Mean-field game of optimal traders vs. a market maker

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We develop a mean-field game (MFG) of interacting strategies in the context of optimal execution of portfolio transactions. We study the interactions between investors that seek to trade optimally and are affected by the behavior of a market maker. This market maker monitors the market liquidity and trades to meet her objective to clear the price. In turn, the reference price is (endogenously) affected permanently by the trading rate of the market maker; thus, the market maker influences the prices to clear the liquidity. First, we formulate the MFG under heterogeneous and identical preferences. Second, we study the identical preferences case without permanent impact in closed-form. Third, we recover the Cardaliaguet and Lehalle's model of crowd impact. Finally, we numerically solve the MFG model under identical preferences and illustrate the behavior of optimal traders facing a market maker.