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Editorial

Editorial for the Special Issue "Mathematical Developments in Modeling Current Financial Phenomena"

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Systemic challenges, behavioral complexities, and rapid technological integration have all contributed to the astonishing pace of change in the global financial landscape. In light of this, the nexus between mathematics and finance has emerged as a crucial field of study, where theoretical abstractions are increasingly used to inform practical financial decision-making, risk assessment, and market design.

Research exploring this dynamic relationship is showcased in this Special Issue, entitled "Mathematical Developments in Modeling Current Financial Phenomena". The objective of this Special Issue is to enhance applied mathematics by exploring its capacity to analyze and predict the complex financial, economic, and technological dynamics that underpin the energy transition and environmental sustainability. The contributions amassed in this issue provide useful insights for practitioners and scholars alike by showcasing a wide range of mathematical methodologies applied to urgent financial problems.

The study by Peykani et al. [1] addresses the critical problem of business failure prediction in capital markets, a task complicated by highly imbalanced datasets. The authors applied a state-of-the-art cost-sensitive learning approach, CorrOV-CSEn, alongside a suite of powerful classifiers (MLP, random forest, gradient boost trees, XGBoost, and CatBoost) to data from the Iranian capital market. Their rigorous evaluation reveals that these models, particularly CatBoost, achieve high sensitivity in detecting failing firms, making them highly effective tools for early warning systems and credit risk assessment in practice.

Farkas and Lucescu [2] significantly contribute to our understanding of how risk-sharing mechanisms, specifically credit default swaps (CDSs), can inadvertently amplify systemic instability within interconnected financial networks. In contrast to broader agent-based models that include a wide range of economic agents, the authors deliberately focused on the interactions between banks and firms, calibrating their model on empirical data from Swiss banks.

Cristescu et al. [3] performed an empirical study exploring the complex relationship between public news sentiment and stock prices of major U.S. technology firms. Using advanced tools such as wavelet coherence and regression analysis, the authors found that sentiment polarity extracted from news titles and descriptions exerts measurable, though heterogeneous, influences on stock price movements. Their results highlight both direct and lagged effects, offering valuable insights into the temporal dynamics of sentiment-driven price behavior.

Afilipoaei and Carrero [4] proposed a rigorous mathematical model of financial bubbles grounded in behavioral finance principles. By employing a system of ordinary dif-

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ferential equations, they modeled the impact of herding behavior, social contagion, and shifting investor moods on market supply and demand. Their framework captures the full lifecycle of a bubble, from unsustainable price growth to sharp collapse and eventual stabilization, thus providing a powerful tool for understanding how collective psychology can drive extreme market outcomes.

Peykani et al. [5] present a credibilistic multi-period rolling portfolio optimization model that integrates entropy-based risk metrics within a fuzzy uncertainty framework. By employing a multi-stage scenario tree and incorporating psychological effects such as changing risk aversion over time, the authors developed a robust method for dynamically managing portfolios. Their empirical analysis, covering both the Tehran and global stock markets, demonstrates that the rolling model (RM) offers superior risk control compared to the unified model (UM), albeit with slightly lower returns, underscoring the inherent trade-offs between risk and reward in dynamic portfolio management.

Dumiter et al. [6] investigated the connections between quantitative sentiment indicators, technical analysis, and stock market behavior. Their integrated approach combines graphical analysis, econometric modeling (VAR and Bayesian VAR), and sentiment indices to reveal how behavioral signals interact with technical factors in influencing U.S. stock market dynamics. Their study underlines the increasing relevance of behavioral finance in both academic research and practical investment analysis.

Together, the articles in this Special Issue highlight how contemporary mathematical methods, from sentiment analytics and AI-driven classification to differential equations and scenario-tree optimization, can improve our comprehension of financial phenomena and help policymakers and practitioners make more informed decisions.

We express our gratitude to the reviewers for their thoughtful and helpful criticism, as well as to all of the authors for their outstanding efforts and intellectual contributions. We would also like to express our appreciation to the *Mathematics* editorial team for their ongoing assistance in the planning and dissemination of this Special Issue.

We believe that this collection will encourage more multidisciplinary cooperation at the intersection of economics, finance, and mathematics and act as a link between theoretical modeling and financial practice.

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