Editorial

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Biographical notes: Nikolaos S. Thomaidis received his MSc in Mathematics and Finance from Imperial College, University of London; and his PhD in Financial Engineering and Computational Intelligence from the University of the Aegean, Greece. Currently, he works with the Department of Financial Engineering and Management as a Senior Lecturer in Computational Finance. His scientific research focuses on the application of computational-statistical methods in various financial engineering tasks (portfolio optimisation, risk and correlation forecasting, statistical arbitrage, etc). He is the author of more than thirty research papers on these topics and also a member of the management committee of the COST Action IC0702 'Combining soft computing techniques and statistical methods to improve data analysis solutions' and the Society for Computational Economics. In addition to his scientific pursuits, he collaborates with various investment funds on the development of algorithmic trading strategies.

Christos Floros completed his first degree in Mathematics and Operational Research at Brighton University and also holds an MA (Economics) and MSc (Mathematics) from Portsmouth University and a PhD in Financial Economics from Swansea University, UK. He is a Senior Lecturer in Banking and Finance at the University of Portsmouth and his research interests include financial econometrics/economics, derivatives and banking. He has been involved in various research projects, and is currently a Project Leader of a Marie Curie FP7 project on 'Volatility forecasting evaluation based on loss function with well-defined multivariate distributional form and ultra high frequency datasets'. He has published in journals such as *Managerial Finance*, *Applied Financial Economics*, *Financial Markets and Portfolio Management*, *International Journal of Managerial Finance*, *Applied Financial Economics Letters*, *Studies in Economics and Finance*, *Derivatives Use Trading and Regulation*, *Journal of Emerging Market Finance*, *Journal of Economic Studies*, among others.

1 Introduction

In recent years, computational methods and techniques have been widely appreciated in the financial industry. New statistical procedures, mathematical models, numerical algorithms and computational heuristics are continuously developed and used by an increasing number of researchers, firms, traders and fund managers. Early research in this field was focused on econometric models and numerical methods for pricing derivative contracts. However, the range of computational techniques was soon extended to encompass heuristics for portfolio selection, agent-based artificial markets and computer programs using metaphors from biological systems and natural phenomena. The high increase in computing power along with several technological developments in parallel architectures and multiple processing has also enabled researchers in financial markets to revisit traditional problems of finance that have been tackled in the past by introducing too simplifying assumptions. Hence, despite the great skepticism surrounding the rapid growth of financial engineering, it is of no dispute that quantitative models and computational techniques have led towards a deeper understanding of the interconnections and the peculiarities of financial markets. This is also shown by the increasing reliance of financial managers on quantitative analysis.

This special issue is an attempt to explore and bring together practical, cutting-edge, applications of computational techniques in financial engineering problems, such as risk analysis, asset pricing and portfolio management. It consists of seven papers each of which was selected following a rigorous, peer-reviewed process. We have made a conscious effort to sustain the quality, variety, and accessibility of the papers that appear in this issue, given the many and often divergent directions in which computational finance has deployed over the years. We believe that despite the wide range of topics covered, contributions exhibit uniformity in style, demonstrating the applicability and empirical performance of the methods proposed. This way, the issue bridges the gap between theory and practice in financial engineering and will be of interest to both researchers and practitioners working in this area.

2 Organisation of this issue

A practical issue that arises for fund managers is how effectively to trade large quantities of a financial asset in order to minimise the market impact and also avoid the leakage of valuable information to other participants. The paper by Cui, Brabazon and O' Neill presents an application of grammatical evolution, a heuristic optimisation technique, to uncover high-quality trade execution rules. Their strategy is benchmarked against two simpler heuristics for order management in a simulated limit-order market.

Goletsis, Exarchos and Katsis investigate the applicability of recently established bio-inspired computational algorithms (mimicking natural ants, bird flocking and the human immune system) in the credit scoring problem. Some comparative results on actual datasets examine the relative classification accuracy of these heuristics against other neural network and statistical techniques commonly applied in the credit scoring literature.

Mamanis and Anagnostopoulos employ a simulated annealing-based multi-objective optimisation technique to explore the efficient frontier for a range of portfolio selection problems. The presented formulations include alternative risk measures (expected

shortfall, value-at-risk and semi-variance) and some practically relevant constraints on the total number of assets held in the portfolio as well as on the proportion of capital invested in each asset.

The paper by Kablan and Ng introduces an adaptive neuro-fuzzy inference system suitable for algorithmic trading in the foreign exchange market. The proposed methodology is benchmarked against other buy-n-hold, momentum and contrarian investment strategies using intraday data.

A rich set of mathematical tools are available from the interaction of investment management and game theory. Stella and Ventura analyse two new game-theoretic approaches to portfolio selection that are not based on restrictive assumptions on the distribution of asset returns. The empirical performance of the proposed strategies is evaluated in terms of various risk measures using data from major stock market indexes.

Commodity markets are an important part of financial industry. Hu and Trafalis use support vector regression models, a flexible functional form parametrisation, to uncover non-linear dynamical patterns in daily US natural gas prices. Extensive comparisons with popular neural network and econometric time series models are presented.

Copula methods have become increasingly popular in the modelling of the dependence structure of financial asset returns. The paper by Zhang and Maringer introduces a pair-copula decomposition approach suitable for multivariate densities, coupled with asymmetric GARCH parametrisations for the volatility dynamics of equity returns. The authors further investigate the possible benefits of this approach from the perspective of portfolio risk management.

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