" phenomena. For multiple-factor and multidimensional non-stationary stochastic processes, especially for the phenomena close to the type of "a black swan" (Taleb, 2007), the traditional methods of forecasting are of no use.

In this paper the method of stochastic modeling by using the cybernetic approach is offered for forecasting of complicated economic processes, especially for crisis situations.

Cybernetic Understanding of Economic Systems and Processes

From the cybernetic point of view the problem of forecasting of economic processes, including risky and crisis situations, is the topic of management in the conditions of incomplete infor-

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mation (Bagaturia & Bagaturia, 2005). In this case it is possible to conduct the optimal management (i.e. to forecast risky and crisis situations and to make a relevant decision) on the basis of the analysis of factors, taking into account their probability characteristics (including the probability characteristics of “noise” - accidental events and factors - uncertain influence of political-economic conditions and/or “shadow players”).

The key areas of economic, business activity include a lot of various political and economic factors, among them we can distinguish those which are out of the firm’s control (fiscal and monetary policy, population levels, the labor market, and so on) and those under the firm’s control (costs, prices, profits, product development, and so on). By understanding these issues, every policy maker, businessman, manager should be able to analyze better the available data and to construct practical and useful forecasts on their basis. Not all businessmen, managers or decision makers have to make forecasts or to conduct market analyses, but since they all find themselves in the situations when they must make decisions using these data, it is important that they understood how those data were derived. Under the conditions of stable development of the world policy and economy, reasonable understanding of widely used tools allows decision-makers of a company to make sales forecasts, to analyze markets, and so on. Political analysis and forecasting is not so easy, because in this case we have no relevant information in contrast with the case of economic data, but economic development is connected very closely with a political situation. Thus, in order to make correct economic forecasting, it is necessary to take into account political considerations, and, in order to make political forecasting, we should account for economic considerations, including a possibility of political and/or economic crisis. The information from sales forecasts and market analyses usually acts as the focal point for firm’s planning activities. The firm has to use various fiscal and economic data to manage its inventory, to make decisions for any type of activity as well as to make decisions related to the expansion/contraction of its work force. Fiscal and economic data also influence the firm’s expansion to new areas, its purchases, capital investment, and its promotional and market activities. Because these data play such an important role in the firm’s planning process, it is crucial that these forecasts and analyses were accurate and that the decision-makers understood how they were derived.

As people advance in their business careers, the number of situations requiring decisions and the impact of those decisions increases dramatically. Successful managers or decision-makers seem to have two inherent qualities: willing to make tough decisions and a high rate of success in those decisions. Their success flows from an ability to combine intuition and general know-how with solid information. This know-how might be a formal technique used to estimate future events, or it could be an informal set of procedures the decision-maker has developed just for this situation. In any case, the more tools the decision-maker is familiar with and can use, the greater his/her chances are for making right decisions.

However, under the conditions of the world economic crisis, which as usual is an unexpected attack at the world economy, all normal estimations of business development became of no use and, as a result, most of companies, especially the companies with weak financial background, declare their bankruptcy, which is followed by various very unhappy consequences - rising of unemployment, inflation, and so on. (sometimes including a political crisis). Of course, we have to admit that not only objective economic processes and politi-

cal events are the reasons of the global crisis, the “shadow players”, who artificially stimulate the crisis situations, play an essential role in it.

Nevertheless, it is obvious that forecasting is essential for any type of activity. Generally, it is possible to forecast the economic development of the country (an industry, a company) only in a more or less stable political and economic situation. Unfortunately, as the world economic history shows, it was impossible to forecast the global economic crisis. But, it is necessary to develop methods of economic crisis forecasting, even if the accuracy of forecasting is not satisfactory from the point of determination of the exact dates and places of the crisis beginning. A mere notice about changing in the economic stability would be enough for creating a new strategy which will help a company (a country) to save a company (country’s economy) without great losses.

