Searching for a New Center: U.S. Securities Markets in Transition

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Things fall apart; the center cannot hold.
—W.B. Yeats, "The Second Coming"

The apocryphal warning of Yeats carries a particular resonance for the U.S. securities markets. Beset by scandals involving both the leadership and the membership, the New York Stock Exchange (NYSE) has struggled to find its bearings in a more demanding marketplace. And the Exchange is not alone in its efforts to find direction. The Nasdaq has found it increasingly difficult to compete with the host of new competitors invading its traditional dealer market. These competitors, in turn, have added new dimensions to the competitive calculus, such as competition over print revenues and rivalries over execution speeds. The advent of decimalization has transformed the pricing of securities, and technology has rendered the current market linkage system increasingly problematic. Indeed, even the ownership of the markets is changing, with Nasdaq now a publicly traded company and the regional exchanges contemplating public offerings. These ownership changes, combined with the recent problems involving oversight of trading practices, have brought into question the entire issue of self-regulation of the securities markets. The forces besetting these markets are converging from all sides.

In this paper, I set out some of the very important issues surrounding the evolving structure of the U.S. equity markets. My goal is not to determine the "new order" for the markets but rather to set out those issues that are at odds with the traditional structure characterizing both market governance and market operation. That structure, which was the foundation for the National Market System (NMS), envisioned a market characterized by a dominant exchange competing via market linkages with several smaller regional exchanges, a single dealer market operating under the auspices of the National Association of Securities Dealers (NASD), and self-regulation undertaken by the cooperatively run exchanges and the member-owned Nasdaq. With the current market structure now vastly different, the NMS framework is faltering, and the search is on for a new "center" for both firms and markets alike.

The Securities and Exchange Commission (SEC) has entered this debate with the publication of Regulation NMS, a four-part proposal of changes to the existing NMS structure (see SEC 2004). While addressing some specific problems with the NMS, I will argue in this paper that these proposals do not go far enough to address the new environment characterizing the U.S. equity markets. A particular omission

is any recognition of the problems posed by changes in exchanges' governance for the self-regulatory structure of equity market oversight. I offer some examples of alternative regulatory approaches that might be more consistent with this new competitive environment. I conclude that the piecemeal approach of Regulation NMS misses the point that a new vision is needed for market regulation, one more consistent with the economic realities of today's markets.

I set the stage for my analysis by briefly detailing the regulatory and governance structures that have characterized the U.S. equity markets for the past quarter-century. I outline the original goals and structure of the NMS, set out some of the realities of the current market structure, and discuss the changing governance of exchanges. I then raise a series of issues relating to three overarching questions in market structure: Specifically, how should markets compete? How should they be linked? And how should they be regulated? Within these broad questions are a wide range of specific topics such as the role of price-time priority, liquidity rebates, tape revenue, pricing increments, and access fees as well as more general issues such as the viability of self-regulation.

A particular challenge confronting U.S. securities markets is how to deal with the transition of markets from cooperatively owned organizations to profit-seeking publicly listed firms.

Old Visions, New Realities

A natural starting point for our analysis is the passage in 1975 of the Securities Act Amendments, authorizing the SEC to facilitate the establishment of a National Market System for securities. The Securities Act articulated an explicit series of principles to guide the development of a national market but gave no specific guidelines regarding the market structure needed to attain these goals. Nonetheless, the vision was to establish a single national market system that would allow for (1) economically efficient execution of securities transactions, (2) fair competition between brokers and dealers, (3) availability of information with respect to quotations and transparency, (4) the opportunity to execute orders without the participation of a dealer, and (5) best execution of orders.[1]

As discussed by many authors (see, for example, Seligman 2003a and Blume 2000), these principles, while laudable, were ill defined and often conflicting in practice. The availability of information with respect to quotations, for example, has been criticized for allowing regional exchanges or alternative trading systems (ATSs) to free-ride on the price discovery efforts of other markets. Similarly, Macey and O'Hara (1997) argue that best execution of orders may be virtually undefinable (let alone unattainable) if features such as speed of execution are included in the execution metric. Perhaps a more fundamental criticism of the NMS principles was that it essentially implied a one-size-fits-all framework in which the disparate needs of traders were sublimated to the view that all orders would have equal standing.

Achieving a functioning single national market required some mechanism for linking the existing markets together. One proposal to do so was a consolidated limit order book, or CLOB, in which all orders would be queued in a strict price-time priority basis. However, the CLOB structure faced substantial opposition and was never implemented. Instead, an electronic linkage of markets, the intermarket trading system, or ITS, was adopted in which orders would first be routed to an exchange and then be sent by a specialist or market maker to another exchange or market quoting a better price. The ITS was facilitated by the development of the consolidated tape, which provided for unified reporting of all trades in NYSE-listed securities occurring both on the floor and elsewhere. The Consolidated Tape Association (CTA) was formed to operate the system, with the ownership of the CTA originally shared unequally by the NYSE, the American Stock Exchange (Amex), the NASD, and three regional exchanges. (For an excellent discussion of the founding of the CTA, see Seligman 2003a.) Consolidated quote data become available soon after. The revenue from selling this trade and quote information would grow substantially, providing upwards of 30 percent of the NYSE's revenue in later years.

Seligman (2003a) argues that this ITS approach to a national market retained the central role of the NYSE by allowing (some would say forcing) orders onto the exchange floor for possible price improvement by floor brokers before they were routed to other destinations. A second consequence of the ITS was that only price priority mattered; the specialist could match the better price offered elsewhere and still retain the order, an outcome not consistent with the price-time priority of a CLOB. Moreover, the only dimension of execution quality incorporated

into this framework was price; factors such as speed of execution were deemed of little consequence in the decades before the advent of electronic trading. To enforce this price priority structure, the "trade-through" rule was adopted, requiring orders to be routed to the setting quoting the best price. Interestingly, the trade-through rule did not apply to stocks in the over-the-counter market. Instead, Nasdaq-listed stocks were required to meet price priority within a market but not across markets.[2] This distinction would provide a greater ability for electronic communication networks (ECNs) and other trading platforms to compete for order flow in Nasdaq stocks than was the case for listed stocks.

