Data-Driven Multi-Scale Decomposition-and-Ensemble Methodology for Complex Financial Time Series Forecasting

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Extended abstract

International financial markets function in a very complex and dynamic manner where high volatility and noisy data are routine. Many factors impact financial markets, including political events, general economic conditions, and even traders' expectations. Due to the high degrees of irregularity and nonlinearity, financial time series forecasting is regarded as a rather challenging task. Empirical investigations have increasingly revealed that movements in financial markets are not random and the markets behave in a highly nonlinear, dynamic manner. Future prices movements in financial markets are often assumed to be ''the standard random walk'' but in reality the randomness may only be a veil that shrouds a noisy nonlinear process. Therefore, for traditional statistical and econometrical models, it is extremely difficult to capture the irregularity and nonlinearity hidden in financial time series. But the difficulty in financial time series forecasting is usually attributed to the limitation of many conventional forecasting models; this has encouraged academic researchers and business practitioners to develop more predictable models for financial time series forecasting.

For this purpose, this talk firstly tries to propose a data-driven multi-scale decomposition-and-ensemble forecasting methodology framework for complex financial time series forecasting. Generally speaking, the data-driven multi-scale decomposition-and-ensemble forecasting methodology consists of four components: data feature exploration and detection, original data decomposition, bio-inspired multi-scale data sub-series forecasting, and ensemble of sub-series prediction results, which will be elaborated in the talk. Then, a few novel bio-inspired forecasting models within the framework of the proposed data-driven multi-scale decomposition-and-ensemble forecasting methodology are presented and developed. Finally, in order to test the applicability and effectiveness of the proposed data-driven multi-scale decomposition-and-ensemble forecasting methodology and its forecasting models, some real-world financial data are used for testing purposes.

Keywords: Financial Time Series Forecasting, Multi-Scale Modeling, Decomposition-and-Ensemble Algorithm, Data Exploration and Detection.

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