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4 An Exchange Is a Many-Splendored Thing: The Classification and Regulation of Automated Trading Systems

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4.1 Introduction

In 1969, a company called Instinet established a computer-based trading facility as an alternative to the exchange markets. The Securities and Exchange Commission (SEC) responded by proposing rule 15c2-10, a filing requirement for automated trading and information systems.[1] The proposed rule was the first direct regulatory action aimed specifically at automated trading markets.

Since then, the growth in automated trade execution systems on a worldwide basis has been explosive. In the United States alone, there are roughly twenty such mechanisms, including completely automated exchanges, exchange facilities with automated trade execution components, and proprietary systems not currently regulated as exchanges.[2]

Growth in regulatory initiatives and analysis with respect to this new form of financial market structure quickly followed. These efforts can be classified in four general ways. There are the obvious hardware and software concerns that are generic in the oversight of any computerized system. Advances in this area include the Automation Review Policy put forward by the SEC.[3] Perhaps less obvious are the oversight issues posed by the nature of the computerized algorithms themselves, which govern the trade-matching mechanism and con-

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1. See Securities Exchange Act Release no. 8661 (August 4, 1969), 34 *Federal Register* 12952.

2. See Domowitz (1993c) for a listing and classification of automated trading markets.

3. See Securities Exchange Act Releases no. 27445 (November 24, 1989), 54 *Federal Register* 48703, and no. 29185 (May 15, 1991), 56 *Federal Register* 22490, with respect to SEC policies. General Accounting Office (1989) contains some additional concerns.

tribute to the pricing and trade allocation properties of the price discovery process.[4] Computerized markets also lend themselves to cross-border trading, raising problems of jurisdiction and standardization.[5] Finally, there is the question of how to classify and regulate automated systems as a trading market. This includes such diverse issues as conformity with existing law, participant protection, and competition, among others.

The market regulation problem is the focus of this paper. The microcosm for the discussion is the issue of SEC regulation of proprietary automated trading systems. The primary emphasis is on the appropriate definition of an exchange for the purpose of regulation and whether the exchange/nonexchange distinction remains a viable regulatory construct.

Some history may help to motivate these issues. Rule 15c2-10 for the regulation of propriety systems was not adopted after its introduction in 1969. It was determined that Instinet did not share certain characteristics of a registered exchange, although it performed the function of an exchange with respect to trading activity. In particular, it was decided that Instinet did not fit into the statutory scheme contemplated for exchanges and, therefore, for exchange regulation.[6] This exhibited a decidedly institutional approach to trading market regulation on the part of the SEC. In fact, rule 15c2-10 was withdrawn in 1975, following the 1975 amendments to the Securities Exchange Act, on the basis of institutional considerations.[7] In response to increasing numbers of automated systems, the SEC adopted a policy of granting "no-action" positions with regard to the Securities Exchange Act's definition of the term "exchange" in 1984.

After some experience in overseeing proprietary trading systems and objections to the no-action approach from various exchanges, the SEC reintroduced rule 15c2-10 in 1989.[8] Some of this experience involved decisions with respect to the definition of an exchange, and how this definition should be applied to proprietary automated systems for purposes of regulation.[9] The rule is still pending approval, and its disposition, including possible amendments or even withdrawal, awaits the analysis to be put forth in the Market 2000 report on U.S. equity markets. If adopted, the new rule would provide regulatory requirements for such systems, which currently are subject to broker-dealer regulation

4. See, for example, Sundel and Blake (1991); Corcoran and Lawton (1993); Domowitz (1993a); and 55 *Federal Register* 17932 (April 30, 1990).

5. See, for example, International Organization of Securities Commissions (1991).

6. Securities Exchange Act Release no. 26708 (April 18, 1989), 54 *Federal Register* 15429.

7. See Securities Exchange Act Release no. 11673 (September 23, 1975), 40 *Federal Register* 4522. Automated trading systems were to be regulated as facilities of an exchange or "association," if the self-regulatory organization operated the system. Proprietary systems were to be regulated as broker-dealers or as securities information processors.

8. See Securities Exchange Act Release no. 26708 (April 18, 1989), 54 *Federal Register* 15429.

9. See, for example, Securities Exchange Act Releases no. 27611 (January 19, 1990), 55 *Federal Register* 1890, and no. 28899 (February 28, 1991), 56 *Federal Register* 8377.

and provisions set forth in individual no-action positions provided to system operators.

This paper is motivated by the following questions posed by the SEC for comment in the concept release of the U.S. Equity Market Structure Study and in the publication of the proposed rule 15c2-10. Might the SEC usefully revisit how it defines an exchange, and is the exchange/nonexchange distinction still viable for determining the regulatory treatment for a market system? Proposed amendments are sought as to how Congress might redefine an exchange in light of advances in automation. The SEC also is interested in whether the choice of designating a system as exchange or nonexchange is too limiting, in general. In fact, the SEC itself asks whether the classification could instead be based on functional attributes of a trading market, proprietary or otherwise. This leads naturally to the appropriateness of adopting a standards approach to the regulation of automated systems.[10]

Given the nature of these questions, this paper is in the spirit of the work in Domowitz (1990, 1993b) on the laws and regulatory definitions germane to the approval of automated trading systems in U.S. futures markets. The language of the law, precedents set in place by the regulatory authorities, and the nature of automated trade execution mechanisms are set out and compared. It will be argued that a functional approach to the regulation of trading markets is more appropriate in the face of automation, the case resting in part on the SEC's rulings. This conclusion is consistent with the analysis of Merton (1992) of financial products and intermediation and Lee (1992) on regulatory anomalies.