The ITS system was criticized almost from the beginning as being an incomplete solution. While changes have been made to the system in the intervening years, the basic constructs of the system remain. Indeed, in 1999 SEC Chairman Arthur Levitt reportedly called the system archaic, a criticism even more true today. In late February 2004, the SEC responded to some of these criticisms with the distribution for public comment of Regulation NMS. This proposed regulation outlines changes to various aspects of the NMS system, the specifics of which will be addressed further in the next section.

What may be useful to contemplate, however, is how the trading environment has changed since the establishment of the NMS. Perhaps no force has been more important in undermining the NMS structure than technology. While the original system envisioned electronic transmission of orders, it clearly did not anticipate the advent of electronic competitors in the form of ECNs. ECNs are essentially electronic limit order books that allow customer orders to interact with each other. With no specialist or market maker required to complete the trade, orders in ECNs can execute almost instantaneously. Moreover, the development of smart routers has allowed traders to send orders to numerous trading venues. With the cost of technology dropping ever lower, new trading systems can be developed by a wide range of providers, dramatically expanding the number of potential competitors. The NMS system envisioned a more constrained world, populated by a handful of exchanges and the NASD.

The ability to create alternative trading systems undermined a second tenet of the NMS—the view that all orders were to be treated equally. While buyers and sellers each desire best execution for their orders, what this means can differ dramatically depending upon the characteristics of the traders. Institutional investors trading large orders, for example, may be more concerned with the price impact of their trades than they are with the size of the bid-ask spread. ITG's Posit, an ATS, and Instinet, now called INET following its merger with the Island ECN, both were developed to meet the desires of institutions to trade electronically with other institutional traders. Moreover, the ability to hide liquidity on ECNs by exposing only part of an order also allowed institutions to better handle their trading costs. But the needs of retail traders could also be met more effectively by specialization. Firms such as Madoff Securities developed payment for order flow and trade improvement algorithms that lowered retail trading costs. The speed of ECN execution also appealed to day traders, a trading species little seen when the NMS was contemplated.

Perhaps no force has been more important in undermining the National Market System structure than technology, which has enabled the development of new trading systems by a wide range of providers.

An important feature of these new entrants to the trading world is their private ownership. While broker-dealers were always proprietary operations, exchanges were organized as member-owned cooperatives. Even the Nasdaq, while starting life as a proprietary system, became part of the NASD, the member-owned securities association of broker-dealers. Backed by private capital and unencumbered by antiquated governance structures, these new corporate trading entities could quickly innovate and develop in ways not available to the existing markets. Indeed, at one point there were approximately a dozen ECNs active in the market although their numbers have now consolidated dramatically. Equally important, the regulatory burdens of these new entities were substantially less than their exchange or Nasdaq counterparts.[3] The extensive

1. See Section 11A(a)(1)(C) of the Exchange Act, 15 U.S.C. 78-1(a)(1)(C).
2. Price priority within the Nasdaq market dates to the imposition of the Manning Rules in 1994.
3. This disparity led the SEC to issue Regulation ATS, which increased the reporting and regulatory responsibilities for some alternative systems.

delays in launching the SuperMontage system, for example, were at least partially due to the time it took to get SEC approvals.

Perhaps not surprisingly, these same changes were affecting equity markets throughout the world. While ECNs played a much smaller role overseas, technology revolutionized trading by providing electronic access across borders. Because larger markets are typically better able to match buyers and sellers, the costs of providing liquidity generally falls with scale. Enhanced technology also lowers trading costs, leading to an ever-increasing arms race between exchanges to develop new trading platforms. For smaller exchanges, the dual demands of larger scale and expensive technology have proved insurmountable. The last ten years have seen the mergers of fifteen exchanges in Europe alone.

While not in principle inconsistent with a national market system, corporate ownership does pose challenges for the self-regulatory structure that underlies equity market supervision.

One factor facilitating this consolidation has been the worldwide shift of exchanges to public ownership. While in 1995 there were no publicly traded exchanges, now there are thirteen, with a market value now approaching $30 billion dollars.[4]

Over this period, nineteen stock markets demutualized, and several other markets, most recently the Philadelphia Stock Exchange, have announced their intention to seek a market listing. Of the world's ten largest stock markets, only the NYSE and the Tokyo Stock Exchange are nonshareholder-owned entities. This departure from the traditional structure of member-owned cooperatives represents a shift not only for individual firms but also for the broader exchange industry as well. Indeed, the recent listing of the Chicago Mercantile Exchange (CME) on the New York Stock Exchange testifies to a similar governance revolution occurring in the ranks of futures exchanges. Table 1 provides a list of these publicly traded equity markets and their market capitalization.

This shift to corporate ownership was surely not envisioned by the framers of the NMS. While not in principle inconsistent with a national market system, corporate ownership does pose challenges for the self-regulatory structure that underlies equity market supervision. Self-regulation rests on the premise that it is in the exchange or market's best interest to curtail any untoward trading behavior. While originally envisioned as a cost-effective way to channel the expertise of the exchange members into oversight obligations, the efficacy of the self-regulatory organization (SRO) approach has been questionable. As detailed by Seligman (2003b), there is a long litany of SRO failures involving virtually every U.S. market or exchange. Of particular importance for the current debate are the 1995 price fixing debacle on the Nasdaq, the 2000 floor broker scandal on the Amex, and, most recently, the $240 million settlement that will be paid by specialist firms on the NYSE to settle charges of stepping ahead of customer orders.

What is particularly unsettling about these recent failures is that they occurred while these exchanges and markets were still essentially member-owned cooperatives. Such a framework should temper, at least in principle, rent-seeking behavior, as the welfare of the market should be paramount over the benefits of individual members. As exchanges move to corporate ownership, however, the focus of a publicly traded firm need not be so encompassing. Given the incentives of profit-seeking firms, is self-regulation a viable mechanism for market oversight? We will return to this question in the next section.

The current realities of the market are thus far removed from the visions that created it. Now, fragmented markets are the norm as order routing systems such as LAVA direct orders to various ECNs and markets. Smart servers slice and dice orders as part of dynamic trading strategies designed to recognize explicitly the role of speed of execution and price impact costs in overall trading costs. "Tradebots" place limit orders, essentially transforming the provision of liquidity into a computerized process. Faced with an ever-widening array of competitors, exchanges and markets are shifting from being "public utilities" to being publicly traded firms. As things fall apart, the search for a new center beckons.

In the next section we turn to addressing some specific issues in this quest—specifically, those issues that relate to market structure. Our particular focus is on three very interrelated issues: how markets should compete, how markets should be linked, and how markets should be regulated.

