Understanding the nature of memory in the order flow of financial markets

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Previously we showed that the long-range memory phenomenon could be reproduced using Markov processes, such as point processes, stochastic differential equations, and agent-based models [1]. Research has led us to question whether the observed long-range memory results from the actual long-range memory process or is just a consequence of the non-linearity of Markov processes. Identifying the best possible models based on given empirical data of observed time series is challenging. The financial markets provide us with vast empirical data, but the best model selection is still problematic for researchers. The widely used long-range memory and self-similarity estimators give varying values of the parameters as these estimators are developed for specific time series models. From the general fractional Lévy stable motion perspective, we investigated the order disbalance time series constructed from the limit order book data of the financial markets [2]. Our results suggested that previous persistence findings in order flow could be related to the power-law distribution of order sizes and other deviations from the normal distribution. Nevertheless, a more detailed consideration of empirical data suggests we construct a more specific order flow model based on the power law of limit order cancel times. In the event time consideration, the limit order cancel times follow the discrete probability mass function derived from the Tsallis q-Exponential distribution [3]. The power-law distribution of the limit order volumes and power-law cancel times form the basis for our modeling of order flow in the financial markets.

References

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