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Uncertainty Analysis in Economics and Finance: Preface to the Special Issue

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Uncertainty is ubiquitous: whether we get information from measurements or from expert estimates, the corresponding measurement results and expert estimates are inevitably approximate. In many application areas – e.g., in physics and mechanics – measurement and estimation uncertainty are the main source of uncertainty: often, we know the equations that describe how the corresponding quantities change with time (e.g., we know Newton's equations of motion), and only uncertainty in the initial values prevent us from making absolutely exact predictions of future states.

Economics and finance are different: for most quantities, be it stock prices, currency exchange rates, etc., we know their current values with very high accuracies. In such situations, the main source of uncertainty comes from not knowing exactly how the corresponding quantities will change in time.

Papers published in this special issue reflect various aspects of the related uncertainty.

Several papers summarize new state-of-the-art techniques that have been very efficient so far and that have a potential for even more efficient applications: the paper[8] promotes random set techniques, and the paper[9] explores the Black-Litterman model for portfolio optimization, a model that enhances the traditional Markowitz portfolio optimization techniques by taking into account possible future changes in the behavior of different financial instruments.

As with many other complex problems, in addition to well-justified approaches, there are also many *heuristic* approaches, approaches which are empirically efficient, but for which there are, at present, no convincing explanations for this efficiency – and this lack of explanations makes people reluctant to use these approaches. Several papers from this issue provide a theoretical justification for such approaches: the paper[7] explains why convex combinations work well for interval uncertainty, and the paper[1] explains why Black-Scholes partial differential equations are effective

beyond their usual assumptions.

The existing methods work well, but they do not lead to perfect predictions. It is therefore desirable to come up with *new* techniques whose predictions will be even more accurate. This is a topic of several papers from this issue: the paper[4] show how to take into account both nonlinearity and symmetry, the paper[10] shows how to better take into account dependence between several quantities, and the paper[3] takes on an even more ambitious question: how to design models which are better than the current state-of-the-art deep learning techniques.

An additional uncertainty appears if we take into account that the dynamics of economic and financial systems depends on how exactly different objectives of different decision makers are taken into account; this dependence is the main subject of *game theory*. In this issue, the corresponding uncertainty-related issues are handled in.[2]

All previously mentioned papers deal with *general* problems of uncertainty in economics and finance. In addition to these general problems, some application areas have their own *specific* problems. In this issue, insurance-related problems are analyzed in,[9] and medicine-related problems are analyzed in.[5]

Many thanks – to all the authors for their excellent papers, to all the referees for their hard work, Dr. Bernadette Bouchon-Meunier, Editor-in-Chief of the International Journal on Uncertainty, Fuzziness, and Knowledge-Based Systems, for encouraging and supporting our work, and to the readers of this issue, for their interest. Enjoy the papers!

References

1. W. Chinnakum and S. Aguilar, "Why Black-Scholes Equations Are Effective Beyond Their Usual Assumptions: Symmetry-Based Explanation", this issue.
2. S. El Obadi and S, Miquel, "Uncertainty in Information Market Games", this issue.
3. R. Liao, P. Manejuk, and S. Sriboochitta, "Beyond Deep Learning: An Econometric Example", this issue.
4. P. Maneejuk, "How to Take Both Nonlinearity and Symmetry into Account in Binary Decision Making: Skew-Probit And Logit Links In Binary Kink Regression", this issue.
5. P. Maneerat and S.-A. Niwitpong, "Comparing Medical Care Costs using Bayesian Credible Intervals for the Ratio of Means of Delta-Lognormal Distributions", this issue.
6. Nguyen Huy Hoang and Bao Quoc Ta, "Ruin probabilities of continuous time risk model with dependent claim sizes and interarrival times", this issue.
7. R. Phadkantha and W. Yamaka, "Why the Use of Convex Combinations Works Well for Interval Data: A Theoretical Explanation", this issue.
8. J. Sirisrisakulchai, Chon Van Le, and Uyen Pham, "On Statistics of Random Sets for Partial Identification of Econometric Structures", this issue.
9. Bao Quoc Ta and Thao Vuong, "The Black-Litterman model for portfolio optimization on Vietnam stock market", this issue.
10. W. Yamaka and S. Thongkrairat, "A Mixed Copula-Based Vector Autoregression Model", this issue.