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# MACROECONOMIC FORECAST MODELS - CONCEPTS AND THEORETICAL NOTIONS

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## Abstract

*The present age is characterized by a rapid system of change, thus increasing the need to know these changes with the anticipation of future developments. Even if, in anticipation of future developments with the help of the macroeconomic forecast, we are talking about relative knowledge, this knowledge allows both the creation of a set of solutions to adapt to the transformations that are required, as well as the reduction of possible risks. Thus, in this article, the authors intend to present some theoretical notions regarding the macroeconomic forecast and its role in determining the evolution of activities carried out in various economic or social sectors. At the same time, based on the theoretical notions, the authors will present the particularities of the use of the linear regression model in the analysis of the evolution of the macroeconomic indicators.*

**Keywords:** *anticipation, macroeconomic forecast, model, simple regression, evolution*

**JEL Classification:** *C40, G17*

## Introduction

At a time when science and technology is constantly evolving and changing, research into the future and anticipation of how phenomena and events unfold have become a permanent concern. Thus, prediction is a discipline whose main objective is to anticipate the context in which various decisions are to be applied. Thus, using various econometric methods, the macroeconomic forecast aims at estimating future values of the main macroeconomic indicators. The importance of using the forecasting function can be seen at various levels of the economy, both in terms of exploring the main trends and their implications, focusing efforts in the directions considered opportune, and adopting legal regulations to restructure some sectors based on objectives. The main role of the forecast is to guide the decision-making process and reduce, as far as possible, the risks of making certain decisions. As far as the predictive function is concerned, we can state that, within macroeconomic management, it is aimed at a time exploration, a process that seeks to determine the dynamics

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and efficiency of a future action. A special place within the present article is the delimitation of the methodological framework of the macroeconomic forecasting, as well as the main statistical and econometric models, with which it is possible to anticipate future evolutions.

### **Literature review**

Anghelache (2016), Dougherty (2007), Andrei and Spătaru (2010) are reference works for the study of econometric methods and instruments, the authors approach the forecasting issues and the case of macroeconomic indicators. Andreou, Ghysels and Kourtellos (2013) discuss on the usefulness of financial data within macroeconomic forecasting. Anghelache (2015) develops on macroeconomic forecasting in a comprehensive presentation. Anghel and Diaconu (2016), Anghelache (2009), Anghelache and Anghelache (2010) present a group of dedicated models designed for macroeconomic prognoses. Anghelache et.al. (2006) develops on the concepts and instruments of macroeconomic analysis. Bardsen, Nymagen, and Jansen (2005) emphasize the role of econometric tools in macroeconomic modelling. Anghelache, Manole, Anghel and Popovici (2016) evaluate the impact of external payment balance indicators on the macroeconomic aggregates that describe the outputs of the national economy. Corbore, Durlauf, Hansen (2006) develop on the theoretical and practical framework of econometrics. Anghelache (2008), Newbold, Karlson and Thorne (2010) are reference works in economic statistics. Benjamin et.al. (2010) present the usefulness of econometric models in forecasting. Anghelache, Pagliacci, and Prodan (2013) design a macroeconomic analysis model on the foundation of the regression method. Carroll (2003) analyzes the macroeconomic expectations of economic stakeholders, approaching the position of professional forecasters. Anghelache et. al. (2017) describe a set of instruments, models and indicators, for macroeconomic prognoses, Anghelache, Manole, and Anghel (2017) are preoccupied with the application of appropriate models within the structural analysis of GDP. Aruoba and Diebold (2010) develop on monitoring the macroeconomic activity in real-time. Anghelache and Anghel (2014) is a reference book in economic modeling, the authors also approach the macroeconomic indicators. Ladiray (2006) develops on data analysis in the forecasting activity. Manole, Anghel, Badiu and Avram (2017) analyze the theoretical framework of macroeconomic proportions and correlations, Anghelache, Manole, Anghel, and Diaconu (2016) develop on a similar topic.. Anghelache, Dima and Anghel (2016) apply the autoregressive model for a five-year interval. Hamilton, Waggoner and Zha (2007) present the characteristics of normalization in econometrics. Öllera and Teterukovsky (2007) develop

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on the measurement of macroeconomic variables' quality. Anghelache, Grabara and Manole (2016) consider the instruments of ARMA models in macroeconomic prognoses. Anghelache (2015) has realized a comprehensive presentation of the macroeconomic situation in Romania in 2015. Clark and Ravazzolo (2015) evaluate the performance of macroeconomic forecasting under certain conditions.

