The SEC's Order Handling Rules of 1997 and Beyond: *Perspective and Outcomes of the Landmark Regulation*

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The Securities and Exchange Commission's Order Handling Rules (OHRs) of 1997 ushered in a period of fundamental and unprecedented change in the competitive structure of the U.S. equity markets. Most significantly, the OHRs led to the reengineering of NASDAQ's dealer market. The new rules required market makers 1) to display customer limit orders in their quotes, 2) to display these quotes in the NASDAQ quote montage whenever they have placed more aggressively priced customer quotes in an electronic communications network (ECN), or else 3) to update their own quotes in NASDAQ to match the ECN quotes. In discussing these rules, Schwartz and Francioni put it this way:

> The proverbial cat was out of the bag. The new requirements set the stage for the ECNs to enter the field. Before the rules were instituted, Instinet was the one and only ECN. By September 1999 there were nine. [2004]

On a December evening in 1996, in a large hotel ballroom in lower Manhattan, the lead author of this article (Lindsey) took the stage to face several hundred NASDAQ broker/dealers. Another author (Schwartz) was in the audience. The scene was historic. In his courageous presentation, Lindsey outlined the details of the proposed OHR regulation. The import of his message was etched on the anxious faces of those present. After his presentation had concluded, these same people filed quietly out of the ballroom. Only the shuffling of their footsteps broke an eerie silence.

In the nearly two decades since the 1997 Order Handling Rules were introduced, the equity markets have experienced tremendous technological innovation, intensified competition among an expanding set of alternative trading venues, and further regulatory change. How has market quality responded? What further structural and regulatory changes are still required? These were among the key questions addressed at the Baruch conference.[1]

To be sure, nothing is better for the success of a conference than robust debate and creative conflict. That said, let us be a little feisty here. Positive things are said about how our markets have evolved over the years. In many ways, our electronic markets today are a huge improvement over their non-electronic predecessors. Lindsey's presentation at the Baruch conference described many of these valuable changes. Nevertheless, other voices have expressed negativity and doubt about elements of our market structure. For example, it is noted that asset managers are finding it difficult to execute their large orders.[2] Electronic markets can be fragile

(to wit, the May 6, 2010 Flash Crash). Moreover, retail customers' confidence in the stability and fairness of the markets appears to have been shaken. How good, one might ask, is market quality for mid- and small-cap stocks? And how about capital raising in the primary markets?

The major developments after 1997 are not, of course, attributable exclusively to the Order Handling Rules. The previously noted technological change, the evolving competitive landscape, and further regulatory initiatives are also major causal factors. So too are the exchanges' transitions from membership organizations to for-profit enterprises, alongside the expanding globalization of trading.[3] In the next section of this article, we consider the pressures for change that faced the markets in the years leading up to the institution of the 1997 OHRs.

THE PRESSURES FOR CHANGE

At the time of the Baruch conference, the S&P 500 Index was roughly six times the level it had been 25 years earlier. We deliberately selected 25 years prior as a starting point because that was roughly one year after the 1987 Market Crash.[4] Because the crash was such a disruption in the market, it spurred many subsequent changes, ranging from mechanizing trading systems to improving our market structure. But much more went on behind the scenes than people ever realized.

The events of the past quarter century have been studied closely in market microstructure papers. In academia, market microstructure, which studies how markets should work and be designed, has become a growth industry. Unfortunately, however, some of the academic literature can be slightly misinformed or misguided.

For example, in the 1990s, most academic thinking held that, when a market order went to a dealer, the order would be routed for execution to the best quote in the market, regardless of which dealer displayed that quote. In other words, dealer markets were thought to be highly competitive. But that is not the way the markets worked. When your market order went to a dealer *and* your dealer happened to have the best quote, your order was executed at that price. Otherwise, your order might not have been executed at all—or it might have been executed later at an inferior price, even though better prices were available in the market when the order was submitted. Dealers kept their order flow to themselves and didn't really compete with each other on price to attract order flow. Dealers did not route customer orders to other, competing dealers for execution. In short, markets did not work the way academics thought.

In the 1990s, academics began to focus on how investors should (and did) interact with the market—that is, how they actually bought and sold securities. In that process, the academics discovered that there were hidden costs associated with transacting in the markets. And institutional investors began to take this research to heart. They realized that they should care about the bid–ask spread, that they should care about market impact[5] and implementation shortfall,[6] and that they should care about how markets actually worked. All of these costs mattered because they affected the performance of investment portfolios. When institutional investors actually began to care about these things and became proactive, the market started to change, and it did so simply because the largest customers were demanding change.

