

# **Deep Hawkes Process for High-Frequency Market Making**

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High-frequency market making is a liquidity-providing trading strategy that simultaneously generates many bids and asks for a security at ultra-low latency while maintaining a relatively neutral position. The strategy makes a profit from the bid-ask spread for every buy and sell transaction, against the risk of adverse selection, uncertain execution and inventory risk. We design realistic simulations of limit order markets and develop a high-frequency market making strategy in which agents process order book information to post the optimal price, order type and execution time. By introducing the Deep Hawkes process to the high-frequency market making strategy, we allow a feedback loop to be created between order arrival and the state of the limit order book, together with self- and cross-excitation effects. Our high-frequency market making strategy accounts for the cancellation of orders that influence order queue position, profitability, bid-ask spread and the value of the order. The experimental results show that our trading agent outperforms the baseline strategy, which uses a probability density estimate of the fundamental price. We investigate the effect of cancellations on market quality and the agent's profitability. We validate how closely the simulation framework approximates reality by reproducing stylised facts from the empirical analysis of the simulated order book data.