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Title: Agent-Based Modeling for Understanding the Dynamics of the Nasdaq Stock Market and Predicting the Impact of Rule Changes

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Abstract

We start with an overview of the key features of ABM and compare it with more standard approaches.

We present the results of our research into the behavior of the Nasdaq stock market. We modeled on an individual level the decision-making process of market makers and investors, market infrastructure and rules, and market evolution. The model allows investigation of market behaviors under a variety of scenarios and conditions. As our main goal, we investigated possible effects of tick size reduction, and found that in the simulated market environment it may result in decreasing the market's ability to perform the function of price discovery. Calibrating the model, we discovered that the simulated market exhibits a number of behaviors normally associated with the real-world market, such as the presence of fat tails, spread clustering, unpredictability, etc. We also created learning market makers and investigated their behavior and the strategies they use. We found that there is a variety of conditions under which artificial learning strategies outperform those extracted from the data or from the expert knowledge.

We further discuss our key predictions and compare them to the market behavior after the decimalization. We stress that while many of our predictions were counterintuitive at the time they were made, 5 out of 6 key predictions are strongly supported by the market's behavior after the decimalization.