A brief discussion of trading systems appears in section 4.2. Regulatory background with respect to the institutional players, characteristics, and procedures relevant to the questions considered here is presented in section 4.3. Section 4.4 contains an analysis of the definition of an exchange, as distilled from legislative history and legal precedent. This definition currently is at the core of SEC regulatory policies with respect to trading systems. Examination of the issues that arise in maintaining this definition as a basis for trading system classification is contained in section 4.5. The emphasis is on exchange membership, liquidity requirements, and competition. The questions of redefinition and a functional approach to system classification occupy section 4.6. A classification scheme consistent with the idea of functional regulation is suggested, and its implications for current trading systems and registered exchanges are explored.

4.2 Automated Trading Systems

A trading system is defined by the SEC to be "any system providing for the dissemination outside the sponsor and its affiliates of indications of interest,

10. See Securities Exchange Act Release no. 26708 (April 18, 1989), 54 *Federal Register* 15429.

quotations, or orders to purchase or sell securities, and providing procedures for executing or settling transactions in such securities."[11]

An automated trading system typically includes computerization of order routing, information dissemination, and trade execution. The order-routing system brings buyers and sellers together so that they can trade. Computerized systems allow the transmission of real-time market information to a much larger group of potential participants than was previously possible. Automated trade execution systems are basically mathematical algorithms that enable trade matching without the person-to-person contact afforded by traditional trading floors or telephone networks. With one exception, discussion of regulation of trading systems has been focused on systems with some form of automated execution.[12]

An automated trade execution system can comprise the entirety of an exchange's trading operations, such as National Securities Trading System (NSTS) of the Cincinnati Stock Exchange or the single-price auction Arizona Stock Exchange. A system may simply be another facility of an exchange, operating in tandem with a traditional trading floor or telephone network, or after regular exchange hours. Examples include Retail Automated Execution System (RAES) of the Chicago Board Options Exchange, Scorex of the Pacific Stock Exchange, and the after-hours crossing networks of the New York Stock Exchange (NYSE). Finally, an automated market may be set up as a proprietary trading system, a for-profit entity, of which Instinet and Posit are examples.[13]

Automated trading markets have a varied microstructure. The following general divisions will be sufficient for the discussion of market definitions in sections 4.4 and 4.5.

4.2.1 Trading Systems with Passive Pricing

Automated trade matching can be based on time and order-type priorities, with the transaction price taken from a floor or telephone market. The trading system has no independent price discovery mechanism. The price may vary through the trading session, if the automated system operates at the same time as the floor/telephone market, or may be fixed at a closing price, say, for an after-hours trading session. Such systems are designed for the trading of individual issues (equities or options) or baskets of stocks.

11. This definition appears in the text of the proposed rule 15c2-10. The rule itself does not apply to facilities of a registered exchange, to systems in which all transactions are internally matched by a broker or dealer, or to "brokers' broker" trading systems. The rule does apply to clearing and settlement facilities, but the discussion in this paper is limited to trading systems with an execution component.

12. The exception is Delta Government Options, which is a trading system for options on federal government securities, comprising a broker, a clearing agency, and a bank. It is basically a blind brokerage system and does not involve computer-generated executions.

13. See Domowitz (1993c) for a listing of automated markets and their classification into various categories of operation.

It is possible to automate some form of price improvement on these systems. Generally speaking, the computer assesses market conditions and prices the trade accordingly for execution, possibly at a price better than the best quote available at the time of order entry. All such rules depend explicitly on pricing and sales in another market such as the NYSE, however. For this reason, systems with automated price improvement must still be considered passive pricing mechanisms.

4.2.2 Limit Order Book Systems in Automated Continuous Markets

In automated continuous markets, bids and offers are submitted continuously over time. Depending on the design of the system, transactions occur in one or both of two ways. First, transactions occur when the orders cross, that is, when the price of the best bid is equal to or greater than the best offer. Market orders are allowed on some systems, resulting in an immediate cross if a counterparty is available in the system. Second, a trader may participate in a trade advertised by an existing quotation on the electronic limit order book by touching a button.

There are many variations on this theme, but all such markets have a price discovery component. That is, price is determined endogenously within the system, based on order flow and the precise rules governing trade priority and execution. Some such systems have explicit provision for market-making operations in the form of a two-sided quotation facility.

4.2.3 Automated Periodic Single-Price Auction

In automated single-price auction systems, bids and offers are submitted over some period of time, and all trades are executed together at one price at a single point of time. The transaction price typically is calculated by maximizing the total volume traded over possible transaction prices, given the bids and offers resting in the system. Bids and offers eligible for a match at the system-calculated price are processed into trades, subject to a set of priority rules.

Once again, there are variations in this system structure, often depending on order types and order information display. Regardless, such systems are price discovery mechanisms, producing equilibrium prices at fixed points in time from order flow into the system. There typically is no provision for two-sided quotations. The only feature sometimes present that is in the spirit of market making is an order type designed to help equate supply and demand in the case of an order imbalance.