But it should be kept in mind that the real driver of market innovation has always been technology. Markets cannot stand in the way of technology. History shows that incumbent markets usually try to fight those changes, but in the end they do not succeed.

Let's turn the clock back a bit to 1969. That was the year Instinet began, representing, perhaps, the first electronic marketplace for stock trading in the United States. Two years later, in 1971, NASDAQ, an electronic dealer market in stocks, was launched. Because of these and other changes then on the horizon, in 1975 Congress enacted amendments to the Securities Exchange Act of 1934.[7] In part, the amendments emphasized the important and evolving role of technology in U.S. markets, and in so doing, they charged the SEC with linking markets and enhancing competition. Twelve months later, the Cincinnati Stock Exchange went fully electronic. The Toronto Stock Exchange became an electronic market in 1977. We had the first electronic linkage between markets the following year in the form of the Intermarket Trading System (ITS).[8] Although people talk about linkages today, we should recognize that it was really some time ago that markets began to link together.

But not all of this worked the way it was envisioned, particularly in the case of the ITS. In fact, the ITS was purposely designed to *not* work particularly well because the markets designed it! The exchanges did not want orders routed from their own exchange to another exchange for execution—and the easiest way to prevent

that was to make sure that the ITS linkage was slow and awkward to use.

The concept of control over order flow still holds today. Whether we are talking about exchanges, dealers, or electronic execution systems, intermediaries want to control the order flow. This involves segmenting flow that is desirable to execute against, crossing flow deemed less desirable through proprietary "dark pools" or other systems, and, as a last resort, routing that flow elsewhere through a linkage.

Embedded in the 1975 amendments mentioned earlier was the National Market System (NMS). The NMS was supposed to ensure implementation of five points that Congress had decided were necessary to strengthen the markets: 1) economically efficient execution, 2) fair competition, 3) widespread availability of information regarding quotes and transactions, 4) orders executed in the best market, and 5) an opportunity for investors' orders to be executed without dealer participation. Look at our markets today—as an industry, we are still struggling to implement these five points.

Why? Because these five ideals are somewhat antithetical to the way market intermediaries like to operate. Market intermediaries are not interested in getting out of the way of orders—that is, allowing orders to simply interact with each other. It is hard to make much money if you just let orders interact with each other. Intermediaries make much more if they trade against orders—at least certain orders. Exchanges, dealers, brokers, etc., make their money by standing between investors who are buying and investors who are selling. That is not to say that these intermediaries do not provide anything valuable to investors, but the question remains, is the value worth the cost?

SOME QUESTIONS NEVER CHANGE

For those who have been involved with market structure for a long time, the same questions or issues tend to be repeated over the years. Sometimes the questions may be the same because people do not like to hear the answers—so they keep asking the same questions, hoping for an answer that they like. But the answers are almost always the same. They may change slightly when something is modified in the market to address a specific issue or problem but, eventually, the system adapts and we end up back with many of the same issues—they just manifest themselves somewhat differently.

Consider, for example, dark pools.[9] Lately there has been a lot of discussion in the press about dark pools. The first dark pool started in 1986 (although it was not called that at the time). It was Instinet's after-hours cross, when after-hours orders could be routed for execution with complete anonymity (including as to whether or not the order even existed). This was long before the term "dark pool" entered our lexicon. Same theme, different time.

Or consider market fragmentation. At the turn of the 19th century, there were more than 100 stock markets in the United States.[10] Do you not think that the markets were fragmented back then? This raised the same questions that are debated today. Over the years, many of those markets closed and consolidated. Why? Because technology changed, and it allowed investors in Kansas City or Des Moines to send, almost instantaneously, their orders to an exchange that was hundreds or thousands of miles away. And technology allowed exchanges to compete in new ways and with lower costs. That is why we can think of technology as the primary innovator in markets.