Structural Issues

How should markets compete? Fundamental to the efficient operation of any market is competition. Competitive forces ensure that markets

TABLE 1

Publicly Listed Exchanges: Market Capitalization

Exchange	Ticker	IPO	Listing date	Market capitalization ($U.S. millions)
Singapore Stock Exchange	SGX	Yes	11-16-00	1,074.1
Athens Stock Exchange	EXAE	Yes	07-28-00	674.5
Deutsche Borse AG	DB1	Yes	02-05-01	6,200.9
Oslo Bors ASA	OSLO	Yes	05-28-01	174.0
Euronext	NXT	Yes	07-10-01	3,608.2
Toronto Stock Exchange	TSX	Yes	11-12-01	1,523.7
Stockholm Stock Exchange	OM	Yes	01-01-93	1,505.8
Chicago Mercantile Exchange	CME	Yes	12-05-02	6,850.0
Australian Stock Exchange	ASX	No	10-14-98	1,498.0
Hong Kong Stock Exchange	HKEX	No	06-27-00	2,615.6
London Stock Exchange	LSE	No	07-20-01	2,128.7
Nasdaq	NDAQ	No	07-01-02	591.2
ArcaEX	AX	Yes	08-16-04	686.3

Note: Market capitalization data are as of November 16, 2004.

operate efficiently, providing investors with low-cost access to fairly priced securities. At its simplest level, competition in security markets involves price setting, with the market maker or limit order trader quoting the highest bid or the lowest offer making the trade. Yet, as noted previously, even price competition is complex if issues such as time priority are included. And the advent of decimal pricing (and even subpenny pricing) has demonstrated the complex role played by the price grid in affecting the provision of liquidity.

The competitive process becomes even more complex if the competition occurs at the market level rather than the trade level. Such competition can take myriad forms, such as payment for order flow, liquidity rebates, order form differences, and competition over tape revenue. In the following discussion, we consider only a few of these many competitive options, beginning with the issue of trade-through rules.

Priority rules. As discussed in the previous section, priority rules for executing orders affect how markets interact with their customers and with each other. The primacy of price priority seems almost an uncontestable proposition. With price priority, a trader wishing to buy stock pays the lowest available price and a trader wishing to sell receives the highest available price, an outcome surely in the interests of both sides. Yet the optimality of this simple rule need not be so apparent when other dimensions of the trade are considered. A trader wishing to buy 100,000 shares, for example, knows that the price he pays will differ from that of a trader buying 100 shares. From the perspective of overall transactions costs, would a trader offering to sell 100,000 shares be a better match than executing the buy order against several thousand orders already in the queue? Similarly, might a trader wishing to execute a trade quickly be better served by an execution that takes place instantly at a worse price rather than one at a better price with a few minutes' delay?

Such issues are not specific to security markets. Consider, for example, the simple problem of buying milk. Someone running out of milk before breakfast might greatly prefer to run to the local convenience store to get a single bottle of milk quickly and pay a higher price than at the local grocery store. Alternatively, someone buying 300 gallons of milk may find a better price at the dairy than at the grocery store. Neither outcome seems unreasonable, yet both violate the notion of strict price priority across markets. What would seem unreasonable is two customers at the convenience store at the same time paying different prices for the milk; such an outcome seems unfair, if not exploitative. This example suggests that price priority within a market is different from price priority across markets.

The debate over the trade-through rule in securities markets brings this distinction into focus. In the current NMS design, strict price-time priority

4. See Mendiola and O'Hara (2003) for an extensive analysis of the factors influencing exchange corporate governance and the performance of these publicly listed exchanges.

was intended to treat each order fairly. But the delivery mechanisms in markets have changed in part because the demands and motivations of traders have changed. Thus, ECNs with automated execution capabilities can execute a trade instantaneously, while the manual NYSE specialist system requires more time. Under current rules, however, if the NYSE is quoting a better price, an ECN participating in the NMS must send the order there even though it may take much longer (and prices may change in the interim). This difficulty has resulted in some ECNs opting to stay out of the NMS, a strategy that has proved difficult to retain given the current regulatory structure.[5]

The current order-handling rules, by forcing orders to the market with the best price, have aggregated liquidity into large pools.

The SEC has responded to this complaint by proposing two exceptions to the current priority rules. First, an automated, or fast, market can trade through a better displayed price on a nonautomated market if the price difference is no more than 1 to 5 cents (with the specific range depending on the stock price). Second, a trader has the right to opt out of the price priority protection if the trader elects this option for each specific trade. Other than for these exceptions, the SEC has retained the trade-through rule and has proposed expanding it to include all market centers. Thus, fast markets cannot trade through other fast markets.[6]

These proposed changes respond both to the changes in technology and to the concern that different traders face different trading problems and so desire different trading outcomes. While accomplishing these objectives, the proposed changes are not without their drawbacks. An immediate problem is that the rules would essentially force all markets to automate, an outcome directly at odds with the specialist system of direct market making. A second, and more fundamental, concern is that these changes may lead to a dramatic deterioration of liquidity and price discovery.

To understand this second concern, let's return to our milk example. One difference between security markets and grocery markets is that milk is a commodity and stocks are not. Microstructure theory has developed a considerable body of work showing that because of asymmetric information the price of a stock depends upon the specifics of the trade.[7] Thus, buyers pay a bit more for the stock because they may be trading on good private information while sellers get a bit less to reflect a discount for potential bad information. The size of the spread depends, in part, on the scale and timing of trades. The greater the order flow, the more uninformed orders there are to offset the informed trades, thereby reducing the spread and price impact of the trade. Such effects are not important in buying milk because asymmetric information issues are not important in milk pricing.

The current order-handling rules, by forcing orders to the market with the best price, have aggregated this liquidity into large pools. Virtually every study of trading prices shows that the NYSE provides the lowest spread and price impact, a result the exchange would attribute to its superior trading system.[8] But the new order rules would allow trades to bypass the exchange either because of an explicit opt-out by the trader or because of a worse, but speedy, price available on an automated system. To the extent that these exceptions are large, the pool of orders remaining on the NYSE will be affected. And, unlike in the milk example, the detrimental impact on liquidity and price discovery can be large.

