

## A Mean Field Game approach to Optimal Execution

Sebastian Jaimungal (University of Toronto, Canada)

This paper introduces a mean field game framework for optimal execution with continuous trading. We generalize the classical optimal liquidation problem to a setting where, in addition to the major agent who is liquidating a large portion of shares, there are a number of minor agents (high-frequency traders (HFTs)) who detect and trade along with the liquidator. Cross interaction between the minor and major agents occur through the impact that each trader has on the drift of the fundamental price. As in the classical approach, here, each agent is exposed to temporary price impact and they attempt to balance their impact against price uncertainty. In all, this gives rise to a stochastic dynamic game with mean field couplings in the fundamental price. We obtain a set of decentralized strategies using a mean field stochastic control approach and explicitly solve for an epsilon-optimal control up to the solution of a deterministic fixed point problem. As well, we present some numerical results which illustrate how the liquidating agents trading strategy is altered in the presence of the HFTs, and how the HFTs trade to profit from the liquidating agents trading.

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