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"A Pure-Jump Market-Making Model for High-Frequency Trading using constrained FBSDEs."

Abstract: We propose a new market-making model which incorporates a number of realistic features relevant for high-frequency trading. In particular, we model the dependency structure of prices and order arrivals with novel self- and cross-exciting point processes. Furthermore, instead of assuming that bid and ask prices can be adjusted continuously by the market maker, we formulate the market maker's decisions as an optimal switching problem. The model also allows for over-trading risk, and the use market orders, which are modeled as impulse control, to get rid of excessive inventory. Because of the stochastic intensities of the cross-exciting point processes, the optimality condition appears to fall outside of the scope of classical Hamilton-Jacobi-Bellman quasi-variational inequalities, so we leverage a newly developed constrained forward backward stochastic differential equation (FBSDE) to solve the optimal control problem. The method's implementability, which includes a Monte-Carlo requirement, is illustrated thanks to full-scale simulations. This is joint work with Dr. Baron Law, some of which is in progress.