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Preface

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Since the market crash of 2008-09, and subsequent recession that followed, many researchers and practitioners in the areas of Computational Finance, Mathematical Finance, and Financial Engineering have moved from using financial innovation to develop tailored securities and structured financial products. They are now focusing their efforts on using mathematics, computation, and complex adaptive systems for modelling and developing risk management solutions for problems in finance, economics, and business. Complex adaptive systems, and computational intelligence in particular, offer tools and techniques for researchers to better understand financial and economic data. By their very nature, financial markets and economies can be complex and chaotic systems, each involving uncertainty and ambiguity that are influenced by their environment. Computational intelligence offers methods that have the ability to identify patterns and respond to their environment, and in return may provide participants with not only a better understanding and forecast of market interactions and dynamics, but also the ability to develop better risk management tools and processes. The research papers in this section deal with a variety of problems and issues, but at their core is an attempt to use computation, mathematics, and the development of complex adaptive systems to provide better forecasts of market and macroeconomic data.

Forecasting Market Data:

Although the financial markets are complex and evolving, a better understanding of both their current and future structure can help market participants make better trading and risk management decisions. In the paper "*Nonlinear Modeling Using Neural Networks for Trading the Soybean Complex*", researchers used neural networks to better understand the soybean crush spread, which considers the interplay between soybean, soy oil, and soymeal contact prices. Neural networks are used to predict the soybean contract settlement prices, along with the crush spread, providing opportunities for more accurate risk management and trading of the soybean complex. For the paper "*TN-RSI: Trend Normalization RSI Indictor for Stock Trading Systems with Evolutionary Computation*", researchers use genetic algorithms to optimize a modified relative strength index that uses trend-removed stock data, thereby allowing the RSI indicator to be used in trending markets where the indicator has typically displayed degraded performance. In "*Volatility Forecasting Using a Hybrid GJR-GARCH Neural Network Model*", researchers use

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three different neural network models to help improve the performance of the GJT method for estimating volatility over a two-month trading cycle. The chosen model provides improved performance over four different market cycles of calm and crisis, providing a more consistent method for understanding volatility in both recession and recovery. In their work "*Application of Gaussian Process to Locational Marginal Pricing Forecasting*", researchers propose a new Gaussian process technique that comes from an extension of support vector machines in order to forecast Locational Marginal Pricing for the smart grid. LMP is critical for economic efficiency in the power markets. In this instance, computational intelligence is providing an approach for better managing supply and demand, thereby increasing profits while minimizing risk.

Forecasting Macroeconomic Data:

While forecasting electricity prices with LMP is helping researchers understand specific power market dynamics, a driving factor is the interplay between the supply and demand of electricity. Likewise, four additional papers in this volume look at forecasting key macroeconomic data. In "*Demand Forecasting Based on Pairwise Item Associations*", one researcher has utilized linear regression, along with pairwise item associations found in transactional data, to develop a framework for forecasting weekly demand of retail items. By providing a better grouping of item similarities and associations, a natural form of variable selection occurs that helps to prevent the problem of over-fitting that often occurs with such prediction models. For the paper "*The Treasury Bill Rate, the Great Recession, and Neural Networks Estimates of Real Business Sales*", researchers use time-delayed neural networks, along with both real total aggregate sales and 3-month Treasury bill interest rates, to better understand the business cycle and the duration of economic recessions. In a similar manner, in the paper "*A Hybrid Neuro-Fuzzy Model to Forecast Inflation*", researchers use a hybrid fuzzy inference neural network, along with several macroeconomic factors to predict the consumer price index, providing a better forecast of an inflation indictor that is critical for the construction of monetary policy. Finally, for their work "*Neural Network Modeling, Simulation and Prediction of Innovation Growth in United Arab Emirates*", researchers use a generalized regression neural network to forecast a global innovation index. The neural network is designed to compute the positive change in the index based on improving various factors, such as education, information technology, and the regulatory environment, among others, allowing policy makers to focus on the key macroeconomic factors most likely to help improve innovation within a country or region.

As world markets and economies become more interconnected, it will be essential that researchers and those in practice have the tools and techniques necessary to help them better forecast and understand key metrics and data. As the aforementioned papers highlight, adaptive systems and computational intelligence are providing the models and approaches necessary to offer such explanations, even in environments with increasing uncertainty and complexity.