High-frequency trading in limit order markets: Equilibrium and Regulation

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Abstract

We examine a general limit order book model with high-frequency traders. We compute the Markov perfect equilibrium numerically using the Q-learning algorithm. After the introduction of the HFTs we observe the following: (i) Gains from trade decrease for all slow traders, but most for the slow speculators. (ii) Gains from trade of HFTs are significantly higher than those of slow speculators. Speed is valuable. (iii) HFTs reduce microstructure noise, increase depth and reduce spread and transaction costs. The flexibility of the model allows us to introduce nonlinear regulatory proposals like time-in-force, cancellation fees, transaction tax, rebates structures and speed bumps. Upon introducing the regulations, we observe the following: (iv) time-in-force increases aggresiveness of investors, decreases gains from trade of slow speculators and decreases the transaction costs. (v) Cancellation fees decrease welfare of both slow and fast speculators, lower spreads and increase aggressiveness of investors. (vi) Transaction tax reduces trading gains of slow speculators, increases aggressiveness of investors and HFTs, decreases liquidity and increases trading costs. (vii) Rebates decrease welfare of both slow and fast speculators, but increase welfare of investors. Additionally, rebates increase price discovery and liquidity and lower transaction costs. (viii) Speed bumps for market orders increase microstructure noise, reduce price discovery and make order submissions by investors less aggressive. Speed bumps lead to welfare transfer from zero private value speculators towards investors.