CRACOW UNIVERSITY OF ECONOMICS

Quantitative methods in the contemporary issues of economics

Edited by Beata Ciałowicz

book excerpt

- Merger of Populations and Aggregate Relative Deprivation
- Convergence of Conflict Sets and Applications
- The Angle between the 2-dimensional Linear Regression Model Lines
- Analysis of Football Players' Labor Market Migrations Using Panel Gravity Models
- Selected Credit Risk Models
- Optimal Path in Growth Model
- Predictive Power Comparison of Bayesian Homoscedastic vs. Markov-switching Heteroscedastic VEC Models
- MCMC Method for the IG-MSF-SBEKK Model
- Indebted Households' Self-assessment of their Financial Situation: Evidence from Poland

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Introduction

Beata Ciałowicz[1]

Quantitative methods in economics include mathematical modelling, game theory, optimization techniques, statistical methods and econometrics. The methodological status of these methods in analyzing the issues of economics has been discussed for years. At the most fundamental level quantitative methods are universally and primarily aimed at answering contemporary economic questions at testing economic theories, ideas or hypotheses. These methods help to extend and formalize a broad range of empirical and theoretical problems in economics and influence the development and refinement of formal models in economics. Moreover, quantitative methods increase research efficiency by making it possible to confront theories with empirical data, to apply a formal theory to many different subject matters and to indicate similarities and differences in a comparative analysis of the theories on the same problem.

This monograph presents some interesting applications of quantitative methods in studying the phenomena of economic processes using mathematical knowledge and tools. The area of scientific research is diversified and covers topics relating to macroeconomics, consumer theory, socio-economic development, households quality of life, heteroskedastic Vector Autoregressive models and credit risk models.

In the first chapter by Jakub Bielawski, *Merger of populations and aggregate relative deprivation*, the problem of merging populations and its consequences is analyzed. In particular, this chapter shows that in some situations it is sufficient to change the weight the individuals attach to the comparison with the richest individuals in the population to obtain that the social stress decreases after the merger.

The following chapter by Anna Denkowska entitled *Convergence of conflict sets and applications* presents some new results concerning the semicontinuity of the

[1] Beata Ciałowicz, Cracow University of Economics, e-mail: beata.cialowicz@uek.krakow.pl

conflict set and discusses them for applications. Specifically, it discusses the conflict sets of a finite family of pairwise disjoint closed subsets of the Euclidean space evolving in time.

The chapter by Michał Górnik, *Analysis of football players labor market migrations using panel gravity models*, gives an example of using panel gravity models for estimating the size of players movement between pairs of countries and verifies hypotheses of the impact of the sport level difference between leagues on the number of transfers as well as the correlation between the overall country economy and its top-tier league capability to attract football players.

Albert Gardoń, in his contribution *The Angle between the 2-dimensional Linear Regression Model Lines*, analyzes an impact of the goodness-of-fit and the ratio of sample variances on the angle between the linear regression lines. This chapter shows that the angle depends not only on the correlation between features but also on the ratio of their sample dispersions.

The next chapter by Stanisław Heilpern, *Selected credit risk models*, is devoted to credit risk in two kinds of models based on the generalized binomial distributions. Firstly, the dependent credit risk, using copulas, mainly Archimedean is investigated. Secondly, a case with the uncertain probability of the insolvent obligors is studied.

Marta Kornafel in her contribution *Optimal path in growth model*, considers the general Ramsey-Koopmans-Cass growth model where some of the parameters depend on time. This work is focused on the dependence of the model and its solution to the perturbance of parameters.

The following chapter by Łukasz Kwiatkowski, *Predictive power comparison of Bayesian homoscedastic vs Markov-switching heteroskedastic VEC models,* develops a framework for modelling the forecasting performance of Bayesian vector error correction models featuring two- and three-state Markovian breaks in the conditional covariance matrix to capture time-varying volatility, typically recognized in macroeconomic data.

Anna Pajor, in her contribution *MCMC method for the IG-MSF-SBEKK model* proposes specific numerical method applied to estimate the hybrid IG-MSF-SBEKK model for daily exchange rate returns. In this method a Markov chain Monte Carlo simulation tool is adapted to obtain a sample from the posterior distribution of parameters and latent variables.

The last chapter by Agnieszka Wałęga, *Indebted households' self-assessment of their financial situation: evidence from Poland,* stresses the importance of the level of debt and over-indebtedness risk for self-assessment financial situation of the household. To examine the relationship between the respondents' self-assessment of their financial situation and commonly used objective measures of over-indebtedness, the ordered probit model was used.

All these research findings were planned to be presented in April 2020, postponed due to the pandemic of COVID-19, at the 56th Conference of Statisticians, Econometricians and Mathematicians of South Poland (SEMPP 2020 conference). The SEMPP conference is one of the oldest scientific conferences in the field of economic sciences in Poland. It was first held in Katowice in 1965, on the initiative of Professor Zdzisław Hellwig, Professor Zbigniew Pawłowski and Professor Kazimierz Zając. It takes place continuously every year and its organizers are alternately economic universities in Katowice, Krakow and Wroclaw. The main aim of this conference is to present the scientific achievements of the employees of economic universities of South Poland in the field of statistics, econometrics and mathematics and their applications in various fields of science including economics, finance and management. Moreover, it gives the opportunity to start and strengthen cooperation between the research centers from Katowice, Krakow and Wroclaw.

This monograph presents some interesting applications of quantitative methods in studying the phenomena of economic processes using mathematical knowledge and tools. The area of scientific research is diversified and covers topics relating to macroeconomics, consumer theory, socio-economic development, households quality of life, heteroskedastic Vector Autoregressive models and credit risk models.