4.3 Some Regulatory Background

In the current regulatory environment, automated trading systems can fall within any of several statutory classifications. Three of these categories are

relevant for the issues addressed here, namely broker-dealers, registered exchanges or facilities thereof, and exempt exchanges.[14]

Generally speaking, brokers make securities transactions for the accounts of their customers, while dealers transact for their own accounts in the process of handling customer orders.[15] They must register with the SEC and become a member of the self-regulatory organization (SRO), that is, with a registered exchange or securities association. Although they must comply with a variety of legal restrictions, their regulatory burden is light compared with registered exchanges, whether or not they operate a trading system. A trading system operating as a broker-dealer does not have the statutory burden of responsibility for real-time market surveillance, for example. Such trading systems may have no obligation to comply with the SEC's Automation Review Policy.[16] The broker-dealer regulatory framework does not apply to system access criteria, terms of trade execution, or the handling of quotations.[17]

The definition of an exchange is far from precise, and is the subject of section 4.4. For the moment, it suffices to think of an exchange in simple terms as a marketplace for securities transactions. Exchanges must register under section 6 of the Securities Exchange Act. Registration brings with it a host of regulatory requirements, duties, and responsibilities.[18] Copies of all rule changes must be filed for public comment and regulatory approval, for example, including development plans for automated systems. Automated systems operated by an exchange must comply with the principles of the Automation Review Policy and are subject to strict surveillance and reporting

14. A system may also be classified as a securities association, but such an association (e.g., the National Association of Securities Dealers [NASD]) is subject to very similar requirements as registered exchanges; see section 15A(b)(1)–(8) of the Securities Exchange Act. Other categories include clearing agency, transfer agent, and securities information processor. The first is not relevant, given the emphasis on the process of trading rather than on the clearing of transactions. The second involves issuance and registration of securities. The NASD has suggested that a trading system be categorized as a securities information processor. Registration as such is not required unless the trading system is first classified as an exchange or securities information processor that acts on an exclusive basis on behalf of a self-regulatory organization. See sections 3(a)(22)(B) and 11A(b)(1) of the Securities Exchange Act.

15. The law defines a broker to be "any person engaged in the business of effecting transactions in securities for the account of others, but does not include a bank." A dealer is "any person engaged in the business of buying and selling securities for his own account, through a broker or otherwise, but does not include a bank, or any person insofar as he buys or sells securities for his own account, either individually or in some fiduciary capacity, but not as a part of a regular business." See sections 3(a)(4) and 3(a)(5) of the Securities Exchange Act.

16. See Securities Exchange Act Releases no. 27445 (November 24, 1989), 54 *Federal Register* 48703, and no. 29185 (May 15, 1991), 56 *Federal Register* 22490. A system operating under a no-action letter may, however, be required to comply with the review policies. Some broker-dealer systems are not subject to this constraint, however.

17. See Domowitz (1993a) for discussion of the oversight problems involved in these areas for automated trading systems.

18. See, for example, Becker, Adkins, Fuller, and Angstadt (1991) and the discussion in Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377.

requirements. An exchange is not allowed to seek exemption from any regulatory burden on behalf of its automated trading system.[19]

An exchange may seek an exemption from registration, however, under section 5 of the Securities Exchange Act. Thus, an automated trading system can be classified as an exchange and can ask for exemption from the regulatory requirements associated with registration. The scope for this action is quite narrow, however. Exemptions are granted based on a "limited volume" provision; that is, in the case of a "limited volume" of transactions, it may not be considered practical or necessary in the public interest to regulate the exchange or system as an SRO. The statute provides no firm standard as to what level of volume would justify a continuing exemption. The guideline recently used is the volume of the smallest of the fully regulated national exchanges.[20]

The decision that proprietary trading systems did not fit into the statutory classification of an exchange led to the regulation of proprietary systems as broker-dealers, with any additional stipulations contained in no-action letters.[21] These conditions generally include the provision of quarterly operational data, notice of any material change to the system, and individually tailored requirements that the SEC sees fit to impose. There is no public notice and comment period in the no-action process, unlike the approval process for trading systems operated as facilities of existing exchanges.

The conditions imposed in the no-action approach imply only sporadic reporting of trading, product, and system innovations. Proprietary systems began to grow in volume terms and in the number and types of securities to be traded. System innovation increased as technology improved, and systems became more complex. Faced with these developments, some experience in monitoring, and complaints with respect to unfair competition under the no-action approach, the SEC reconsidered the problem.

The result is the reintroduction of rule 15c2-10 for the regulation of trading systems, over and above the statutory requirements for broker-dealers. The proposed rule contains a variety of requirements, but it is effectively a vehicle to create a statutory classification (i.e., a market participant) somewhere between a broker-dealer and an exchange. In the proposed rule, the SEC reemphasizes

19. This follows from the classification of an automated trading system associated with an exchange as a "facility" of the exchange; see section 3(a)(2) of the Securities Exchange Act. The statute further does not allow exchanges to be exempt from parts of the act; it is an all-or-nothing provision. In contrast, section 17(b)(1) provides such exemptive authority regarding the registration of clearing agencies.

20. The SEC exempted seven exchanges from 1935 to 1936 on the basis of low volume. The only other such action in history is the exemption of the Arizona Stock Exchange, an automated trading system, in 1991; see Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377. The volume standard used was that of the Cincinnati Stock Exchange, which averaged 717 trades per day with daily share volume of 1,238,241 in 1990.

21. A no-action letter states that the SEC staff agrees not to recommend enforcement action to the SEC with respect to the nonregistration of the trading system as an exchange. The letters are not subject to judicial review; that is, they are not "orders" of the SEC.

its position that proprietary trading systems do not fit into the statutory classification of an exchange. The commission further believes that subjecting trading systems to exchange registration would deter innovation in trading system structure.[22]

Renewed concern with the issue of the allocation of regulatory costs between exchanges and competing systems, even under a scheme of "heightened broker-dealer regulation," has surfaced, however (see SEC 1991). This has led to reconsideration of the definition of an exchange and the viability of maintaining the exchange/nonexchange distinction.

