Abstract

Decision-theoretic forecasting in business and macroeconomic applications: properties, models, methods of testing and practical recommendations

The main purpose of the project is to deepen the knowledge and to develop more tight connections between theory and practice in the field of the decision-theoretic approach to forecasting and forecast evaluation in logistics and macroeconomics. The project concentrates mainly on optimal forecasts in logistic systems operating under the type II service level, in which case the aim is to establish a decision-theoretic basis for optimal forecasting, as well as on modal forecasts of macroeconomic indicators, in which case the main purpose is to assess the recently proposed modal regression as a tool of obtaining such forecasts. Furthermore, additional research tasks are the derivation of statistical models of computing long-term quantile forecasts of demand with the quantile smoothing methodology and an evaluation of modal regression as a means to construct marketing-mix models.

Although the problem of determining optimal forecasts defined as forecasts obtained according to the Bayes rule, i.e., predictions minimizing the expected value of the assumed cost (loss) function, was discussed in the econometric and economic literature since the late fifties, many authors indicate that establishing a practical linkage of forecasts evaluation and profits from the forecasting process was considered so far mainly in the field of empirical finance and neglected in other areas. In the project, we concentrate on establishing such links in the case of logistics, marketing and macroeconomic forecasts.

The research will be based on formal statistical and optimization considerations, simulation analyses and expansive empirical studies utilizing data from M-competitions, case studies and macroeconomic and marketing databases.

In terms of logistic and supply chain forecasting, the novelty of this research project concerns first of all the approach to study, construct, evaluate and test forecasts in logistic systems working under the type II service level. Defining the general form of the loss function associated with optimal forecasts leading to the assumed fill rate service level, establishing the statistical properties of such forecasts together with the ways of computing and testing them will create the theoretical basis for the decision-theoretic analysis of logistic forecasts, an analysis having many direct practical implications, providing at the same time a strong impulse for deepening the scientific discussion on forecast evaluation in logistic and supply chain applications.

Besides, one of the major aims of this project is the assessment of a new analytic framework – modal regression – as a tool for obtaining forecasts of macroeconomic indicators under the 0-1 loss function or, more generally, under a bounded symmetric loss function, and as a means to plan marketing activities. So far, this research problems have not been analyzed on the basis of expansive empirical studies or were not considered at all. This part of the project should deepen the discussion on the place of semiparametric approaches to economic forecasting. Furthermore, as a result of the planned theoretical and empirical considerations, many practical indications for forecasting in business and economics will be formulated.