The NYSE has argued strenuously against changing the trade-through rules, citing the costs that would arise just from executing trades at prices from 1 to 4 cents off of the best quote. Indeed, the NYSE provides empirical estimates ranging from $1.5 billion to almost $3.5 billion due to this effect alone (see NYSE 2004). Yet an even larger effect may arise from the opt-out provision of the proposal. To the extent that institutional traders elect to send their orders away from the exchange, the overall liquidity of the market will be lessened. A particular concern is that orders will be internalized at the large dealer firms, removing completely any exposure of these orders in a public market. Such an outcome could undermine the overall price discovery mechanism, in effect making the market as a whole worse off.

There are two general responses, and myriad individual rejoinders, to this argument. The first is that it is no longer clear that centralization is necessary for price discovery or liquidity. Indeed, the advent of electronic routing has made the reward to posting better prices almost instantaneous, enhancing rather than detracting from market efficiency. The active market for exchange-traded funds such

as the QQQ suggests that liquidity can obtain in fragmented trading, at least for the most active securities.[9] This trading flexibility has led some institutional traders to cite a preference for the fragmented trading of Nasdaq stocks relative to the centralized trading of listed stocks. The second response points to the requirements of best execution in obviating the need for a trade-through rule. As noted earlier, the difficulties inherent in even defining, let alone attaining, best execution are not insignificant. Potentially offsetting this, however, are the competitive pressures that impose best execution not by fiat but by the demands of customers for better performance from their broker-dealers.

The challenge facing the SEC, then, is to enhance the competition for orders without so weakening the market fundamentals of liquidity and price discovery that "the center falls apart." Increased electronic execution capabilities on the exchanges will ameliorate some of these concerns, but the overall issue of whether orders can, or should, opt out of price priority remains contentious.[10]

Tape revenue. Competition across markets can take place on many levels, with one of the most important involving the revenue that arises from selling trade and quote information. As noted in the previous section, the development of consolidated trade and quote data was fundamental to the formation of a national market system. One approach to providing trades and quotes would be to have a governmental entity collect and disseminate this information in much the way that the National Weather Service provides temperature and climate data. This governmental solution was rejected, however, in favor of a quasi-private-sector approach. In particular, the Consolidated Tape Association (CTA), an entity owned by the exchanges and the Nasdaq, collects and sells data from the exchanges and markets. The CTA, in turn, provides tape revenue to the exchanges and markets via a formula based on the number of trades or prints to the consolidated tape.

In recent years, this sharing mechanism has come under attack from many directions. Under current rules the tape revenues are distributed to entities on the basis of the number of trades or share volume reported by the SRO that regulates them. Originally, the tape revenue was shared by the exchanges and the NASD, but the development of ECNs set forth demands for the sharing of the revenue to these entities. These demands were exacerbated by the introduction of the SuperMontage trading system on the Nasdaq, which essentially transformed that market into an ECN of its own. In response, a number of ECNs shifted to reporting trades on other venues where they were given rebates on the tape revenue they generated.[11]

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A second criticism of this sharing mechanism is that it introduces perverse incentives into the market. In particular, because more trades mean more revenue, trades are shredded into numerous smaller trades and thus into greater numbers of prints. The SEC has also raised concerns over the existence of

5. If an ECN does not publicly post quotes, then it is able to trade through the price. An example of this is Instinet, which remained outside of the NMS although its competitors ARCA and Brut did participate in the NMS. Alternatively, Island, which did have publicly exposed quotes, opted to "go dark" rather than comply with the SEC's rules regarding access (a stance which it has now reversed). See Hendershott and Jones (forthcoming) for an interesting analysis of this Island transparency case.
6. A fast market could match the better price of another fast market and execute the trade. Thus, the new system envisions retaining price priority across markets but not time priority.
7. For a review of microstructure theory, see O'Hara (1995). A more detailed analysis of the role of markets in liquidity and price discovery is O'Hara (2003).
8. Representative studies are Bessembinder (2003, 1999), Boehmer (2003), and Jones and Lipson (2003).
9. Exchange-traded funds (ETFs) are portfolios of securities that trade as a single entity. Among the most active is the QQQ, which is composed of the 100 largest Nasdaq stocks. ETFs trade actively on ECNs, on the Nasdaq, and on the various exchanges.
10. Indeed, the SEC appears to be divided on this opt-out issue, as evidenced by a new proposal reportedly circulated to the commissioners in late November 2004. This new proposal would back away from allowing traders to opt out of price priority although specific details of the plan are not yet publicly available. See "SEC Preps 'Best-Price' Overhaul," *Wall Street Journal*, November 22, 2004, for more discussion.
11. In particular, Instinet reported to the Alternative Display Facility (ADF), Island reported to the Cincinnati Stock Exchange, Brut reported to the Boston Stock Exchange, and Archipelago joined forces with the then Pacific Exchange.

wash sales, or trades reported solely for the purpose of printing more trades. Similarly, some venues exist purely as print facilities for the purposes of garnering print revenue. Competition over tape revenue has thus emerged as an important vector in the competition between markets.

This new competitive dimension raises a number of important questions. Perhaps the most significant of these is, what activity is print revenue intended to reward? Presumably, tape data are valuable because trades and quotes represent the state of the market. While any individual data point is relatively valueless, the aggregation of the data is not, and in this sense market data are like a public good: The data's existence benefits all, but data emerge from collective and not individual actions. One solution to the problem of selling a public good is simply to give it away or, in this case, to disseminate the data freely. But this approach ignores the fact that the data are not costless to produce. The alternative approach is to allocate the revenue to the markets in proportion to the value they have created.

If the goal is to promote quality regulation, then the costs of such regulation may not be well reflected by a formula that ties revenues to trades and quotes and not to oversight costs.

But what exactly is this value? The current rules reward the printing of trades but ignore the fact that not all trades are equally informative as to the state of the market. For example, a large trade may be much more informative than a small one, particularly if the small trade is the product of a trade-shredding algorithm. A related issue is that for many traders quote data are the relevant state variable, yet the production of quote data is not even considered in the revenue-sharing rule.

The SEC has responded to these concerns by proposing in Regulation NMS a new formula that would divide market data revenue between trades and quote production. The goal would be to reward markets that provide the "best" quotes, measured in term of time at the inside spread or potentially with respect to other variables such as the size of the quote. The notion here is to better link the revenue to a market with the underlying value that market is creating.