4.4 The "Generally Understood" Meaning of Exchange

The Securities Exchange Act defines an exchange to be "any organization, association, or group of persons, whether incorporated or unincorporated, which constitutes, maintains, or provides a market place or facilities for bringing together purchasers and sellers of securities or for otherwise performing with respect to securities the functions commonly performed by a stock exchange *as that term is generally understood,* and includes the market place and the market facilities maintained by such exchange" (section 3[a][1], emphasis added). The legislative history of the Securities Exchange Act gives the SEC considerable leeway in interpreting what trading systems should be classified as exchanges.[23] Even very recent decisions have deferred to SEC interpretations of what the phrase "generally understood" is supposed to mean, and invite reinterpretation of the phrase over time.[24]

There is concern that an overexpansive interpretation would make certain types of operations "exchanges" automatically, so it is important to clarify the obvious exceptions. The definition specifically does not apply to broker-dealers operating systems that limit use to their own retail customers. Such systems are considered to be simple automation of the internal trade execution functions traditionally managed by a broker-dealer. The definition also does not apply to certain systems operated by brokers' brokers for nonequity, generally government or municipal, securities. Such a system permits dealers to advertise their trading interests anonymously and provides a means of executing transactions based on those indications of interest. This type of system is excluded from the discussion by existing law. The apparent reason for this exclu-

22. Such language in the proposed rule was considerably reinforced in later decisions, in which membership requirements were cited as a large barrier to entry, and the "straitjacket" of exchange regulation with respect to evolving systems is mentioned.

23. This dates back to 1934. Congress decreed that stock exchanges could not be regulated under a rigid statutory definition. See "Stock Exchange Practices," 73d Congress, 2d session, 1934, Senate Report 792, 5.

24. See, for example, *Board of Trade of the City of Chicago v. Securities and Exchange Commission,* no. 90-1246 (7th Circuit, February 4, 1991). The court noted specifically that the wording was not "crystal clear," and affirmed the SEC's interpretation at the time.

sion is the classification of a brokers' broker as performing "traditional" broker-dealer functions.[25]

Given these exceptions, it is possible to clarify the issues surrounding what is "generally understood" to be an exchange. These issues can be aggregated into the categories of pricing, trading conventions, access, and liquidity. The discussion is limited to the general definition of an exchange, whether it be required to register or it obtains exemption from registration.[26]

4.4.1 Price Discovery and Information in the Definition of an Exchange

A system that does not provide trade execution facilities cannot be considered an exchange. Procedures for executing transactions include any rules, guidelines, or facilities for order entry and execution. Automated execution facilities qualify under this definition. Execution facilities, automated or otherwise, even combined with price information dissemination, are not sufficient to qualify a trading system as an exchange, given congressional and SEC rulings.[27]

Execution of trades does not imply price discovery, as illustrated in section 4.2. Price discovery is held to be an essential element of an exchange. Lack of price discovery is a major factor in the SEC's decision to consider proprietary systems as fundamentally different from exchanges.[28] The Instinet system engaged in price discovery at the time of this ruling, however, and is not classified as an exchange. On the other hand, the SEC determined that the Wunsch Auction System should be defined as an exchange, in part because its automated procedures set an equilibrium price for securities.[29] Thus, proprietary systems engaged in passive pricing cannot be considered exchanges, but price discovery, even combined with price information dissemination, is not sufficient to qualify.

Price information dissemination is, however, a component of the exchange definition. The requirement does not include a transparency restriction, that is,

25. When Congress enacted the Government Securities Act, it added the definitions of government securities broker and dealer to the Securities Exchange Act. Congress did not feel the need to create a category of "government securities exchange," given the fact that, traditionally, blind brokers in nongovernment securities had been regarded as broker-dealers. See 55 *Federal Register* 1899 (January 19, 1990).

26. Typically, a determination first is made as to whether or not a system is an exchange. Once the determination is made, a system that is classified as an exchange may then seek exemption status. See, for example, Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377, particularly footnote 36.

27. See 93d Congress, 2d session, 1974, Senate Report 865, 4–7, in which Congress recommended that "communications and execution" systems such as Instinet should be registered as securities information processors, rather than as exchanges. The SEC finally chose to regulate Instinet as a broker-dealer under a no-action provision; see Richard G. Ketchum to Daniel T. Brooks, Cadwalader, Wickersham and Taft, August 8, 1986, SEC files.

28. See Securities Exchange Act Release no. 26708 (April 18, 1989), 54 *Federal Register* 15429.

29. See Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377.

a statement as to the degree to which prices and volumes are made publicly available on a real-time basis. It does mandate that the exchange's design makes buy and sell quotations available on a regular or continuous basis. In fact, the SEC has gone so far as to use the publication of two-sided (simultaneous buy and sell) quotations as part of its exchange definition.[30]

4.4.2 Trading Rules and Conventions in the Definition of an Exchange

The legislative history surrounding trading systems clearly shows that having an arbitrary set of rules and conventions that centralize trading does not qualify a system as an exchange. The SEC requires that the system have either a formal market-maker structure or a consolidated limit order book, or be a single-price auction to be considered an exchange.

An automated system clearly can fulfill any or all of these requirements. In practice, automated markets that have been classified as exchanges embody both a market-maker system and a limit order book or employ a periodic auction for trade execution and pricing.[31] If the system lacks market makers, there are apparent restrictions on the operation of the limit order facility. Limit order protection for customer orders is expected. This is a trivial detail for automated continuous auctions, for example, which usually embody such protection as part of their design. The SEC has also objected to a limited duration for orders resting on the book in a system. Removal of unfilled orders at the end of a day is considered to be at odds with expected exchange operations.[32]

Although the courts have occasionally ruled otherwise,[33] the SEC has decided that lack of a traditional trading floor does not eliminate the classification of a system as an exchange. This is evident simply from the existence of the Cincinnati Stock Exchange and the Arizona Stock Exchange. The requirement is centralization of trading for the purpose of trade execution. The means can range from the traditional trading floor to a computer system allowing access across geographical boundaries.

