

# The HFT Uproar: What Went Wrong and How to Fix It

Reasoned leadership and an understanding of technology can level the playing field and assure fairness

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Allegations by Michael Lewis' populist book "Flash Boys" that the financial markets are rigged, along with the ensuing public outrage, have been seized upon by regulators, legislators and prosecutors alike. According to the book, the alleged rigging favors exchanges, high-frequency traders and big banks at the expense of retail and institutional investors, as some traders use their speed advantage to detect large orders from institutions and quickly bid up the price.

Among the reactions: calls for congressional hearings, moves by the European Parliament to impose restrictions, and investigations by the Securities and Exchange Commission, Commodity Futures Trading Commission, Federal Trade Commission, Federal Bureau of Investigation and the Attorney General of New York.

"Flash Boys" spotlights a new entity, IEX, an exchange-like broker-dealer operating an alternative trading system which seeks to level the playing field between retail investors and high-frequency trading firms equipped with superfast computers and telecommunications equipment.

All of this amounts to just the latest feeding frenzy of indignation over supposed corruption of the financial system. Most indignant are the regulators who on their watch yet again failed to adjust the markets to the new realities of the technology and competition that they themselves championed. There now appears to be a stampede to the moral high ground, as government agencies attempt to relinquish any responsibility for the state of the financial markets' microstructure that they themselves architected.



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## **Historical Perspective**

There have been many times in the past when markets did not keep pace with the evolving needs of market participants. Regulators would step in as fair arbiters to point out the weaknesses, and the financial industry stood up and accepted the challenge.

When the financial system nearly collapsed in the Wall Street paperwork crisis of the 1960s, Herman Bevis, the retired head of Price Waterhouse stood up and led the initiative to come up with a solution. When the first amendments to the 1930s-era National Market System (NMS) were implemented in the early 1970s, the chairman of PaineWebber at the time, James Davant led that initiative. When the Inter-market Trading System was stood up in the late 1970s, it was New York Stock Exchange chairman John Phelan who stepped up. When the stock market crashed in 1987, Nicholas Brady, then chairman of Dillon, Read & Co. and soon thereafter Secretary of the Treasury, led an investigation into the fundamental market mechanisms that caused the crash. John Reed, then chairman of Citigroup and later CEO of the NYSE, played an influential role over a 20-year period in a global project to re-engineer the fundamentals of the global infrastructure of finance, taking lessons learned from the '87 crash.

Then regulators, particularly the SEC, began to intervene through prescriptive market microstructure design. A 1994 paper published William Christie and Paul Schultz, "Why do Nasdaq Market Makers Avoid Odd-Eighth Quotes?" opened up a Pandora's box as to why the multiple-dealer market, designed to produce narrow bid-ask spreads through competition for order flow among individual dealers, did not. They found that odd-eighth quotes were virtually nonexistent for 70 of 100 actively traded Nasdaq securities, including Apple Computer and Lotus Development. The lack of odd-eighth quotes could not be explained by all trading activity variables thought to impact spreads. This result implied that the inside spreads for a large number of Nasdaq stocks were at least \$0.25 and raised the question of whether dealers implicitly colluded to maintain wide spreads.

A series of SEC no-action letters allowed a long list of "experimental" alternative trading systems (ATSS) to be part of the original NMS as it evolved. This set in motion structural changes that allowed for broker-dealers to establish trading venues that interfaced in new ways with the exchange-based NMS that had been in place since the Securities Act Amendments of 1975.

These alternative platforms - crossing networks, electronic communications networks (ECNs), after-market matching systems, et al. - were formalized in the SEC's Alternative Trading Systems release of December 1998. With new order handling rules following the earlier collusion charges, no longer were Nasdaq market makers allowed to trade against the orders coming into them without first exposing it to the market. Thereafter, the SEC mandated compression of stock price increments to pennies rather than eighths and sixteenths of a dollar - the decimalization policy that squeezed profits for market makers and specialists that had always made their money from the spread.