While this seems a desirable outcome, there remains the underlying issue of whether the data should be sold at all. Indeed, ECNs routinely give away limit order book data, information surely of value to traders and the market. A more fundamental argument with respect to the trade and quote data is that it is not the market that creates the data but rather the buyers, sellers, and limit order traders who transact there. How do they benefit from this proposed sharing rule? One argument for excluding them is that the revenue streams, in turn, are necessary to pay for the self-regulatory functions of the market. In effect, the market revenue data pay for the oversight of the market, and this oversight in turn benefits all traders. Yet, as will be argued later in this section, the self-regulatory structure may be problematic for many reasons. Moreover, if the goal is to promote quality regulation, then it may be that the costs of such regulation are not well reflected by a formula that ties revenues to trades and quotes and not to the costs of actual oversight.

Pennies, subpennies, and limit orders. A third dimension to the competitive calculus of recent concern is the pricing metric. For more than a century, the U.S. equity markets quoted securities prices in eighths, a convention designed to minimize transactions costs by reducing the number of possible price points. This system worked reasonably well when the transactions costs of trading were sufficiently high that spreads were often a multiple of the minimum increment. But in recent years enhanced technology and increased competition drove equilibrium spreads for many securities below that level. With minimum spreads fixed at mandated levels, however, practices such as payment for order flow arose to reallocate the excess spread revenues.

The SEC responded in the late nineties by allowing decimal pricing, a process that was completed in early 2001. As shown by numerous research studies (see, for example, Bacidore 1997; Goldstein and Kavajecz 2000; Jones and Lipson 2003), the immediate impact of this change was to reduce both quoted and effective spreads for small orders. A less positive development was a similar fall in market depth for many securities. Market depth fell because the smaller price grid undermined the attractiveness of placing limit orders. Whereas under the old system a market maker or floor broker would have to better an existing limit order by an eighth to establish priority at the quote, now this enhanced priority could be accomplished by improving the quote by a penny. This "pennying" behavior undercut the value of placing a limit order, and consequently displayed liquidity fell. Thus, the

shift to decimal pricing produced lower transaction costs at the expense of lower displayed liquidity.

Perhaps not surprisingly, price competition then evolved to some venues quoting prices in subpenny increments. The INET ATS (formerly the Island ECN), for example, allowed subpenny pricing for all securities, while the Instinet ECN permitted subpenny trading for all stocks trading over $10.00.[12] The SEC has responded in Regulation NMS with a proposed ban on subpenny pricing for stocks trading above one dollar. The rationale for this prohibition is to protect the value of limit orders from pernicious subpennying behavior. Thus, while shifting to subpennies would reduce spreads for some traders, the SEC argues that the overall market liquidity costs of doing so exceed these benefits.[13]

This debate illustrates the complex role played by price competition and the pricing grid. Indeed, some argue that the SEC should have moved more forcefully by restricting prices to a larger grid. Yet there are also concerns that limit orders traders are imposing costs on the market by causing flickering quotes. In particular, by placing and then rapidly canceling limit orders, these traders cause the displayed bid or ask quote to flicker. This practice is a particular problem on ECNs, where, as Hasbrouck and Saar (2002) provide evidence, more than 25 percent of all submitted orders are cancelled within two seconds of submission. But even markets such as the NYSE are not immune to this problem.

The proposed Regulation NMS does not address this problem. Certainly, one solution is to require that all posted limit orders have a minimum duration. Opponents of such a rule argue that it restricts the trading strategies of active traders who rely on the flexibility to change orders quickly. And it is always within the purview of an individual market to restrict cancellations, either explicitly or by charging fees for cancellations. Alternatively, what may be needed is a new type of price-contingent limit order that would allow limit order traders to prespecify price revision contingencies, thereby obviating the need for cancellations. Nonetheless, whether individual gains, or even the actions of individual markets, are sufficient to offset the losses to the market as a whole from unstable quotes remains a contentious, and important, issue.

How should markets be linked? The issues addressed above concern the various ways trading venues compete. But how an individual venue chooses to compete is not independent of how the trading venues are linked together to form the market. Market linkages involve many dimensions, but among the most important are who can place orders in the market, who can access them, and how easy it is for this to occur. This linkage issue is at the heart of the debate over the NMS, and not surprisingly it is a focus of the new SEC proposal. The SEC proposal has raised a wide range of linkage issues, including the problems of locked and crossed markets, and the difficulties of the current ITS system in handling automated executions. Brevity necessitates selectivity, so rather than address these (admittedly important) issues, I turn our attention instead to the basic issue of access fees and access rights in market linkages.

Market linkages involve many dimensions, but among the most important are who can place orders in the market, who can access them, and how easy it is for this to occur.

Access fees. The original NMS envisioned orders freely flowing to the market quoting the best price. To facilitate this outcome, orders entered into the ITS could be electronically sent to any participating venue, with no venue permitted to charge explicit access fees for sending or receiving the order. Similarly, while Nasdaq-listed securities were not explicitly part of the ITS, broker-dealers placing quotes in the Nasdaq were also not permitted to charge access fees for executing against their quotes. In effect, the specialists and market makers in these venues earned profits from executing trade.

The development of ECNs, however, introduced a new business model into the competitive environment. Unlike in an exchange or dealer market where a

12. Island actually lowered its minimum tick size from 1/256 to 1/1000 in April 2001. See Biais, Bisière, and Spatt (2003) for a very interesting analysis of tick size and competition between Nasdaq and Island.
13. INET announced that effective March 8, 2004, they would eliminate trading in subpenny increments for all stocks trading over $1.00 with the exception of the Nasdaq QQQ. INET attributed this decision to the results of a pilot study, concluding "we have determined that trading in penny increments generally provides greater price discovery, market transparency, and overall execution quality on INET in the current environment." See INET Subscriber e-mail, March 1, 2004.

market maker provides liquidity, liquidity in an ECN arises endogenously from the submitted orders. To operate the system, an ECN charges customers explicit access fees. Because liquidity providers are generally more valuable to an electronic limit order book than are liquidity demanders, most ECNs charge a fee to take liquidity (that is, execute against an existing limit order) and provide a rebate to customers who "make" liquidity by placing a limit order.[14] Thus, the overall cost of trading on the ECN involves both the bid-ask spread and these access fees or rebates.[15]

Originally, only customers of the ECN could submit orders and execute against existing orders.

Recent regulatory failures at the Nasdaq, the Amex, and the NYSE suggest that even the most effective markets have struggled with controlling the interests of their members.