Negotiation facilities also are not required for classification as an exchange. Once again, although the courts have found that an exchange is in part defined as a place to negotiate transactions, the SEC has decided otherwise.[34] This is

30. See Securities Exchange Act Release no. 27611 (January 19, 1990), 55 *Federal Register* 1890.

31. The Cincinnati Stock Exchange essentially operates as a consolidated limit order book, but "designated dealers" are assigned to each security. These dealers commit to an obligation to fill agency orders of limited size under certain conditions. The Arizona Stock Exchange is a single-price automated auction.

32. See Securities Exchange Act Release no. 27611 (January 19, 1990), 55 *Federal Register* 1890.

33. In *Board of Trade of the City of Chicago v. Securities and Exchange Commission*, the court held up the lack of a trading floor as a way in which a trading system did not fulfill the functions commonly expected of an exchange.

34. See *LTV v. UMIC Government Securities, Inc.*, 523 *Federal Supplement* 819 (1981), where the court stated that an exchange was a place or means through which persons meet to negotiate securities transactions.

also evident from the existence of automated systems classified as exchanges, which do not have negotiation capabilities.

4.4.3 Access and the Definition of an Exchange

Traditionally, an exchange is composed of members, who have a proprietary interest in the exchange. In fact, the Securities Exchange Act mandates that a registered (nonexempt) exchange provide for fair representation of its members under section 6(b)(3).

The term "member" is defined in some detail under section 3(a)(3)B. Generally speaking, a member is a registered broker-dealer or any person associated with a broker-dealer under section 6(c)(1). Institutions that must comply with the rules of an exchange are also included in the definition of member for the purpose of regulation under the act.

A member need not have a proprietary interest in the exchange under the law. Thus, an individual or institution participating in a trading system owned by others could still be considered a member if the system were classified as an exchange.

More important, the act does not specifically prohibit an exchange from giving direct trading access to individuals who are not broker-dealers.[35] Most automated trading systems permit access to individuals or institutions that are not registered as broker-dealers. This does not mean that they could not be considered exchanges, registered or exempt.

4.4.4 Liquidity and the Definition of an Exchange

Liquidity is a difficult concept, and many definitions have been proposed. The discussion here is limited specifically to the way the SEC defines liquidity in the context of the "generally understood" terminology defining an exchange.

It may help first to clarify what is not liquidity in the classification of a system as an exchange. Liquidity is not immediacy, in the usual sense of being able to transact quickly and in a continuous fashion. Liquidity also is not based on volume considerations.[36]

The SEC holds that having two-sided quotations on a "regular or continuous basis" is a guiding principle for liquidity, and has judged a system to be illiquid on the basis of a low percentage of two-sided quotes, relative to overall buy and sell quotations.[37] In this context, the SEC has virtually identified liquidity

35. Compare section 6(b)(8) with section 6(f). See also section 6(o)(1) regarding denial of membership.

36. Both of these conclusions are based on the SEC's recent decisions regarding the Wunsch Auction System, now known as the Arizona Stock Exchange. The commission determined that the system is indeed an exchange, based in part on its belief that the market fosters liquidity, but the auction mechanism is periodic, not continuous. Liquidity is not immediacy. Once the commission reached this conclusion, it then granted a low-volume exemption from registration. Liquidity for the purpose of exchange definition is therefore not based on volume. See Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377.

37. See Securities Exchange Act Releases no. 26708 (April 18, 1989), 54 *Federal Register* 15429, and no. 27611 (January 19, 1990), 55 *Federal Register* 1890, with respect to liquidity and a low percentage of two-sided quotations.

with the specialist/market-maker/dealer function, by stating that liquidity by the definition above is provided only through a formal market-making mechanism.[38] This would make a formal market-making mechanism part of the definition of an exchange, in contradiction to commission statements that the market-making function could, at least in principle, be replaced by a consolidated limit order book.

The commission has relaxed the provision of requiring two-sided quotes in the definition of liquidity provision in at least one case. The SEC still requires the entry of buy and sell quotations on a regular basis such that purchasers and sellers have a reasonable expectation that they can "regularly" execute their orders at those quotes. The same standard is applied to "elements" of a trading system, most notably the mechanism for setting transaction prices. The trading system itself must be designed to create liquidity in the sense that buyers and sellers have a reasonable expectation that they can regularly execute orders.[39]

For a trading system to be classified as an exchange, it must make an attempt to assure liquidity provision by these definitions. In the case of an automated system, this means that the design of the system itself must be expected to create a liquid market through its rules and trading procedures. The key word here is "expected." In particular, only the likelihood that the trading mechanism would create liquidity by the commission's definitions is required for a trading system to be classified as an exchange.[40]

4.4.5 What Is an Exchange?

It is now possible to define what is "generally understood," at least by the SEC, to be an exchange. To be classified as an exchange, a trading system must

provide trade execution facilities;

provide price information in the form of buy and sell quotations on a regular or continuous basis;

engage in price discovery through its trading procedures, rules, or mechanism;

have either a formal market-maker structure or a consolidated limit order book, or be a single-price auction;

centralize trading for the purpose of trade execution;

have members; and

38. See, for example, Securities Exchange Act Release no. 27611 (January 19, 1990), 55 *Federal Register* 1890. Even the discussion of an automated exchange in that reference emphasizes liquidity provision through the market-making function.

39. See ibid., on the first point, and Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377, with respect to trading mechanisms.

40. See, for example, Securities Exchange Act Release no. 27611 (January 19, 1990), 55 *Federal Register* 1890, particularly footnote 100, but this idea also appears elsewhere.

