

## **Report of supervisor on the PhD study and doctoral thesis**

**RNDr. Ing. Barbora Petrová, MSc.**

Barbora Petrová has been studying PhD program Probability and Mathematical Statistics, Econometrics and Financial Mathematics since 2014. Before that, she had successfully completed three master studies and had got a master diploma at MFF UK, University of Economics in Prague, Faculty of Finance and Accounting and Vrije Universiteit Amsterdam, Faculty of Sciences. Her excellent knowledge of optimization and finance allows her to work hard from the very beginning of the PhD studies and to get the first awards and publications already during the first year of the study. In particular, she won the first place in the PhD competition organized by Czech Society for Operations Research at MME conference in 2015. Moreover, she got the second place in the competition organized by Czech Econometric Society: Best Student Paper in Theoretical Economics in 2015, when the first place remained vacant. In the other years (2016-2018) she always won the second or the third place in these competitions, when participated.

During the last four years, RNDr. Petrová fulfilled all the requirements of the PhD study program. Moreover, she was very helpful in pedagogical activities of our department, teaching exercises in Economics for two years and exercises in Introduction to Optimization for two years as well. Finally, she has participated at research grants of the Czech Science Foundation, mainly at the project of Excellence: DYME – Dynamic Models in Economics.

In total, Barbora Petrová published 7 papers during the PhD studies and one more is still under revision in EJOR. In 4 of these 7 papers, she is the only author. Four papers are published in IF journals (2 *Kybernetika*, *CMS*, *Operations research for Health Care*), two papers in the proceedings of the MME conference (listed in *WoS*) and one paper is a chapter in a booklet. Moreover, she has presented her results at 8 domestic and foreign international conferences, for example, at *CMS 2017* in Bergamo, *CMS 2016* in Salamanca or *EWGCFM 2015* in Dubai.

The doctoral dissertation thesis is based on four chapters, most of the results have already been published. The first chapter presents a new concept of risk premiums which is suitable for application to multistage portfolio selection problem. It shows the way how the new risk premiums should be constructed and applied in the dynamic maximal expected utility portfolio selection problem when considered multivariate utility functions.

The other three chapters go further in the theory of multivariate utility functions, deriving new results in the theory of multivariate first-order stochastic dominance. The author focuses on three most important types of multivariate stochastic dominance: strong, linear and weak (orthant) dominance. She discusses the relations among each other and also to the multivariate risk premiums. Moreover, she introduces the way how these relations could be applied to multistage (or multiperiod) stochastic programming problems, especially to the dynamic portfolio optimization problems for the empirical

and Gaussian distribution of returns. Finally, the author presents interesting results of the numerical studies.

Summarizing, the thesis contains new theoretical results and interesting empirical studies. Most of them have already been published in IF journals. I have no doubts that the thesis fulfills all the requirements for the doctoral dissertation and I **strongly recommend** it for the defense.

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