Regulation ATS changed this practice by requiring any ECN with at least 5 percent of the trading volume in a security to display its quotes in a public quotation system; an ATS with 20 percent or more of the trading volume was required to provide fair access to its system. This requirement was intended to foster best execution by providing all traders with access to the "best" price. While laudable in principle, this required linkage introduced several complications to the trading process. First, the quoted price of the ECN did not explicitly include the access fee. Thus, the quote montage, while reflecting the best price, did not actually reflect the lowest execution cost. To the extent that a trade-through rule applied to the order, a broker-dealer would have to send the order to the ECN for execution even though the overall cost could be higher. A second problem involved the size of the access fees. While noncustomers could execute against an order, they could not similarly place an order on the ECN. By charging large access fees, ECNs could then afford to pay large liquidity rebates to their customers. The competitive metric thus involved using access fees to subsidize customers at the expense of noncustomers.

Certainly, one solution to this problem would be to change the quote montage to reflect the price plus the access fee. This approach would have had the advantage of fostering true best execution by making the actual trading price more explicit. The SEC rejected this approach, however, and instead mandated in Regulation NMS a maximum access fee that can be charged for any transaction. The proposed regulation caps access fees at 0.001 cents per share, with a maximum access charge per transaction capped at 0.02 cents. An important aspect of this proposal is that broker-dealers can now charge access fees, as can ITS exchange members. A natural outcome would be to expect that all trades now will involve explicit access charges whereas before many did not.

The advantage to this approach is that it standardizes fees and removes the ability to gouge noncustomers at the expense of customers. The disadvantage is that it arbitrarily imposes a price ceiling on the transaction and removes any role for market forces in setting access fees. Indeed, it can be argued that the access fee issue is relevant only because trade-through rules require orders be routed to the lowest price; in the absence of this requirement broker-dealers would choose to route orders based on overall costs, thus allowing market forces to set access charges.[16] With Regulation NMS now extending trade-through rules to all markets, the effect of these mandated fees will be widespread. From this perspective, the SEC's approach is both anticompetitive and inconsistent with the general view that market prices are best set by the market.

Who can access markets? The SEC-mandated approach to access fees contrasts with the market-based approach the SEC is proposing to deal with the more general issue of how markets are to be linked. Here the SEC is stepping away from the hard linkages of the ITS to allow market forces to link markets together. Currently, "there is no existing 'hard wired' linkage for Nasdaq stocks other than the telephonic access required by the Nasdaq UTP Plan and the minimum access standards of the ADF" (SEC 2004, 22). Instead, access is provided by a mélange of linkages that participants in the ADF have established amongst themselves. The SEC is proposing that quoting market centers and quoting market participants must make their quotations accessible to all market participants "on terms as favorable as it grants to its most preferred member, customer, or subscriber."[17] Further, "an SRO would not be permitted to post quotes or orders for another market center (such as an ATS or market maker) through its facilities unless it has first made a determination that the market center has provided adequate access to its quotes and orders under the proposed access standards." From a practical per-

spective, this linkage requirement essentially imposes direct access obligations on ADF participants that have not yet established linkages with quoting market centers.

Exactly how this connection will be done remains to be seen. What is important is that unlike the market-to-market linkages characterizing the ITS system, this system envisions indirect linkages through a member, customer, or subscriber. Such an approach seems more consistent with the new market structure of multiple electronic trading venues competing at the customer level. As this approach will also create greater access to markets, an interesting question is how this will affect the current value of exchange seats, which traditionally have reflected the value of access. The recent fall in NYSE prices suggests at least a partial answer.

How should markets be regulated? The market structure issues discussed in the previous two subsections illustrate the dramatic changes in equity markets since the inception of the National Market System. Yet a more fundamental change is on the horizon, one that has the potential to influence the operations of the U.S. equity markets in ways even more profound. I refer here to the changing corporate governance of exchanges and markets.

As noted earlier, stock exchanges around the world are converting from being member-owned cooperatives to being publicly traded firms. This shift reflects a variety of causes, including greater access to capital, the need for greater efficiency in operation, and the increasing heterogeneity of members' interests leading to difficulties in cooperative decision making. As discussed by Mendiola and O'Hara (2003), this change is both widespread and accelerating; eight of the world's ten largest stock markets are now publicly traded firms, with proposed conversions pending for several other markets. In the United States, the Nasdaq, the CME, and ArcaEx (the entity combining the Archipelago ECN and the Pacific Stock Exchange) currently have traded shares, and the Philadelphia Stock Exchange has announced plans to convert to public ownership.

While the change in corporate governance should influence exchange operation, a more intriguing issue is how it will influence exchange regulation. U.S. equity markets and exchanges rely on a system of self-regulation. As detailed by Seligman (2003b), the decision to eschew direct government regulation reflected the view that "self-regulation would have 'unquestioned advantage' over direct SEC enforcement" because of the problems of regulating behavior that was undesirable but not easily proscribed by statute" (Seligman 2003b, 12). With direct regulation left to the SRO, the government would play a residual role, being ready to use "the shotgun behind the door" should the members fail to satisfactorily police themselves.

That self-regulation has not always worked well is unquestioned. Recent regulatory failures at the Nasdaq, the Amex, and the NYSE suggest that even the most effective markets have struggled with controlling the interests of their members. As exchanges shift from cooperative governance to corporate ownership, however, the very concept of self-regulation is called into question. Is it even sensible to expect a private firm to put the interests of the market ahead of those of its shareholders?

While the United States has yet to address this specific issue, the transition of exchanges to corporate ownership around the world has forced other countries to confront the regulatory question. Interestingly, while the problem of regulating these exchanges is essentially the same, the solutions being adopted show little uniformity. Table 2 sets out the regulatory framework currently used for the London Stock Exchange, the Toronto Stock Exchange, Euronext, the Deutsche Borse, and the Stockholm Stock Exchange (OM).