### **Research methodology and data**

The elaboration and delimitation of the methodological framework of macroeconomic forecasting, presupposes, firstly, the structuring of the forecasts and their substantiation. Structuring the forecasts involves the operationalization of the activity by grouping the problems and the actions to be undertaken, depending on different established criteria such as sections, profiles, etc. The basis for the forecasts is to take into account all elements that influence established indicators by collecting all the necessary information. The elaboration of the macroeconomic forecasting papers involves the following three essential steps, namely: diagnosis, prognosis and planning.

Any forecast is based on an analysis of the activities and events in the period prior to the period under review, as well as on the economic and social factors that determine the trends to date. Thus, diagnostic analysis (diagnosis) follows the evolution or unfolding of certain events over a certain period of time, as well as identifying the factors that favor this evolution.

On the basis of the results of the diagnostic analysis, the prognosis process is started, comprising the following stages:

1. the interpretation and capitalization of the information obtained from the diagnostic analysis, as well as other information necessary for the elaboration of the forecast;
2. preparing prospective studies and preliminary forecasts;
3. elaboration of partial or sectoral forecasts;
4. Making the final macroeconomic forecast.

Macroeconomic or sectoral planning or programming, as the case may be, refers to the time horizon required for foresight activity and is developed by interested decision makers over a long time horizon (over 7 years), medium (3-7 years), or yearly, Depending on the specificity of the activity.

Among the most important and most used statistical and econometric models, in the macroeconomic forecast, we refer to the linear regression model. Thus, the linear regression model is a statistic-econometric instrument aimed at determining the dependency relations between two or more variables. Given that any macroeconomic analysis involves certain measurement errors that may influence the estimation of parameters, a residual variable

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is included in the regression model. In addition to linear patterns, there are also nonlinear patterns that can be converted into linear patterns by means of different mathematical functions (e.g., logarithm). Depending on the number of variables depending on which dependency of the explained variable is analyzed, the regression model can be simple or multiple.

The linear regression model can be represented by the following function:

$$y = b + ax + \varepsilon$$

where,

$y$  = dependent variable (explained);

$x$  = independent variable (explanatory);

$\varepsilon$  = residual variable;

$a, b$  = parameters estimated using the data series used to define the two variables.

The forecasting methods used in macroeconomic forecasting can be grouped as follows:

- from the point of view of their role in substantiating the plan or forecast, they are divided into: fundamental methods, predictive methods on elements, structural forecasting methods and intuitive methods;
- from the point of view of the decision maker's attitude to the subject of the forecast, they are divided into: exploratory methods and normative methods.

In the fundamental methods, we can remember the method of analysis and synthesis, which involves, on the one hand, the decomposition of a process into its constitutive elements, in order to perform an individual analysis of the elements, and on the other, the reunification of these constituents, for the realization of an overall analysis, generalizing the conclusions drawn up in the first phase.

With regard to element prediction, one of the main methods is the extrapolation method. This method involves studying the evolution of some indicators in the past (for a certain period of time) and prolonging this evolution in the future.

When discussing structural forecasting methods, it is important to note the motto of successive approximations aimed at determining all the elements that condition the evolution of a process or phenomenon, and their organization in the form of a tree.

Among the intuitive methods, we mention the method of group discussions, also known as brainstorming, which involves getting a large number of ideas to solve a problem by stimulating participants' creativity and teamwork.

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### Conclusions

From the points addressed in this article, it follows that the science of prediction is complex and absolutely necessary to be used in the present age. Thus, by presenting the essential aspects of the macroeconomic forecast, the authors managed to capture the main methods to be used when anticipating future developments. Beyond the applicability of the forecast in the statistical surveys as outlined in this article, the prediction function is the most important function of macroeconomic management, this being the basis for the development and implementation of decision-making processes. In this presentation, the authors have only surprised some of the key elements that characterize the macroeconomic forecast, and this issue will also be addressed in future works.

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