There were a number of changes in the 1990s, and we will touch on some of the high points. The Manning Rule was introduced in 1994,[11] and it was the first time that market makers were actually prohibited from executing ahead of their customers' limit orders. If a market maker's customer placed an order, the Manning Rule required the market maker to give any better market price to the customer, rather than execute that order for the market maker's own account. Previously, market makers would often take the better price for themselves (for example, buy at a lower price) and then execute the customer's order at a worse price (sell to the customer the same security at a higher price). In 1994, Christie and Schultz published their seminal paper on price collusion on the NASDAQ market. A year later, in 1995, markets moved to T+3 settlement.[12] Then, in 1996, the SEC issued a 21(a) report on the NASDAQ market and a settlement with the NASDAQ market makers on collusion and quote-fixing.[13]

The "SOES Bandits" should also be mentioned.[14] They were traders who used NASDAQ's Small Order Entry System (SOES) to trade quickly. The earliest high-frequency traders actually started in the 1990s as SOES Bandits, with many of them surviving today as high-frequency traders. Many of the questions or arguments that were raised then are still being asked today.

Clearly, some participants in markets do not like speed, but some do.

In general, market participants will always try to obtain an advantage. For some, that advantage is found in speed—whether it be the SOES Bandits of the 1990s or the high-frequency traders of the 2000s. The demand for speed also helped to drive the application of technology in our markets, as high speed traders became an important source of order flow for the exchanges.

DECIMALIZATION, THE ORDER HANDLING RULES, AND REGULATION ATS

Let us next consider the pricing convention on NASDAQ, as described in the Christie and Schultz [1994] paper. The authors focused on the avoidance of odd eights by dealers in their published quotes—and they got it almost right. In reality, dealers only avoided odd eights when the dealer spread in the market was greater than three quarters. There were actually two pricing conventions that the dealers used. They avoided quoting odd eights when the dealer spread was greater than three quarters, and they avoided odd sixteenths when the dealer spread was less than three quarters.

The Christie-Schultz paper started the ball rolling by asking the question: "Is there collusion in the NASDAQ market?" The SEC looked into that question—and the investigation resulted in an enforcement action against the NASDAQ market makers, in the Justice Department's actions against the NASDAQ market makers, and, finally, in the SEC's 1997 Order Handling Rules.

The Order Handling Rules were intended to be a structural fix for the lack of competition in the dealer market. The idea was to strengthen competition in the marketplace for both market makers and exchanges. The OHRs ultimately led to the concept of Electronic Communication Networks (ECNs)[15] and, finally, to Regulation Alternative Trading Systems (Reg ATS).[16] Why were these changes necessary? Roughly speaking, in excess of 80% of all the securities traded in the NASDAQ market followed the pricing conventions just mentioned.

So it was not just a little corner of the market; it was the majority of the OTC market. The structural fixes implemented by the Order Handling Rules—which essentially required display, dissemination, and the ability to interact with customer limit orders—broke the pricing conventions used in the NASDAQ market. After these conventions were broken, spreads that for years had been inexplicably wider in the NASDAQ market than the NYSE almost immediately collapsed and became very close to NYSE spreads. Although the OHRs had the most significant effect on NASDAQ, the NYSE and other exchanges that were also required to comply experienced narrowing spreads as well.

Around this time, the markets started moving to decimal pricing (or penny increments) in the quotes. Many people seem to think that the SEC required the markets to move to decimals, or that the SEC was told to do it by Congress. Neither is correct, although it is true that there was something called the Common Cents Pricing Act of 1997.[17] The Act was circulated in the House, but was never even voted on in Committee. It was written by David Cavicke, who was on the staff of Representative Mike Oxley.[18] There is a part that states that stocks should be quoted in dollar and cents; however, stocks were already quoted in dollars and cents, and perhaps what he really wanted to say is that stocks should be priced in decimals, pennies, or something similar. But Cavicke did not change his language. In any event, it did not really matter because the bill did not go anywhere.

So, let us consider some of the backstory about how decimals were introduced into the marketplace. In 1997, the NYSE was using its regulatory arm to pressure some of its member firms because those firms were routing orders (which could have been executed on the exchange) to the third market—that is, to OTC dealers who made markets in NYSE-listed securities. Third-market market makers were paying for order flow, and exchange members were routing to those third markets because of those payments. The NYSE, in the guise of a regulator, would essentially say to those members: "Why are you routing to the third market? That cannot be best execution—you should be routing those orders to the exchange." The implication is that there might be an enforcement action if the orders were not routed to the NYSE.