In this paper we consider an opportunity of the world (global) economic crisis forecasting on the basis of cybernetic methodology that gives a chance as to the countries based on global economy to avoid or to mitigate the consequences of the global economic crisis, so to business companies to craft an optimal strategy of company’s development during the crisis. In this case, it is possible to represent the role of forecasting as it is shown in the figure, which presents the external-internal framework of the analysis and forecasting of the existing situation for any general case. It demonstrates both the analytical steps and the connection between business forecasting and winning business strategy.

Generally, forecasting is needed in order to choose a winning strategy for company’s (country’s) successful development on the basis of three fundamental analyses. The fundamental directions of the analysis include:

- Macro-environment analysis i.e. analysis of national and global economy, industry and competitive conditions, political situation, and so on,
- Micro-environment analysis i.e. the company’s (country’s) internal situation, political-economic stability, competitive position (particularly for a business company), and so on,
- Evaluation of the existing strategy of a company (a country).

In this case we can note the logical flow from the analysis of the company’s external and internal situation to the evaluation of alternatives, the forecast of each alternative and to the choice or to the craft of a new (winning) strategy that includes establishing a mission, setting objectives, goals, aims, tasks, criteria, and so on, generally - the ways of company’s development. The necessity in such an analysis is obvious if we use the cybernetic approach.

Forecasting is the process of estimation of various events in unknown situations. As soon as, from another – *cybernetic* - point of view, the problem of economic crisis forecasting is the topic of management in the conditions of incomplete information, it is possible to conduct the optimal management (i.e. to forecast the economic crisis) on the basis of the factor analysis and the consideration of probability characteristics of “noise” and feedback (Bagaturia, 2014). The cybernetic approach considers an economic system/process from the position of the theory of management. Such an approach must be used for the management and analysis of economic processes, including the tasks of business management. The figure

shows the general structure of an economic system/process from the cybernetic point of view. The processes proceeding inside are unknown or little known for us. At our disposal there are external processes acting on the economic system/process (denoted as X) and the reaction of the system (object of management) on this influence, its response (denoted as Y).

The task of optimal management is to make and to implement such decisions (managing influence - denoted as U) that will give opportunities to achieve the aims with consideration of social-economic, political/economic processes proceeding outside and inside the system (object of management), i.e. the value of acting factors and the influence of „noise“. Particularly, for the economic system, the internal and external processes are estimated by GDP, Export-Import Balance, Income, Costs, Unemployment level, FDI, Currency rate, Inflation rate, and so on.

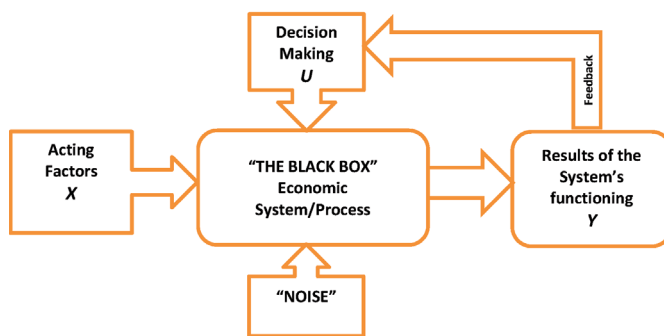


Figure 1. Cybernetic Model for Management of the Economic System

For checking up how well we achieve the planned goals, the criterion of estimation must properly be selected. According to the criterion, we have to ascertain how effective is our decision, how we approach our goal. After making a decision and testing its realization, it is important to analyze the feedback information. The decision should be corrected, changed or finally realized according to feedback results. Maybe it is necessary to reconsider the criterion of optimality and the demands to entrance factors too. The criterion is strategic if it can change in compliance with changing circumstances.

The economic process, functioning of the country's (company's) economy is influenced by the national (local) and foreign political-economic circumstances as well. The character and intensity of the influence, the time and place of its appearance are not defined in advance, particularly in unstable political and economic circumstances.