## **Regulation NMS**

It was again on the SEC's watch that a major market structure reform, Regulation NMS, was implemented in 2005.

Different from the other market restructurings, Reg NMS was carried out under regulators' edicts that dictated, in an unprecedented fashion, the technical architecture of the new market system design. Notwithstanding that the SEC issued consultative papers and received comment letters and input from the industry, it was their judgment that in the end prevailed. From the preamble of the final rules of Regulation NMS:

*"Given the wide range of perspectives on market structure issues, it is perhaps inevitable that there would be differences of opinion on the Commission's policy choices. The time has arrived, however, when decisions must be made and contentious issues must be resolved so that the markets can move forward with certainty concerning their future regulatory environment and appropriately respond to fundamental economic and competitive forces. The Commission always seeks to achieve consensus, but trying to achieve consensus should not impede the achievement of the statutory objectives for the NMS and should not damage the competitiveness of the U.S. equity markets, both at home and internationally. We believe that further delay is not warranted and therefore have adopted final rules needed to modernize and strengthen the NMS."*

Good things resulted as intended, including lower cost of trading, but the inevitable unintended consequences resulted, many known and predicted at the time. The most significant of the known faults in the design was the Inter-market Sweep Order (ISO). This order type was intended to move an order from its entry point at an exchange or ATS throughout the multiple trading venues when price improvement and/or yet-unfilled portions of the order were to be filled at other trading venues. Another unprecedented system design was the permitted internal matching of orders by brokers who had the order flow to do so, mainly the biggest brokers.

### **Retail Proposals Unrealized**

The large retail brokers had originally and collectively proposed a central limit order book (CLOB) for retail orders but withdrew the proposal when it was also to include institutional size orders. At the time, those large blocks were being "worked" at the upstairs trading desks of these firms - finding a client, or a few, to take the block in its entirety. They also had the option of buying the block themselves, or a piece of it.

To keep the markets from becoming bifurcated, the upstairs dealing price and the exchange-determined price being different, they were required to post the block to the public consolidated tape that displayed the size and price of all trades. When the price determined upstairs for the block was to be different from the publicly displayed best bid or offer, the block trader bought up all the book's orders in a public trading venue of its choice, making the determination of the cheapest cost to move the public national best bid and offer (NBBO) to now reflect the block's agreed-to price.

What was supposed to keep all these fragmented pools of liquidity in check, by having the orders executed at the best price available, was the quote ticker that supplied the NBBO. Computers reading that ticker and making sure orders were matched at or at better than the NBBO price (between the bid and offer) was the glue that would keep all in check.

Also left undone was the public display of the depth of the book. It was set at the top of the order book's quotes and volume at the NBBO price. The depth of the book beyond that - the resting orders at the next best bids and offers beyond the top of the book at each trading venue - was left to each trading venue to offer at value-add fees. Speedier access to price information directly from each trading venue was also left to be offered separately and priced to the higher values that came to be appreciated by HFT firms.

It was understood at the time that by dropping pricing points from fractions to decimals, for every price point there would be 100 ways to price the bid or offer, 12.5 times what one-eighth increments allowed. It was anticipated that trading volume would skyrocket, and it did.

The other anticipated issue was the lowering of the average trade size. It would be harder to position a block upstairs and place it with a trading venue to buy up all the prevailing interest above or below the anticipated execution price. There was no more centralized inter-market trading system controlled by the exchanges - it was now a decentralized system where entry into the market was through each trading venue controlled by broker-dealers.

### **Technology Outruns the Markets**

This reform was taking place at a time of major technological change, not yet well understood at the time by financial executives, and certainly not by the policy pundits or lobbyists offering input to the SEC. It was unfortunate that the technologists who understood this change did not have a voice - their positions in the large firms and their activities in industry trade associations were sublimated to those of the lawyers, economists, lobbyists and revenue-producing executives who spoke on behalf of the industry. Of the 51 panelists on the SEC's final hearings on Reg NMS, I observed just three technologists present, none representing the "speeds and feeds" world Reg NMS was about to be catapulted into.