One of those third-market market makers called one of us (Lindsey) and said, "You know Dick Grasso[19] is doing this, and if he doesn't stop beating up on the firms and taking business away from me, I am going to break the eighth and quote in sixteenths." This was the reply: "Go ahead, call him and tell him that." He did, but the NYSE did not stop its pressure tactics. So Bernie Madoff[20]—yes, that Bernie Madoff—called Lindsey back a few weeks later and said, "Dick hasn't stopped; I am going to break the eighth and start quoting in sixteenths."

So, it was Bernie Madoff who broke the eighth—the pricing convention that had been in place for the NYSE for over 200 years! Madoff had programmed his system well in advance to trade in decimals and sixteenths. He went to sixteenths first and the Street went crazy. Within a few weeks, the market was, of course, trading in sixteenths. After sixteenths, it did not take long to move to decimals. Systems needed to be modified, and eventually the exchanges submitted rules for trading in decimals, which were approved by the SEC in the 2000s. Of course, at the time, the United States was the only market in the world that did not have decimal pricing; every other equity market in the world traded in decimals.

Let us next pick up on Reg ATS. There may be some confusion between ATSs and ECNs. The difference is that an ECN is run by a broker/dealer or, potentially, by an exchange. In other words, an ECN is run by a regulated entity. An ATS, on the other hand, is run by something that is neither a broker/dealer nor an exchange. The reason the concept of an ATS and its regulation was created is because, following the establishment of a regulatory framework for ECNs, the thinking got extended further. There was nothing, for example, that would have prevented Microsoft from setting up an electronic market to trade Microsoft stock. And if Microsoft or any other company did that, there was nothing in the regulatory structure to ensure that transparency, fairness, and access would be built into that market. The idea behind Reg ATS was to close that little regulatory loophole—so if an otherwise unregulated entity set up a trading system, there would be a way for the SEC to have regulatory authority.

Quoted spreads came down with the move to decimals, and the across-stock, volume-weighted average number of shares quoted also decreased. Frank Zarb, who was the Chairman of NASDAQ in the late 1990s, publically recognized that ECNs developed because the exchanges were not really fulfilling investors' needs. And that realization spurred the growth of ECNs, which were bringing in new technology, new order types, and new competition. The goal of the Order Handling Rules and Reg ATS was to introduce more competition into the market. The Commission never considered it to be its job to decide what that competition needed to look like. It did not think it should force a particular market structure (like a Central Limit Order Book).[21] Quite simply, the Commission believed that competition between execution venues should drive the development of markets.

HAVE ALL THE IMPACTS BEEN BENEFICIAL?

Let us examine some of the issues that people raise when they say that the changes arising from the Order Handling Rules—decimalization and automation—have been bad for the markets. First, the number of public customer accounts of broker/dealers has grown approximately 80% since 1997. Equity ownership by individuals has decreased, but ownership among institutional investors has increased. Institutions play a larger role today in the marketplace. But this was a trend that started during World War II, so there is nothing new there. The literature has shown that institutional trading costs have come down by almost every measure, including commissions and implementation shortfalls. Even average retail commissions have come down during the past decade. That is clearly good for investors. Broker commission income has actually increased over time because volumes have increased; obviously, that is good for brokers.

Another comment one might hear is how the average trade size on the NYSE has diminished over this time period. Personally, I would question that. If one looks at average trade size on the NYSE over a longer period of time, one will see a nice big run up in trade size from the 1980s to the late 1990s, with a peak in 1988. But average trade size today is not much different from that of the 1970s. One might complain that trade size is smaller than it was in 1990; that is definitely true, but perhaps misleading.

In September 1990, there was a rule change (Rule 115A) at the NYSE that modified the way opening trades were reported. Instead of opening trades being reported as a single, large block, the rule required that the reporting be based on the individual orders that constituted the block. Thus, the opening was reported as a number of small trades, instead a single, large trade size.

Although changing the way trades are reported does not change overall volume, it does change average trade size dramatically, because the opening generally constitutes the largest volume of the day. The Rule 115A change is one of the reasons the data show a decline in trade size since 1990. There may be other factors that influence reported trade size, but we need to be careful when we try to draw conclusions without understanding and accounting for all of those factors.

Execution speed has definitely increased. Most would consider this to be a positive. The median displayed depth (at least for larger stocks) has gone up, but it has not changed very much for the smaller-cap stocks.[22] In other words, for the most liquid stocks, there has been an increase in displayed depth (especially if you include depth displayed plus or minus 6 cents outside the best bid or offer). But, for less liquid stocks, there has not been much of a change in displayed depth.