Generally, such a situation occurs in developing countries of transitive economics. The nonprogrammable and unpredictable action of political-economic circumstances, as is customary, has an adverse impact on the functioning of the existing political system. Hence, the political-economic environment should be referred to „noise“ from the standpoint of management. By using the feedback link, theoretically it is possible to predict the influence of the political-economic „noise“ (including the influence of the „shadow players“) and to choose the relevant strategy. In the conditions of effective and viable public management, the feedback influences the economic system and forms various demands that finally will stimulate the achievement of ultimate aims.

In case of correct definition of X , U , Y , and „noise“, it

is possible to estimate (i.e. to forecast) the probability of changes in any factors of the economic system. For this purpose we use stochastic modeling.

Stochastic Model

Let event Y be the results of the economic system, e.g. the economic crisis of the world or of any particular country. Event Y may occur in different ways of X_i , $i=1,2,\dots,n$. So we can introduce a conceptual model of the crisis as

$$Y = f(X_1, X_2, \dots, X_n)$$

It is impossible even theoretically to construct the mathematical model f because of its stochastic character.

The specific types of X_i depend on the type of event Y , the period of history and the interests of „shadow players“. Today, for economic processes, they may be the tendencies of global and national economy; the trends of chief characteristics of the national economy and industry; the relations between national and global economy; the activity of huge transnational companies; the decrease in GDP; unbalanced budget; a failure of the pension system; revealed drawbacks of the banking system; nervous behaviour of leading stock markets; aggressive political decisions; and so on.

Say *a priori* probabilities $P(X_i)$ (the hypothesis about Y occurrence) are known. In this case, it is possible to investigate the changing process of $P(X_i)$ in accordance with the results of Y , i.e. after Y has taken place. For this purpose we have to estimate a *posterior* probabilities $P(X_i/Y)$, which provides the basis for prediction of crisis events (Bagaturia, 2012). In accordance with Bayes methodology, the conditional probabilities $P(X_i/Y)$ can be estimated as follow (Aczel, 1996):

$$P(X_i/Y) = \frac{P(X_i) \times P(Y/X_i)}{P(Y)}$$

The probability $P(Y)$ should be evaluated by the formula of probabilities of Full Group

$$P(Y) = \sum_{i=1}^n P(X_i) \times P(Y/X_i)$$

The analysis of the above-given equations gives us the possibility to forecast the conditional probability of Y occurrence (i.e. the probability of crisis beginning) $P(X_i/Y)$ on the basis of *a priori* probabilities $P(X_i)$. It means that, during monitoring of the political and/or economic processes, it is possible to note the critical turning point of the conditions of origination of the crisis, i.e. to note the change in the value of probabilities $P(X_i/Y)$ $i=1,2,\dots,n$, which should be considered as a **sign of the crisis**. Therefore, the authorized persons/structures can pay attention to the measures for reducing or mitigating of the crisis preconditions.

For the practical use of above-mentioned methodology, it is necessary to list and estimate the following:

- The ways of crisis occurrence – X_i ;
- *A priori* probabilities $P(X_i)$;
- Conditional probabilities $P(X_i/Y)$.

For this purpose it is necessary to use environmental scanning techniques. Environmental Scanning involves the study and interpretation of social, political, economic, ecological, and technological events in the effort to spot budding trends and conditions that could eventually affect the industry. This is an attempt to look broadly at the world, international economic relations, political processes, and so on. The environmental scanning raises experts, politicians and managers' awareness of potential developments that could have an important impact on industry conditions and pose new opportunities and threats. The environmental scanning can be accomplished by systematic monitoring and studying the current events, constructing the scenarios and employing the judgemental (Delphi) methods (techniques for finding consensus among a group of "knowledgeable experts"). Although highly qualitative and subjective, the environmental scanning helps managers to extend their planning horizon, to convert a current political/economic situation into clearer strategic issues (which they can begin to develop a strategic answer for), and to think strategically about future developments in the surroundings.

