CrossMark

Preface: Special Issue on New Challenges in Financial Optimization and Risk Management

Xiao-Guang Yang[1] · Shu-Shang Zhu[2]

Optimization plays a significant role in both financial theory and practice. Mean–variance analysis of portfolio selection, one of the corner stones of modern financial theory, paved by Henry Markowitz in 1952, was modeled exactly as a convex quadratic programming which helps striking a balance between the expected return and investment risk. Actually, many financial decision-making problems can be formulated as optimization problems, and accordingly, some most important theories in finance actually originated from the theory of optimization. For examples, capital asset pricing model (CAPM) can be obtained from the first-order optimality condition of mean-variance model; arbitrage pricing theory (APT) can be derived by using the duality of linear programming. The past three decades have witnessed uncountable successful applications of optimization methodologies in solving diverse problems in finance, especially in investment and risk management. In the past two decades, due to a rapid development and globalization of financial markets, the importance of financial risk management has been raised to an unprecedented level. At the same time, we have also witnessed the emergence of powerful optimization methods, such as conic optimization, robust optimization and first-order methods, which greatly promoted the advancement of portfolio selection, asset/liability management, market/credit/liquidity risk management, the designing and pricing of financial products and so on. Nowadays,

✉ Xiao-Guang Yang
xgyang@iss.ac.cn

Shu-Shang Zhu
zhuss@mail.sysu.edu.cn

[1] Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing 100190, China

[2] Department of Finance and Investment, Sun Yat-Sen Business School, Sun Yat-Sen University, Guangzhou 510275, China

🖉 Springer

under the new environment of financial markets characterized by "globalization" and "networking", financial decision and risk management are facing many new challenges, including rapidly changing environment, nonlinear characteristics, unstructured information, irrational human behavior, etc. With deeper and broader connections among countries/regions, worldwide financial linkages are becoming more and more complicated, and trading is getting faster and faster, which can induce propagation and contagion of financial systemic risk instinctively, resulting in severe consequences such as Subprime Crisis and European Debt Crisis. To cope with such "new challenges", we have to develop new pricing models, risk measures and computational methods to make the financial decision and risk management more efficient and robust. Therefore, we managed to organize this special issue on new challenges in financial optimization and risk management.

We have collected in this special issue nine rigorously reviewed papers which are mainly contributed by Chinese young scholars who are very active in the relevant research fields and have good knowledge about Chinese and international financial markets. Among these nine papers, two papers by Ma et al. and Xu address the issues of derivative pricing. The former focuses on the pricing of an American strangle, while the latter considers the uncertainty of underlying asset in a more general pricing setting. The paper of Zhang et al. (Zhang, Fang and Xu) investigates the existence of the core of a reinsurance market where the risks of different companies may be interdependent. The paper of Zhang et al. (Zhang, Wang and Cui) proposes an extra resource allocation model considering simultaneously both the global efficiency and growing potential. The paper of Wu and Gao investigates the optimal execution problem in the limit order market for mitigating liquidity risk. The other four papers consider problems related to portfolio decision. More specifically, the two papers by Peng et al. and Liu et al. consider the time consistent strategies involving state-dependent risk aversion or data uncertainty in optimal dynamic investment decision. The paper of Wang et al. studies the optimal portfolio and consumption under some general utility function and short-term rate model. And the paper of Zhu et al. proposes a multi-factor model based second-order immunization method for bond portfolio immunization to eliminate interest rate risk.

In summary, we can see that the papers in this special issue cover a wide range of topics in financial optimization and risk management, which include derivative pricing, optimal investment and consumption, time consistent and robust portfolio strategy, optimal liquidation, interest rate risk immunization, resource allocation and reinsurance. Furthermore, these novel papers investigate those issues by emphasizing human behaviors and uncertainty of the environment to suit the practical application better, especially in the real world which is riskier than ever. We hope that the ideas, theories and methods proposed in these papers can really add values to both theoretical and practical aspects of finance, and we also hope it will bring more hints on cooperation between people in optimization and finance.

We wish to take this opportunity to thank all the authors for contributing their brilliant works to this special issue, as well as all the referees for their high quality reviews. We also appreciate Professor Duan Li for his kind direction and encouragement of the editorial work of this special issue. Lastly but not least, we would like to thank the editorial team of JORSC for their professional support and help.