

Least Squares Estimation of Hawkes processes and application to high-frequency finance

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Abstract

We propose a fast parametric estimation method for marked Hawkes processes with general kernels and time-varying background rates, applicable to large datasets. We use our method to model different frequencies of excitation of mid-price movements in the Nasdaq equity market. Because of latency, there might be several events happening in between the arrival of an order on a market and the arrival of the order it triggers. This feature cannot be captured by any decreasing Hawkes kernel. Our approach allows to capture these effects while getting a better fit to market data. We also use the branching representation of Hawkes processes to model the impact of specific trades on the price and volatility.

Keywords: Hawkes processes; stochastic gradient descent; Monte Carlo methods; high-frequency trading; market-microstructure.

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