As of October 2012, the time of the Baruch conference, the average holding time for equities was on the order of a year. That is the average holding time across equities and across investors, so that number includes the holding times of high-frequency traders. Average holding time for stocks has decreased over the last decade—but if you look back before the 1929 crash, holding time is about the same as it was then. What we see is a long period of higher average holding times for equities beginning after the 1929 crash and running through the late 1970s, with average holding times steadily declining since then.

There are many explanations for such an observation. For example, stocks did not trade very actively during the Great Depression or during World War II. Stocks held by individuals at that time were sold over the intervening years (1940 to 1980) to institutional investors like pension funds, mutual funds, and life insurance companies, which may have had longer holding periods. Today, there appears to be much more active trading in equities across the board—even for institutional investors. The pressure to achieve returns drives much of this activity, and it increases the turnover of equities.

Clearly, the market shares of exchanges have changed dramatically over time because there has been more competition. Presumably, the New York Stock Exchange or NASDQ would consider this to be a bad result, but others can see it simply as a result of competition. You can also see where that order flow is going. Not surprisingly, despite the complaints, the order flow really is not being siphoned off to dark pools, and it is not being siphoned off to all these ATS, etc. Instead, the most rapidly growing "execution venue" right now is i*nternalization*.[23] Most of that order flow is actually going to internalization and the dealer systems. For those who have been around a while, that is nothing new. The desire to control order flow is simply manifesting itself today in a different way.

That is not to say that there are not some issues with the way markets function today. Obviously,

EXHIBIT 1
Timeline of Major Market Changes

1969 Instinet launched
1971 NASDAQ starts
1975 Amendments to the '34 Act
1976 Cincinnati Stock Exchange goes fully electronic
1977 Toronto Stock Exchange begins electronic trading
1978 ITS links the exchanges
1982 NASDAQ starts in ITS
1984 SuperDOT
Mid-1980's Program Trading
1984 SOES
1986 First Dark Pool—Instinet After-Hours Cross
1986 London goes electronic
1987 POSIT
1987 Reuters buys Instinet
1987 Market "Break"
1987 NASDAQ ACES allows market maker auto-execution
1990 NASDAQ Selectnet
1991 NYSE begins after-hours crossing system
1992 NYSE volume surpasses 200 million
1992 NYSE 200th anniversary
1994 Manning Rule
1994 NASDAQ volume surpasses NYSE
1994 Christie and Schultz
1995 T+3 Settlement
1996 21(a) Report
1996 SEC & Justice Department settlement with NASDAQ market makers
1997 Order Handling Rules
1997 NASDAQ & NYSE begin trading in sixteenths
1997 NYSE first billion share day
1998 Reg ATS
1998 Island trades 15% NASDAQ volume
1998 Optimark launched
1999 ISE launched
1999 Gramm-Leach Bliley repeals Glass-Steagall
2000 Decimalization of NYSE
2000 Rule 390 abolished
2000 NYSE Direct+ auto-execution launched
2001 NYSE 2.81 billion share day
2001 NASDAQ sells to firms
2001 NASDAQ decimalized
2001 Disclosure of Order Execution and Routing Practices
2002 NASDAQ SuperMontage
2003 Dick Grasso resigns from NYSE
2004 Specialist firms settle with SEC
2005 Reg NMS approved
2005 Exchange/ECN consolidation (NASDAQ /INET & NYSE/ARCA)
2005 NASDAQ trades publically
2005 HF trading explodes
2005 Record price for NYSE seat $3.25 million
2005 Goldman SigmaX and other broker ATS's
2005 Knight buys ATTN (Houtkin) and rebrands direct edge
2006 NYSE/Archipeligo/Euronext merger
2006 NYSE trades publically
2006 BATS inverts pricing
2007 Reg NMS fully implemented
2007 Flash orders
2007 Uptick rule removed
2008 Dark pools take off

EXHIBIT 1 *(continued)*

2008/2009 Short-sale restrictions
2009 Suspension of flash orders
2010 SEC Concept Release on Equity Market Structure
2010 Sponsored Access rules
2010 Flash Crash
2010 Direct Edge becomes stock exchange

electronic trading is very much in our thoughts and on the pages of the press. There are clearly issues associated with algorithms—and whether there are sufficient controls in the market to ensure that an algorithm has been properly tested and cannot disrupt trading. There is also the issue of high-frequency trading, which may be abusive in some forms. There are undoubtedly some forms of high-frequency trading that do not add depth (liquidity) to the market, but instead attempt to manipulate prices.

