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Buy Low, Sell High: A High Frequency Trading Perspective

In this I will present a class of self-exciting processes as a promising approach to modeling trading activity at high frequencies. Our model neatly accounts for the clustering of intensity of trades and the feedback effect which trading induces on both market orders as well as the shape of the limit order book (LOB). Further, it allows for efficient calibration to market data based on pseudo-likelihood methods. As well, various probabilistic quantities of interest such as the probability that the next market order is a buy or sell, the distribution of the time of arrival of a buy or sell order, and the probability that the mid-price moves a given amount before a market order arrives are also easily computable. Finally, we study an optimal control problem for a trader who places immediate-or-cancel limit buy-and-sell orders to take advantage of the bid-ask spread. Asymptotic expansions in the level of risk-aversion lead to closed form and intuitive results which are also adapted to the state of the market. Some numerical experiments will be used to demonstrate the utility of the model and optimal strategies.

[This is joint work with Alvaro Cartea, U. Carlos III de Madrid and Jason Ricci, U. Toronto]