> exhibit the likelihood, through system rules and/or design, of creating liquidity in the sense that there be entry of buy and sell quotations on a regular basis, such that both buyers and sellers have a reasonable expectation that they can regularly execute their orders at those quotes.

This definition, distilled from legislative, legal, and commission decisions, remains flexible with respect to regulatory action. A trading system cannot avoid classification as an exchange simply by omitting "particular characteristics" of exchange markets (as generally understood).[41] A trading system that appears likely to result in a regular centralized securities market, in the commission's opinion, would be classified as an exchange.

4.5 The Exchange/Nonexchange Distinction

The SEC has requested comments as to whether the exchange/nonexchange distinction is still viable, given the introduction of automated trading systems. The purpose of this section is to examine some of the issues that arise by maintaining the existing definition as a basis for regulatory action.

4.5.1 Members versus Participants

Direct access to the trading facilities provided by an exchange has traditionally been limited to members, who are registered as, or associated with, broker-dealers and have a proprietary interest in the exchange. The technology behind automated systems eliminates the need for a physical presence, and rules limiting access to a narrow class of traders typically are lessened in proprietary trading systems.[42] In particular, institutional traders may deal directly with each other, without the need for the financial intermediation provided by broker-dealers.

It was argued in section 4.4 that members need not have a proprietary interest in the system, and that direct access to a system classified as an exchange can be allowed to participants who are not broker-dealers. These points were based on a rather literal interpretation of the law and on a single precedent, the classification of the Wunsch Auction System as an exchange.

Both points are more easily challenged than upheld by the SEC in maintaining the exchange/nonexchange distinction. Institutions are members only for the enforcement of certain narrow provisions of the Securities Exchange Act, for example. There is the question of whether interpreting section 6(f)(1) as allowing institutional participation is consistent with the intent of Congress as expressed in section 3(a)(3)A of the act with respect to limitations on exchange membership. It might also be argued that the Wunsch system is a spe-

41. Examples given in ibid. include omission of affirmative market-making obligations or a limit order book.

42. Complete elimination is impossible, of course, for a variety of reasons. A participant must, at the minimum, demonstrate the financial means to settle transactions.

cial case, given the periodic nature of the price discovery process, and that continuous trading systems require membership in order to be classified as an exchange. Finally, the SEC has noted that the legal question of whether the act prohibits an exchange from granting direct trading access to participants who are not broker-dealers has not been settled (see SEC 1991).

There are competitive questions that would arise from this prohibition, and from a strictly traditional definition of membership. Exchanges would be legally limited with respect to access, while proprietary trading systems would not. Trading systems without members would further not be subject to the potential barrier to entry of the act's provision regarding fair representation of members, should they otherwise be forced to register as an exchange. Exchange classification and possible registration are avoided simply by a lack of membership, which has nothing at all to do with the actual function of trading market operations.

Maintenance of the membership requirement in the definition of an exchange may further serve to create a two-tier market, splitting institutional order flow from retail customer order flow.[43] It is not clear that such an outcome is desirable.

4.5.2 Liquidity and Two-Sided Quotations

By its definition of liquidity in terms of two-sided quotations, the SEC virtually forces a formal market-making system to be an essential element of an exchange. Although it was noted in section 4.4 that the requirement had seemingly been relaxed to that of regular buy and sell quotations, this observation was based on the single precedent provided by decisions concerning a single-price auction. Market making is associated with continuous auction and dealer markets, and the SEC could make this case in its classification of continuous trading systems as exchanges.

One of the functions of an exchange is to provide a basis for liquidity, defined more broadly than in the SEC's use in classifying trading systems. Part of the SEC's definition will serve as a basis for discussion: the creation of liquidity in the sense that both buyers and sellers have a reasonable expectation that they can regularly execute their orders at those quotes.

Liquidity might then be distinguished in two fashions. The first is "inside liquidity," which is the liquidity provided by market makers. The second is "outside liquidity," which is provided by investors, institutional or otherwise.[44] Outside liquidity is provided when one investor's position in a security is sold to another investor, regardless of whether the financial intermediation of a market maker is involved. Inside liquidity can be important with respect to the

43. Some might well argue that this has happened already, in part because of the differences in execution costs between proprietary systems allowing direct participation by institutions and exchanges that enforce the financial intermediation of broker-dealers.

44. See Miller and Upton (1989) with respect to immediacy and Domowitz (1995) for discussion in the context of automation.

definition proposed above, but need not be required. The market must produce outside liquidity for the market to fulfill its basic function.

The SEC definition is tantamount to stating that the basic function of providing outside liquidity cannot be accomplished without inside liquidity for a trading system to be classified as an exchange. Regulating immediacy by means of rules with respect to the affirmative obligations of specialists, for example, is indeed part of regulating trading operations. This is regulation of the market-making function, not of the function of producing outside liquidity. In fact, regulation of the market-making function does not necessarily mean that inside liquidity aids outside liquidity.[45]

It may be the case that a market-making system does encourage relatively more outside liquidity than a limit order book system. Relative liquidity is not the issue, however. A trading system operating with a limit order book and without a formal market-making structure is capable of generating the likelihood of liquidity in the sense of buyers and sellers expecting regular execution of orders. There are many examples of such systems operating overseas.[46]

4.5.3 Passive Pricing, Competition, and the Low-Volume Exemption

Although passive pricing trading systems might satisfy most of the requirements for exchange classification, the lack of price production rules out such a determination.[47] Such systems use automation to directly appropriate quotes from another price-producing trading system. The passive system then may operate at a lower cost relative to an exchange, because it does not bear the burden of the production of prices and the associated higher cost of regulation. Existing exchanges are unhappy about the situation, claiming unfair competitive advantage in favor of such proprietary systems.[48]

It is interesting that one of the reasons given for not regulating such systems as exchanges is possible adverse effects on innovation and competition.[49] It is not clear what kind of competition is being cited, and one must look to history for some guidance. Following the 1975 amendments to the Securities Exchange Act, the SEC promoted the development of the National Market Sys-

45. Franks and Schaefer (1990) report, for example, that a large proportion of trades on Nasdaq are matched; that is, dealers sometimes do not complete a transaction until a counterparty has been found.

