Report of supervisor on the PhD study and doctoral thesis

RNDr. Tomáš Rusý

Tomáš Rusý has been studying PhD program Probability and Mathematical Statistics, Econometrics and Financial Mathematics since 2017. Before that, he had successfully completed master studies at MFF UK in program PMSE and bachelor studies at FSV UK in program Economics and Finance. His excellent knowledge of optimization and finance allows him 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, he won

- the first place in the CAFIN competition 2017 in the area of financial planning and accounting
- the first place in the Czech university research competition (SVOČ)
- the first place in the PhD competition organized by Czech Society for Operations Research at MME conference in 2018.

Later, he won the second place in PhD competition organized by Czech Society for Operations Research at MME conference in 2019 and in the competition organized by Czech Econometric Society: Best Student Paper in Theoretical Economics in 2019.

During the last four years, RNDr. Rusý fulfilled all the requirements of the PhD study program. Moreover, he was very helpful in pedagogical activities of our department, teaching exercises in Investment Analysis for three years and exercises in Introduction to Optimization for three years as well. He supervised or consulted two bachelor and one diploma thesis. He was very active in the Econometric project seminar, too. Finally, he has participated in research grants of the Czech Science Foundation, mainly in the standard project “Stochastic optimization problems with endogenous uncertainty” and EXPRO project “Dynamic models for digital finance”.

In total, Tomáš Rusý published 4 papers during the PhD studies (two of them in IF journals – Kybernetika and Annals of Operations research) and two more are still under review – after major or minor revisions (in EJOR and Journal of Empirical Finance).. Moreover, he has presented his results at several domestic and foreign international conferences, for example, at ICSP 2019 in Trondheim, CMS 2019 in Chemnitz or CMS 2018 in Trondheim. Finally he visited University of Orebro for one-month research stay in April-May 2021.

The doctoral dissertation thesis is based on three chapters, some of the results have already been published the rest is still under review. The first chapter presents a new calibration method for the one-factor short-rate models, a class of models which is frequently used in the financial industry for modelling interest rates. A special attention is paid to Hull-White model. The scenarios generated using this method are then employed in the subsequent chapters.

The second chapter of this thesis discusses a decision-dependent randomness asset-liability management model. There, the author formulates a model for a life-cycle of a loan which is provided by a company to an individual customer. Moreover, one of the decisions which the company has to make is to offer an interest rate to the customer. The customer's (random) decision whether to accept or reject the loan directly depends on the offer from the company and hence it induces decision-dependent randomness to the program.

The third part presents a new contamination techniques for the decision dependent randomness multistage stochastic programs. Using these techniques one can make a stress testing of these endogenous randomness problems. The theoretical results are applied to the ALM model from the previous chapter. This chapter is the most innovative and advanced part of the thesis which hopefully will be published in EJOR in next few weeks/months.

Summarizing, the thesis contains new theoretical results and interesting empirical studies. Some of them have already been published in IF journals such as AnOR. The other results are still under review, but I have no doubts that the thesis fulfills all the requirements for the doctoral dissertation and I **strongly recommend** it for the defense.

In Prague,

29.11.2021

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