Perhaps the most dramatic shift in regulatory structure has occurred in the United Kingdom, where in 2000 the Financial Services Authority (FSA) took over general oversight of the London Stock Exchange. This "super regulator" engages in all aspects of financial regulation, including the oversight of banking, insurance, and the stock market. The London Stock Exchange continues to have responsibility for monitoring daily trading operations on the exchange, but the FSA has taken over the power to list and delist securities. This new role allows the

14. Rebates were introduced by Island in 1997 and have gradually become the norm in ECN trading.
15. There are, of course, indirect fees that attach to trading on other venues, such as the seat prices or Designated Order Turnaround (DOT) fees on the NYSE or the SuperMontage access fees in Nasdaq.
16. The Nasdaq market currently does not have a trade-through rule, and at least some observers argue that the access-fee issue there has been largely dealt with by market forces and by the cap of 0.03 cents per transaction set by the Nasdaq.
17. Under new Rule 600, a quoting market center is any order execution facility that is required to make available to a quotation vender its best bid or best offer in a security pursuant to the Quote Rule. A quoting market participant is any broker-dealer that provides its best bid or best offer in a security to an exchange or association pursuant to the Quote Rule or Regulation ATS and whose best bid or best offer is not otherwise available through a quoting market center.

TABLE 2

Regulation of Stock Exchanges

Stock market	Public listed/mutual	Self-regulated?	Regulation entity if not self-regulated
London	Public listed	No	FSA (Financial Service Authority)
Toronto (TSX)	Public listed	Partially	Market Regulation Services Inc. (RS) A national, independent, not-for-profit regulation services provider, jointly owned by TSX and the Investment Dealers Association of Canada
Euronext	Listed public	Yes	
Deutsche Borse (Frankfurt Stock Exchange)	Public	No	Exchange Supervisory Authority (under the Hessian Ministry of Economics)
OM (Stockholm)	Public listed	No	Finansinspektionen (FI), the Swedish Financial Supervisory Authority A public authority that supervises and monitors companies operating in financial markets. (The Swedish Parliament and the Swedish government have stipulated that SFSA should contribute to the stability and efficiency of the financial sector and promote satisfactory consumer protection.)

Sources: London (LSE): www.fsa.gov.uk/pubs/policy/launch.pdf; Toronto (TSX): www.rs.ca/en/about/index.asp?printVersion=no&locl=about; Euronext: www.euronext.com/editorial/wide/0,4771,1732_4436322,00.html; Deutsche Borse (Frankfurt Stock Exchange):www.boersenaufsicht.de/hessen.htm; OM (Stockholm): www.fi.se/english/index.asp

How is regulation handled?	Power of listing/delisting
The regulation arm of the London Stock Exchange was transferred to FSA in 2000. FSA has engaged in every aspect of regulatory activities in the exchange: • to promote fairness, transparency, and orderly conduct in financial markets, looking in the first instance to the markets and market participants to set and enforce high standards in this area; and • to take action where such standards are inadequate or are ineffectively enforced.	No
RS's areas of regulatory responsibility include market policy, market surveillance, investigations, and enforcement. • Market policy: RS develops and administers trading rules applicable to all marketplaces in Canada, the Universal Market Integrity Rules (UMIR). • Market surveillance: RS monitors every trade every day made in Canada in real time to ensure strict compliance with UMIR. • Investigations: RS conducts investigations into trading activities in response to complaints or any market activity identified during its market surveillance that could be construed as violating securities trading rules, policies, and statutes. • Enforcement: RS is responsible for enforcing the proper and fair conduct of regulated individuals and firms and can impose fines of up to $1 million per violation depending on the severity of the violation and can suspend or ban individuals from access to the market.	Yes
In accordance with Dutch law, Euronext has a two-tier governance structure with a Supervisory Board and a Managing Board. • The Supervisory Board is a separate body, consisting of independent members, and the members of the Supervisory Board cannot also be members of the Managing Board at the same time. • The Supervisory Board oversees the actions and policies of the Managing Board and the general course of Euronext's business activities and assists and advises, in its supervisory capacity, the Managing Board in performing its managerial duties. • Major decisions require previous approval of the Supervisory Board. Among others, its duties include the adoption of the financial statements that all members of the Supervisory Board and the Managing Board must sign.	Yes
The Exchange Supervisory Authority supervises • price formation processes, • investigation of violations against the exchange rules and regulations, • development of fraud prevention, • supervision of lawful conduct by exchange bodies, • supervision of trading participants admitted to exchange trading, and • the legislation and exchange policy.	No
FI ensures timely implementation of measures against suspected illegal trading. FI supervises compliance with the Swedish Insider Act and investigates cases of suspected offences and share price manipulations. FI established new rules of conduct for the securities market concerning increased information about the risks and documentation requirements for advisory meetings. These governing rules include • trading information from and to customers; • handling documents of business engagement; • employees' and related parties' own transactions with financial instruments and foreign currencies; • allotment rules in conjunction with public tender offer, etc.; • suspension of trading; and • reporting obligation in conjunction with trades regarding financial instruments.	No

government regulator to decide who should have access to the U.K. capital markets, a decision formerly within the purview of the exchange itself.

Direct government supervision is the case for the Deutsche Borse, where the Exchange Supervisory Authority controls virtually all aspects of trade monitoring, listing, and supervision. The Stockholm market is also under direct supervision and is overseen by the Finansinpektionen (FI), a public authority set up to supervise and monitor companies operating in the financial markets. The Stockholm Exchange represents a particularly interesting example, as this market is completely owned by the technology company OM.

There is little doubt that the U.S. markets will evolve toward the private ownership structure now so prevalent elsewhere.

In contrast to the these directly regulated markets, the Euronext market has retained a self-regulatory structure. Euronext, however, has an intriguing two-tiered governance structure involving a Supervisory Board and a Managing Board. The Supervisory Board is composed of independent members, who cannot by law also serve on the Managing Board. While the Managing Board is responsible for running the company, the Supervisory Board oversees all exchange activities and is responsible for the overall regulation of the market. In accordance with Dutch law, all major decisions require the approval of the Supervisory Board, and the members of both boards are required to sign all financial statements.

Yet another regulatory variant is found in the regulation of the Toronto Stock Exchange. Canadian regulation is entrusted to Market Regulation Services, Inc. (RS), a national, independent, not-for-profit regulation services provider that is jointly owned by the Toronto Stock Exchange and the Investment Dealers Association of Canada. As an industry-run SRO, RS retains the basic self-regulatory approach but removes the influence of specific exchange ownership. Thus, RS is responsible for trade monitoring, enforcement, rule setting, and enforcement for all security markets in Canada.