46. Some such systems do embody a design detail allowing the input of two-sided quotations, encouraging informal market making for profit. Some others, particularly the larger ones, such as the Paris Cotation Assistée en Continu (CAC) and the German Deutsche Terminbörse (DTB), have some sort of market making or dual-capacity dealing formalized as part of market operations. Market makers on the DTB, however, must exhibit quotes on either side of the market only upon request, and need not do so on a regular or continuous basis. The DTB is considered very liquid, with over 3.7 million futures contracts and 9 million options contracts traded in 1991.

47. Two-sided-quotation dissemination is included here. Some systems simply generate automatic quotations based directly on the prices on the NYSE.

48. See Securities Exchange Act Release no. 26708 (April 18, 1989), 54 *Federal Register* 15429, footnote 6, for a list of such complaints from every major exchange.

49. See, for example, Securities Exchange Act Release no. 27611 (January 19, 1990), 55 *Federal Register* 1890, and SEC (1991).

tem. This concept was based on the idea that trading systems would compete on the basis of superior quotations. It follows that competition is meant to foster better price discovery. On the other hand, the diversion of order flow to the lower-cost producer of the execution service, the passive pricing system, can result in the inability of orders in all markets to interact with one another. This diversion of outside liquidity away from the price-producing market may then cause an erosion in the quality of price information, hence a deterioration of the price discovery process. Protection of passive pricing systems on the basis of competition, using the definition of exchange as the excuse, may be misplaced.

Fostering the development of innovative price-producing systems to promote competition is a useful goal, however. The SEC believes that the costs of exchange regulation do not decrease linearly with volume, and that there are large fixed costs of compliance, especially for new systems that handle institutional order flow.[50] Classification as an exchange does not necessarily mean registration and regulation as an exchange. New systems can be expected to have low volume, and the low-volume exemption can be used as a tool to foster price competition. Exempt exchanges can be usefully regulated under the types of restrictions envisioned under proposed rule 15c2-10. Such a course of action is sensible, given that large volume is an important pressure for tighter regulation in the interest of protecting the overall market.[51]

4.6 A Functional Approach to Trading Markets

The SEC has asked for proposed amendments as to how Congress might redefine an exchange in light of advances in automation. A suitable reinterpretation might involve dropping requirements for, or restrictions on, membership, as well as eliminating the market-making requirement in the form of two-sided quotations. The commission would still be left with the problem of passive pricing systems, forcing another look at the price discovery element in the definition. All in all, such a substantial redefinition could occasion a major revision of regulatory law in order to accommodate its application and enforcement. Perhaps realizing this, the commission also queried whether classification and regulation might instead be based on functional attributes of a trading market. The regulatory rewrite could then be oriented toward functions that are more stable than their associated institutions in the light of continued innovations in trading market infrastructure.

The intent of this section is not to discuss the economic-philosophical foundations of functional versus institutional regulation, nor the regulatory dialec-

50. See Securities Exchange Act Release no. 28899 (February 28, 1991), 56 *Federal Register* 8377.

51. This point also is made by Lee (1992). He goes a bit farther, however, in proposing that volume alone might be used as the appropriate definition of an exchange.

tic and process of change associated with regulatory avoidance. This has been done elsewhere.[52] The purpose here is to delineate some of the lines of inquiry with respect to a shift from institutional to functional regulation of trading systems in the face of the technical advances in trading market structure. A bit of general background is necessary, however.

The SEC talks of regulating "functional attributes," which is in line with Lee (1992), who defines functional regulation as the determination of the functions that require regulation and the rationale for such regulation. Merton (1992) uses the term to mean regulation of different products that are nearly perfect substitutes from the perspective of their users.[53] The discussion here uses both definitions, taking the users to be participants in the trading process.[54] Either way, regulation along functional lines would not require constant changes over time in the regulations surrounding trading systems as they further develop.

4.6.1 Price Discovery

Economists would generally agree that the price discovery process, with the associated dissemination of price information, is a primary market function. Trading systems that produce prices are substitutes. Regulatory initiatives that promote quality price production and competitive pressures would qualify such systems as nearly perfect substitutes. The mechanism of price production can vary, from automated limit order books to formal market-making systems. Combinations of both currently exist in both automated and nonautomated execution settings. Obviously, the quality of price production may still vary, and differential costs to the participants necessitate the usual trade-offs.

A functional approach to the classification and regulation of trading systems then implies that price discovery systems be regulated on equal terms. The legal focus of inquiry will naturally shift to the definition of price discovery.[55] This should not be too difficult a task, however. Any reasonable definition would imply that the floor of the NYSE, Instinet, Delta Government Options, and the periodic-auction mechanism of the Arizona Stock Exchange would be classified and regulated as price discovery markets. Such a determination also calls the exclusion of brokers' broker systems, mentioned in section 4.4, into serious question.

52. See, for example, Kane (1986), Lee (1992), and Merton (1992), and the references therein.

53. Some of Merton's (1992) discussion is a bit broader philosophically, giving functional regulation the perspective of taking as given the economic functions of markets and intermediaries, and questioning what is the best institutional structure to perform those functions.