Co-location[24] is not new. We have always had co-location in our markets; simply think about the floor traders and specialists at the NYSE. To a large extent, we do not have all those traders standing co-located on the exchange floor anymore. Instead, we have computers sitting next to one another, serving the same purpose that people did in the past. Granted, computers are faster than people. Granted, they have to be programmed properly. But, at the same time, this can be seen as just another example of technology driving the markets.

CONCLUSION

If you go back in history, you can see all the same fights that we are experiencing today. They happened when the telegraph and the telephone came to the market and disrupted vested interests. In the late 19th century, the NYSE painted its windows black to prevent anybody from distributing prices outside the floor of the NYSE, so that all prices could be controlled inside.

Go back to the Buttonwood Tree Agreement.[25] The 24 brokers who signed the agreement promised to give preference to each other in all negotiations for the purchase and sale of stock. The activities in which people engage in the market, and the types of complaints that result from those activities, are no different today than they were 20, 40, or a 100 years ago.

Consider the following quotes taken from a letter written by Robert W. Haack, Chairman of the NYSE in 1970, complaining to the SEC:

> Some traders deliberately instruct brokers to execute orders on regional exchanges or take their business to the third market in order to conceal their activity from the public view.
>
> It is an unusual and interesting phenomenon that the market with the greatest degree of regulation, greatest capital, and the most impressive record for depth and liquidity should find itself being fragmented. I believe that the causes for this fragmentation are not related to any change in the unique economies of scale available on the Floor of the New York Stock Exchange but to the presence of antiquated and unequal rules and the emergence of a new environment for trading in securities.
>
> I am also concerned about the lack of regulation in the recently developed 'computer markets' which are highly susceptible to abuse and non-disclosure.
>
> The New York Stock Exchange, to put it crassly, no longer has the only game in town. The result has been a break in the similarity of interests between people engaged in floor activities, whose profitability depends on the share of business brought to our Exchange, and firms doing business with the public, who have become willing partners to fragmentation.

Haack was complaining about fragmented markets, about other markets stealing order flow from the NYSE, about computerized trading and its impact on the NYSE and order flow, about dealers internalizing orders away from the NYSE, and about market participants who wanted to keep order flow hidden. Sound familiar?

It is the same story over and over. In Exhibit 1, we have briefly outlined a history of U.S. market structure, paying particular attention to the 1997 Order Handling Rules and the developments that followed. In so doing, we have stressed the importance of competition, and we note that, with competition, some enterprises survive and some do not. That said, let us end with Lindsey's concluding remark at the October 2012 conference:

> I went to the SEC as an economist. I am still an economist. I still believe in free markets and competition. I did write laws and rules, but they were intended to spur competition. Because I believe that competition regulates markets better than regulation ever can.

ENDNOTES

On October 23, 2012, Baruch College's Financial Markets Conference Series presented, "Rapidly Changing Securities Markets: Who Are the Initiators?" One major initiator was Richard Lindsey, former Director of Market Regulation at the Securities and Exchange Commission. Lindsey was the chief architect and an intellectual *tour de force* of the Commission's landmark 1997 Order Handling Rules. This article, with additional research, is an expansion of his presentation at that Baruch conference.

[1]For further material from the Baruch Conference, see "Rapidly Changing Securities Markets: Who Are the Initiators," Schwartz and Byrne, Springer, forthcoming, 2016.

[2]This is a bit ironic. We have high-frequency trading and miniscule latency, but it can still take hours to completely execute a large order.

[3]A timeline of major market changes, starting with Instinet's launch in 1969, is presented in Exhibit 1.

[4]The Stock Market Crash of 1987 or "Black Monday" on October 19th, 1987, was the largest one-day market crash in history. The Dow lost 22.6% of its value, or $500 billion.

[5]"Market impact" refers to the impact of a decision to buy or sell a security as reflected in the extent to which the buying or selling shifts the prices against the buyer or seller.

[6]"Implementation shortfall" refers to the difference between the current price or value when a decision is made to buy or sell a security and the final execution price or value, factoring in commissions, fees, and taxes. In sum, implementation shortfall is the total of the execution costs and the opportunity cost in the instance of adverse market movement between the time of the trading decision and order execution.