These alternative regulatory models suggest that there may be many ways to regulate publicly traded exchanges. Nonetheless, a feature common to all approaches is independence between the supervisory authority and the management of the exchange or market. This structure differs from the typical U.S. model, where the regulatory function is carried on directly by the exchange.[18] When exchanges were cooperatively owned and not profit-seeking, this distinction between management and supervision may have been less important. In a world of profit-seeking exchanges, however, the mandates of management and supervision are likely to diverge.

There is little doubt that the U.S. markets will evolve toward the private ownership structure now so prevalent elsewhere. The SEC, however, has given scant attention to the implications of this shift, focusing instead on amending the rules of the National Market System as opposed to changing the regulatory structure of the equity markets.[19] Nonetheless, the recurrent, and highly public, scandals involving U.S. equity market governance and regulation suggest that attention to this important issue is overdue. The recent corporate governance reforms at the NYSE suggest that individual markets may adopt some changes, but the real issue remains how to regulate U.S. markets operating as profit-seeking, publicly owned firms.

As a starting point for this discussion, let us briefly outline how these regulatory alternatives could be applied to the U.S. markets.

Super-regulator. Following the U.K. model, the regulatory functions of each exchange would be shared between the market and the SEC. The SEC would be responsible for marketwide regulation, such as the setting of listing and delisting standards, the setting of disclosure and corporate governance regulations, and the overall monitoring of market fairness and transparency. The exchange would be responsible for the monitoring of all trading on its trading platforms. One aspect of this regulatory arrangement is that listing fees would no longer be a revenue source for the exchange but instead would accrue to the SEC. Centralizing regulation has several advantages, among them consistency across markets, uniform control of access to the U.S. equity markets, and the removal of self-serving interests from market regulation. But the disadvantages are substantial, with perhaps the foremost being the dramatic expansion of government involvement in the securities markets. This approach also reduces the value of industry expertise, both in terms of efficiency and expense.

Industry-sponsored SRO. The Canadian approach suggests that an industry-sponsored SRO could be

applied to the U.S. markets. This model would require shifting all regulatory responsibilities from the individual exchanges and markets to a central nongovernmental regulator. This regulatory model retains the role of industry expertise but also the perverse incentives of allowing industry participants to regulate themselves. An objection to this approach, as well as to the super-regulator model, is that it also removes a competitive dimension from markets. For example, the NYSE has long viewed the value of its market monitoring as an important benefit to NYSE listing. However, an important benefit is that it removes the incentive of individual markets to compete via lower regulatory requirements. Such regulatory arbitrage is a particular concern as profit-seeking markets compete for listing and trading revenues.

Enhanced self-regulation. A third alternative is to retain the general self-regulatory approach but with changes to address the specific incentive problems attaching to proprietary exchange or market operation. The NASDR model suggests one possible framework, with the regulatory arm structured as a separate entity from the parent organization. Alternatively, the NYSE is proposing retaining its regulatory arm in-house but changing the reporting lines to go directly to the board. Unlike the Euronext model, however, there is only one board at the NYSE, so management and supervisory decisions would still reside in the same group. An added disadvantage of this approach is that it retains multiple regulators, an expensive and costly approach that ignores the scale benefits of standardized technology for market oversight. Perhaps more importantly, this approach retains the premise that profit-seeking firms can be trusted to regulate themselves, a questionable assumption given the recurring scandals in U.S. equity markets.

In my view, these regulatory issues are fundamental to the search for a new center for the U.S. equity markets. The current regulatory framework evolved from the pre-SEC days when markets essentially oversaw their own trading environment. Their failure to do so effectively, however, was in large part responsible for the formation of the SEC in the Exchange Act of 1934 and the creation of the NASD in the Maloney Act of 1938. Regardless of one's view of the efficacy of self-regulation since then, the changing economic environment now raises serious concerns about the appropriateness of self-regulation going forward.

Conclusions

The best lack all conviction, while the worst are full of passionate intensity.
—W.B. Yeats, "The Second Coming"

The challenges confronting markets and regulators are substantial. This paper has set out a number of issues relating to how markets compete, how markets are linked, and how markets are regulated. As is readily conceded, this list is incomplete, reflecting the complexity of our U.S. market structure. Nonetheless, what I have tried to outline here are the changes that I think have undermined the current structure of the U.S. markets and the issues that must be addressed as a consequence. A particular challenge is how to deal with the transition of markets from cooperatively owned organizations to profit-seeking, publicly listed firms.

The SEC's Regulation NMS is a promising start in this direction, providing a number of much-needed changes for the market. But it is an incremental approach, changing particular features of the markets while retaining the basic structure that has been in place since the inception of the National Market System. My argument in this paper is that Regulation NMS does not go deep enough—that a new vision, rather than piecemeal changes, is needed to address the fundamental changes that are shaping the equity markets. While incremental changes may ultimately bring improvement, a more likely result is a market structure increasingly at odds with its economic reality.

In crafting this new vision, perhaps the most important issue to consider is the nature of competition in U.S. securities markets. The NMS was crafted to deal with an unequal world of dominant markets interacting with smaller competitors. The SEC was needed to set the rules of play to enforce

18. An exception to this is found in the reorganization of Nasdaq, where following the price-fixing scandal the regulatory arm was split off to form NASDR. NASDR is now separated from the Nasdaq market, but both are owned by the NASD. In a similar vein, ARCA outsourced its regulation to the Pacific Exchange (PCX) although their subsequent merger renders this distinction less clear-cut.
19. On November 9, 2004, the SEC proposed rules that would strengthen the corporate governance of markets that operate as SROs. The proposed changes require SROs to publicly disclose compensation of top executives and to have a majority of directors be independent. The proposal also seeks to limit a single member to owning no more than 20 percent of a publicly owned exchange or market. These changes, while useful, do not address the inherent conflicts noted above in profit-seeking firms' self-regulating. For more discussion of these issues, see Macey and O'Hara (2004).

competitive behavior while retaining a role for the smaller competitors. The new reality is that markets are technology driven, often fragmented, but highly competitive. This competitive nature can allow the market to resolve many competitive issues such as pricing and access without direct interference from the SEC. But, as I have argued here, where direction is needed is at the firm level, where regulation must provide the proper oversight to ensure fair and appropriate behavior.

As Yeats reminds us, the dual perils of indecision and haste can equally undermine the prospects for success. As markets and regulators grapple with solutions to these problems, the most important element in finding a new center may be the courage to make the necessary changes.

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