Automation, speed, and stock market quality: The NYSE's Hybrid ☆

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Abstract

Automation and trading speed are increasingly important aspects of competition among financial markets. Yet we know little about how changing a market's automation and speed affects the cost of immediacy and price discovery, two key dimensions of market quality. At the end of 2006 the New York Stock Exchange introduced its Hybrid Market, increasing automation and reducing the execution time for market orders from 10 seconds to less than one second. We find that the change raises the cost of immediacy (bid-ask spreads) because of increased adverse selection and reduces the noise in prices, making prices more efficient.
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JEL classification: G12; G14

Keywords: Automation; Liquidity; Speed; Transparency; Latency; Adverse selection

1. Introduction

The automation and speed of the trading process have long been important dimensions of financial market design, and the growth of electronic trading in recent years has intensified the emphasis on these dimensions.[1] If automation and speed reduce transaction costs, they enable more efficient allocation of securities among heterogeneous investors, improve risk-sharing and consumption smoothing, and can raise asset prices (Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005). Automation and speed may also enhance price discovery, or how efficiently new information is incorporated into prices (Chordia, Roll, and Subrahmanyam, 2008; Boehmer and Kelley, 2009). More efficient price discovery contributes to better informed financing and investment decisions, benefiting shareholders by facilitating better corporate decisions.[2] However, theoretical models of limit order books and liquidity provision offer ambiguous predictions regarding the impact of automation and speed. Existing literature compares speed across market structures (Battalio, Hatch, and Jennings, 2003; Boehmer, 2005) and levels of automation across market structures (e.g., Venkataraman, 2001). However, it is difficult to control for all differences across markets. The effect of changing automation and speed within a market is an important and understudied area.[3]

We use the New York Stock Exchange's (NYSE) introduction of its 'Hybrid Market' to study how increasing automation and speed within a market affects market quality. The Hybrid Market was designed to increase the speed of the NYSE's trading so that it would qualify as a fast market under Reg NMS' trade-through rules, which apply only to fast markets (SEC, 2005); see Section 1 for details of the Hybrid Market introduction. The Hybrid Market expands automated electronic execution and lowers the execution time for market orders from over 10 seconds to less than one second. Because the NYSE's pre-existing automated electronic execution was fully anonymous and did not allow traders on the NYSE's trading floor a last-mover advantage, the Hybrid introduction also expands those features.[4] Our analysis examines theoretical predictions of how speed and automation may affect the cost of immediacy (transaction costs for market orders) and price discovery in limit order books and in markets with dedicated market makers (specialists at the NYSE). Our empirical strategy is an event study of the Hybrid Market introduction. We match NYSE stocks with NASDAQ stocks to control for changes in

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[1]See Jain (2005a, b) for evidence on the increase in automated markets and its effects on asset prices and liquidity. See The Economist (2007a, b, 2008) and Bunge (2009) for discussions of the importance of speed. The speed of trading in a market is important because delay induces uncertainty about the probability of execution and the price at which execution may occur. Traders' risk aversion makes such uncertainty undesirable. Even if traders are risk neutral, many trading strategies are more difficult to implement with slower execution. Strategies contingent on prices, strategies involving simultaneous trades in multiple securities, and strategies which break larger orders into smaller orders all perform worse as execution times increase. Boehmer, Jennings, and Wei (2007) find that a market center receives more order flow when its reported execution speed increases.

[2]Feedback from market prices to the firms that issue securities has long been noted; see, for example, Keynes (1936) and Tobin (1969), whose q-theory incorporates the market value of securities.

[3]See Cardella, Hao, and Kalcheva (2010) for a survey of floor trading versus automation as well as citations of studies on derivative markets switching from floor to automated trading.

[4]Automated trading need not be anonymous. The NYSE Hybrid Market implementation of fully automated trading is anonymous for immediately executable orders. Because the significant changes were implemented simultaneously, our results include changes to the speed of execution, the anonymity/transparency of the identities of marketable orders, and the last mover advantage of floor traders.