Computational approaches and data analytics in financial services

Dimitris Andriosopoulos, Michalis Doumpos, Panos M. Pardalos & Constantin Zopounidis

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EDITORIAL

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Over the past decades, the field of finance has evolved rapidly, driven by advances in information technology and the introduction of financial innovations involving new financial products and services. Nowadays, the sector of financial services faces many opportunities as well as major challenges. On the one hand, there is a plethora of investment and financing options for investors and corporations. On the other hand, the complexity of financial products and services has increased considerably, and financial markets are exposed to global systemic risks arising from economic and geopolitical factors. Moreover, in the era of big data, enormous amounts of information are available for designing and providing customised financial solutions as well as for understanding the deep uncertainties involved in financial decision-making. In this context, analytical approaches have become indispensable tools for descriptive, prescriptive, and predictive financial modelling. Such approaches cover a wide range of areas in operational research and other related fields.

The goal of this special issue is to cover the recent advances regarding the contributions of such approaches in financial services. Out of more than 40 submissions, 17 were finally accepted after a rigorous review process. The accepted papers cover several important areas in financial decision-making, such as portfolio selection, asset trading, financial derivatives, energy finance, real estate investments, credit risk modelling, as well as the operations-finance interface.

The special issue starts with the overview paper by Andriosopoulos, Doumpos, Pardalos, and Zopounidis, who discuss the contributions of computational and data analytic approaches in financial services, covering the recent bibliography on this area, with emphasis on portfolio management, credit risk modelling, and other areas in banking, investments, and insurance.

The next three papers involve portfolio selection. In the first paper, Bernard, De Staelen, and Vanduffel, present an algorithm that allows the incorporation of various types of risk constraints in optimal portfolio selection problems, for which no explicit solution is available. The performance of the algorithm is illustrated on various (non-)expected utility problems. In the second paper, Sant'Anna, Filomena, Caldeira, and Borenstein, introduce an approach that combines cointegration and optimisation tools with statistical process control charts for dynamic rebalancing of index tracking portfolios. The next paper, by Henriques and Neves, presents a multi-objective framework for portfolio optimization, which considers uncertainty through an interval programming formulation in the context of the mean-absolute deviation model.

The next group of papers includes three studies on trading models. First, Cheng, Di Giacinto, and Wang, consider the problem of optimal liquidation of a position in a risky security. The problem is formulated as a continuous time stochastic optimal control problem that maximises a risk-adjusted profit and loss function. A closed form solution is constructed that provides an explicit expression of the optimal liquidation policies. The next two papers (Chen, Coolen, Coolen-Maturi, and He, Coolen, Coolen-Maturi) involve the use of nonparametric predictive inference for asset trading and inferring information from option price data under the binomial pricing model.

The third group of papers covers the use of forecasting models in financial markets. In the first paper of this part of the special issue, Adcock, Ye, and Yin use a truncated-GARCH model to examine the effect of price limits on price behaviour and volatility of Chinese A-shares. The obtained results show that price limits do not reduce volatility while the price discovery hypothesis cannot be rejected. Next, Meligkotsidou, Panopoulou, Vrontos, and Vrontos, present the use of quantile autoregressive models that incorporate macroeconomic and financial variables for volatility prediction. The reported results for the S&P 500 index show that the proposed approach yields significantly better results than other regression models. Following, Matallín-Sáez, Soler-Domínguez, and Tortosa-Ausina, employ a two-stage approach to examine the effect that the funds' and managers' characteristics have on the efficiency of mutual funds. The proposed methodology combines non-parametric partial frontier estimators with quantile regression, and reveals that the intricacies in the fund performance differences depends on the quantile distribution, as opposed to conditional mean approaches. The fourth paper in this part, by Do, Lyócsa, and Molnár, also uses quantile regression to investigate the impact of fuel prices, emission allowances, demand, past prices, wind and solar production on electricity prices, using data from Germany. In the last paper in this group, Alexandridis, Karlis, Papastamos, and Andritsos, compare the performance of various linear and non-linear models for predicting the prices of residential properties in Greece.

The next three papers are related to credit risk assessment and bankruptcy prediction. Angilella and Mazzù use a multicriteria decision aid methodology based on the ELECTRE-Tri method to assess the

creditworthiness of small and medium-sized enterprises, with an application to data from Italy. Ferreira, Esperança, Xavier, Costa, and Pérez-Gladish also use a multicriteria methodology that combines cognitive mapping and a value function approach to develop an evaluation system for social credit applications. The third paper in this group, by Christopoulos, Dokas, Kalantonis, and Koukkou, investigates the prediction of financial distress for firms listed in the New York Stock Exchange, using a survival model based on dynamic logit approach.

The special issue closes with two papers on the operations-finance interface. In the first paper, Pei, Wang, Fan, Pardalos, and Liu, present a hybrid algorithm for a parallel-batching scheduling problem considering processing cost and revenue, with the objective of maximising the total net revenue. Comparative results against other metaheuristics demonstrate the performance of the algorithm. In the last paper, Shi, Zhang, Zhou, and Shi, examine an inventory ordering and financing policy for a retailer who purchases a single deteriorating item to satisfy ramp-type demand. The proposed model enables suppliers to make trade credit decisions and retailers to define order plans that minimise cost.

Closing this editorial, we express our sincere thanks to the authors whose contributions have been essential in completing this special issue. We also acknowledge the support of all reviewers who devoted considerable time to provide critical evaluations, insightful comments, and constructive suggestions for the submitted papers. Without their help it would be impossible to achieve this issue's high standards.

Dimitris Andriosopoulos
Strathclyde Business School, United Kingdom
Michalis Doumpos
Technical University of Crete, Greece
✉ mdoumpos@dpem.tuc.gr
Panos M. Pardalos
University of Florida, USA
Constantin Zopounidis
Technical University of Crete, Greece & Audencia Business School, France