That the speed of networks had accelerated to unprecedented levels with all the fiber networks installed during the Internet bubble, was lost on the regulators. This fiber capacity, referred to as "black fiber," remained dormant until lit up by the traders who were looking to speed up the ISO order. They could link directly to each trading venue and now execute thousands of trades between the time it took the ISO order to travel to the other trading venues and the time it took to update the NBBO. Welcome to the world of high-frequency trading (HFT)!

In the end, today's market infrastructure had been engineered by regulators, specifically the SEC and of late the CFTC, and not by knowledgeable market participants and scholars and by strong industry leaders, as was the case in the past.

### **Leadership for the New Reality**

Recently it was reported that Edward C. "Ned" Johnson, the humble patriarch of Fidelity Investments, was organizing an effort to reduce costs and streamline trading for a consortium of investment firms to deal with the issues of high-frequency traders interacting with long-term investor orders. Large asset managers like Vanguard, T.Rowe Price and BlackRock handle Main Street investments through their mutual funds and retirement plans. The initiative by Fidelity is rare in the mutual fund industry, where the big asset managers do not typically form consortiums. The potential to match order flow amongst themselves in their own "dark pool" can potentially be a game changer. It could produce a low-cost trading platform and set the tone for the reengineering of market infrastructure without regulators meddling in a revamped design, as was the case in prior decades.

A private company, Fidelity is one of the last of the major financial institutions to have the founding family still associated with the firm. This was the model of the old investment banks that had their founders' names on the door and that have largely disappeared.

Mr. Johnson seems to be rising to the occasion to lead on this controversial issue, following in the footsteps of the earlier financial industry leaders. His interest in technology is legendary among his peers. He once personally escorted me into the basement of his building, where he proudly pointed to the back-up batteries that would keep his shop operating 24/7. Fidelity was one of the two founders of the FIX trade communications protocol; it was the first mutual fund company to set itself up as a discount broker and the first to establish a clearing company for other financial intermediaries.

### **Specific Fixes**

Here are a few thoughts about how to fix the markets' infrastructure and microstructure plumbing so that competitive forces can be unleashed on a level playing field.

**Speed-** Slow down the market so all orders enter the queue simultaneously and priority is based on price improvement. In the 350 microseconds that the IEX ATS slows down its orders so that they arrive simultaneously at the order books of multiple trading venues, 7,000 orders can be sent. Such volume of orders arriving at different times distorts the top-of-book price on each trading venue relative to the public NBBO. A single market infrastructure design is one solution. Precedents can be found in the design of the Internet, in the intelligence community's information-gathering efforts and in the daily business of Google, Amazon and other technology-driven companies.

Using similar concepts, local databases can be federated into a virtual view of exchange/trading venue order books. This design can operate in real time across the globe, allowing a single view of the collective order books as though it was a CLOB, centralized virtually and not physically.

**Risk-** Some microseconds can be "borrowed" from slowing down orders and used to perform risk management functions on trades and counterparties: credit and trade limit checking; aggregation of individually established limits across multiple financial intermediaries; forward view of how those 7,000 trades will affect markets before they are entered into the markets; and most importantly, regulators' computers able to monitor markets in real time.

**Value-added services-** With a level playing field where time advantage is eliminated, price improvement will dominate and create further value propositions for clients and trading firms alike. New competition in innovative services would surely ensue. Such services could include mechanisms to execute trades at size; analytic, aggregation and real-time execution-through-payment services; straight-through-processing extended to bookkeeping and reporting; and real-time collateral and margin provisioning. Finally, the new plumbing of the market can be extended to all electronically traded, regulated markets, allowing for integrated trading strategies and aggregated value-added services.

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