[7]Federal legislation launched on June 4, 1975, to amend the Securities Exchange Act of 1934. The 1975 amendments instructed the Securities and Exchange Commission to cooperate with the industry in creating a National Market System along with an ambitious system for the clearance and settlement of securities transactions nationwide. The amendments also provided for the prohibition of fixed-commission rates, promulgated earlier by the SEC in its Rule 19b-3.

[8]The ITS was created to electronically link the trading floors of the regional exchanges in trading stocks listed on either the NYSE or AMEX and one or more of the regionals. The Cincinnati Stock Exchange was among the first regionals to use the ITS.

[9]In dark pool electronic trading, pre-trade prices are not displayed, thus explaining the term "dark," and the prices at which shares are exchanged are only revealed post-trade.

[10]See, 1963 Special Study, p. 928, or Coffee [2002].

[11]On September 12, 2011, Rule 5320 replaced existing FINRA customer limit and market order protection rules ("Manning"), NYSE Rule 92 and similar exchange rules.

[12]Settlement occurs three days after the transaction date (T).

[13]See "Report Pursuant to Section 21(a) of the Securities Exchange Act of 1934 Regarding the NASD and the NASDAQ Market," http://www.sec.gov/litigation/investreport/nasdaq21a.htm.

[14]"SOES Bandits" were the bane of many NASDAQ market makers. The market makers frequently accused these early high-speed electronic traders of unfairly profiting from less nimble market makers who could "lose" heavily in the short time it took them to adjust their two-sided quotes.

See also Michael Berryhill, "Watch out, stock market, here come the SOES BANDITS," *Houston Post,* June 13, 1996. http://www.houstonpress.com/news/watch-out-stock-market-here-come-the-soes-bandits-6571504.

[15]For example, in 1997, Josh Levine and Jeff Citron created Island ECN. A year later, Island ECN accounted for as much as 15% of NASDAQ trades.

[16]See, RIN 3235-AH41, Regulation of Exchanges and Alternative Trading Systems, https://www.sec.gov/rules/final/34-40760.txt, Release No. 34-40760; File No. S7-12-98.

[17]See, S. 838 (is) - Common Cents Stock Pricing Act of 1997. https://www.govtrack.us/congress/bills/105/hr1053/text/ih.

[18]Michael G. Oxley, former Republican Congressman for the 4th District of Ohio (1981–2007), was Chairman of the House Financial Services Committee during office. Oxley achieved wide acclaim for his co-authorship of the landmark Sarbanes-Oxley Act of 2002.

[19]Richard "Dick" Grasso, the legendary former Chairman and CEO of the New York Stock Exchange from 1995 to 2003. He was forced out in a public controversy over his compensation package. Grasso rose from humble beginnings in Jackson Heights, Queens, NY, joining the Big Board as a clerk in the late 1960s, climbing the ranks to helm the exchange at its height. Grasso's departure in 2003, after a 36-year career at the exchange, resulted from an outcry over his reported pay package of about $140 million. On July 1, 2008, the New York State Supreme Court of Appeals dismissed all claims in this regard against Grasso.

[20]Founder of Bernard L. Madoff Investment Securities, better known publicly for later perpetrating what is regarded as the largest Ponzi scheme in financial history.

[21]A Central Limit Order Book would centralize limit orders across the marketplace, which was a concept proposed by U.S. regulators in the past but opposed by various interests.

[22]See Angel, Harris, and Spatt [2010].

[23]The SEC offers this explanation on its website: "When you place an order to buy or sell a stock, your broker has choices on where to execute your order. Instead of routing

your order to a market or market makers for execution, your broker may fill the order from the firm's own inventory. This is called "internalization." In this way, your broker's firm may make money on the "spread" – which is the difference between the purchase price and the sale price" (https://www.sec.gov/answers/internalization.htm).

[24]This refers to the ability of market participants to gain advantages in the speed of their trade executions and price-quote data through advanced technology, specifically the "co-location" of their computer servers near stock exchanges' computers. That lowers so-called latency, a critical factor in high-speed trade executions. The practice is regarded as legal though it has many critics.

[25]The NYSE began on May 17, 1792, with the signing of the Buttonwood Tree Agreement by 24 New York City stockbrokers and merchants outside 68 Wall Street under a buttonwood tree.

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