

Short-term stock price prediction based on limit order book dynamics

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Abstract

Interaction of capital market participants is a complicated dynamic process. A stochastic model is proposed to describe the dynamics to predict short-term stock price behaviors. Independent compound Poisson processes are introduced to describe the occurrences of market orders, limit orders, and cancellations of limit orders, respectively. Based on high-frequency observations of the limit order book, the maximum empirical likelihood estimator (MELE) is applied to estimate the parameters of the compound Poisson processes. Moreover, an analytical formula is derived to compute the probability distribution of the first-passage time of a compound Poisson process. Based on this formula, the conditional probability of price increase and the conditional distribution of the duration until the first change in mid-price are obtained. Finally, a novel approach of short-term stock price prediction is proposed and this methodology works reasonably well in the data analysis of Intel (INTC).