The scope of monitoring must be both financial and strategic objectives (e.g. Revenue growth; Dividends; Profit margins; Higher returns on invested capital; Stronger bond and credit ratings; Bigger cash flows; A rising stock price; A more diversified revenue base; Stable earnings during recessionary periods; Market share changing; Industry rank; Higher product quality; Lower costs relative to key competitors; Broader or more attractive product line; A stronger reputation with customers; Superior customer service; A leader in technology/product innovation; Increased ability to compete in international market; Expanded growth opportunities; and so on), tendencies of the global and national economy, chief characteristics of the national economy and industry; the relations between national and global economy; driving and competitive forces; competitive positions of companies; future competitors; key success factors; and so on.

At the same time, the forecaster must take into account a threat of mistakes. These mistakes, basically, are connected with consideration only of one variant of succession of the events, with errors of extrapolation, with putting on high hopes on the use of mathematical methods or, on the contrary, with disregarding of mathematical methods, with insufficient attention to the estimation of various factors, with a failure to take into account possible changes and, at last, with self-deception when in the real phenomena businessmen or managers do not notice dangerous tendencies and remain in the captivity of illusions.

Conclusion

The offered stochastic model gives an opportunity to evaluate the preconditions of the development of economic processes. On the basis of such an evaluation, the opportunity of predicting the future conditions of these processes arises. This does not mean that we can forecast particular events of economic processes, e.g. the economic crisis, but the prediction of the tendencies of changes in the world economic climate is possible. Understanding of the coming changes would be a sufficient condition for making the relevant recommendations for the countries in order to create the optimal strategy of development.

References

- Aczel, A. (1996). *Complete business statistics*. Irwin, McGraw-Hill, Boston.
- Altman, E. I. (July 2000). Predicting financial distress of companies: revisiting the Z-score and Zeta models. Retrieved May 6, 2014, from <http://pages.stern.nyu.edu/~ealtman/Zscores.pdf>
- Armstrong, J. S. (ed.) (2001). *Principles of forecasting: A handbook for researchers and practitioners*. Norwell, MA: Kluwer Academic Publishers.
- Bagaturia, G., & Bagaturia, O. (2005). Cybernetic conception of public management. *Bulletin of the Georgian Academy of Sciences*, 171(2).
- Bagaturia, G. (2012). Bayesian methodology for the forecasting of global economic crisis. *Satellite Workshop/Latsis Symposium 2012 "Economic on the Move: Trends and Challenges from the Natural Sciences"*, ETH, Zurich, Switzerland. Retrieved from http://web.sg.ethz.ch/Latsis_2012/
- Bagaturia, G. (2014). Cybernetic model for global economic crisis forecasting. *International Turgut Ozal Congress on Business, Economics and Political Science – 2013. Proceedings*. Turgut Ozal University, Ankara, Turkey. Retrieved from <http://www.intoc.org/index.php/proceedings/>
- Barnett, V. (1998). Kondratiev and the dynamics of economic development. *Structure and Dynamics*. 4(1), 3-57.
- Callinicos, A. (2010 [1983]). *The revolutionary ideas of Karl Marx*. Bloomsbury, London: Bookmarks.
- Devezas, T. (2006). *Kondratieff waves, warfare and world security*. Amsterdam: IOS Press.
- Hanke J., & Wichern, D. (2005). *Business forecasting*. Pearson Education International.
- Korotaev, A., & Tsirel, S. (2010). A spectral analysis of world GDP dynamics: Kondratiev waves, Kuznets swings, Juglar and Kitchin cycles in global economic development, and the 2008–2009 economic crisis. Retrieved May 6, 2010, from <http://archive.today/dL22>
- Marx, K. (1849). *Wage labour and capital*. Germany: Neue Rheinische Zeitung.
- Screpanti, E., & Zamagna, S. (1993). *An outline of the history of economic thought*. Oxford University Press.
- Taleb, N. N. (2007). *The black swan: The impact of the highly improbable*. London: Penguin.