54. The discussion here narrows with respect to services provided by trading markets. In particular, companies desiring listing services are classifiable as "users," but this is considered a different "function," and may possibly destroy perfect substitutability between trading systems with and without listing facilities from the viewpoint of the companies whose shares are traded. In any case, listing services can be regulated separately. Lee (1992) even makes a case for separating the listing function from the sponsor of a trading system on economic and incentive grounds.

55. For example, computer-generated quotations at or at most an eighth away from "primary market quotes" might not be reasonably classified as a price discovery mechanism.

Classification and concomitant regulation along price discovery lines helps to clearly answer some hypothetical questions posed by the SEC with respect to proprietary trading systems.[56] For example, if five broker-dealers or five institutions developed a trading system among themselves, would this be an exchange? The question is irrelevant in the context of functional regulation. If this system engages in price discovery, it is regulated accordingly.

Would a price discovery system merit different regulatory treatment from one operating as a passive pricing mechanism? The answer is yes, in the sense of an additional layer of regulatory oversight relative to that required for mere trade execution. Given the importance of price discovery to the public-interest mandates of regulatory legislation, surveillance of the process and rules with respect to price reporting are natural additional requirements.[57]

This does not necessarily mean that price discovery systems need operate at a significant handicap relative to passive pricing mechanisms. Price discovery systems can obtain incremental profits from the sale of price information. Passive pricing systems cannot operate without such information, and should expect to pay for it. The lesser regulatory burden of passive pricing systems also does not imply that price discovery markets will lose enough market share to make operating not worthwhile and quality price discovery impossible.[58] In fact, the NYSE claims an increase in the percentage of large trades executed on the NYSE over the past few years and best pricing, despite the proliferation of proprietary trading systems (see Shapiro 1995). The price production mechanism and its associated liquidity bring participants to price discovery markets.

4.6.2 Trade Execution

Centralization for the purpose of trade execution also is a basic function of trading systems. Such execution at low cost is a major motivation for institutions moving to trading systems that do not necessarily offer price improvement through the price discovery process. The minimum quality of trade execution in terms of price is already legally defined in terms of best quotations in consolidated markets. From the functional perspective, centralization for trade execution can be considered a means of regulatory classification independent of pricing, conditional on such a minimum pricing standard.

Execution relates to the basic economic function of resource allocation at given prices, and therefore deserves a level of regulatory oversight. Passive pricing systems as well as price discovery markets execute trades. Volume reporting requirements are important, for example, as well as the design and integrity of the system. The latter implies that the SEC's Automation Review

56. See Becker, Adkins, Fuller, and Angstadt (1991) for this, and other, examples.

57. See, for example, Corcoran and Lawton (1993) and Domowitz (1993a) for additional discussion with respect to different oversight for varying levels and functions of automated systems.

58. Obviously, a fully specified equilibrium model of both price and nonprice competition in the exchange services industry would be helpful in qualifying the balance between system types as a function of services and costs. This model has yet to be formulated in the literature.

Policy and some form of proposed rule 15c2–10 be applied in the case of functional regulation of automated trade execution.

This is not currently the case for all execution systems. In fact, rule 15c2-10, which is largely oriented toward execution, is not applicable to a potentially large number of broker-dealer systems as it now stands. The functional perspective would discard prohibitions on the regulation of execution that are purely historical and apply to the institutional definition of broker-dealers. If the trading system executes trades, it is regulated as a trade execution system. This would also prevent proprietary trading systems from hiding as broker-dealers simply to avoid regulation under something like the proposed rule 15c2-10 and the related review policies.

Classification along the functional line of execution also means that execution systems that do not engage in price discovery, but are currently facilities of registered exchanges, would be regulated simply as execution mechanisms. Thus, the NYSE after-hours crossing network would have equal standing with Instinet's or Posit's crossing systems. The all-or-nothing provision with respect to exchange regulation would no longer necessarily be applicable. From the competitive point of view, currently registered exchanges could compete on an equal footing with proprietary trading systems in the market for passive pricing execution services.[59]

4.6.3 Liquidity

There may be a legitimate argument as to whether liquidity creation is a basic function of a market or a measure of the quality of the market's product. The position taken here views liquidity as something to be fostered through regulation, but not necessarily as a line of classification that promotes different regulation for liquid versus illiquid markets.

Liquidity, in the regulatory context of system classification, is embodied in the notion that both buyers and sellers have a reasonable expectation that they can regularly execute their orders at quotes resting on the system. Liquidity by this definition could be considered likely in both price discovery and passive pricing trading systems. Although good-quality price discovery and execution require some level of liquidity, it is unnecessary to legislate liquidity or the means of its provision. The process of trading will drive markets with too little liquidity out of business and motivate additional innovation with respect to mechanisms friendly to liquidity provision.

In particular, a functional perspective need not draw regulatory classification lines between systems differentiated by direct outside liquidity and inside liquidity that is used to promote outside liquidity.[60] Merton (1992) characterizes

59. This could introduce issues of vertical integration into the discussion of trading system regulation, since a passive pricing system could be using prices produced by the same entity on a different level.

60. This does not mean that a formal market-making mechanism does not need oversight, but that the liquidity-provision mechanism requires oversight. The general nature and degree of that

innovation in part by the cyclic pattern of the replacement of financial intermediaries by market mechanisms, followed by the entry of intermediaries using the new mechanism. Limit order book systems have replaced, or are used instead of, formal market-making mechanisms in some international jurisdictions. Market makers have not necessarily disappeared, but have adapted to the new technology and offer services accordingly.

4.6.4 The Question of Standards

The SEC has requested comment on the appropriateness of a "standards" approach for the regulation of proprietary systems. This includes standards under which systems and system amendments would be approved and standards for exemption from certain regulatory burdens.[61] These questions are equally appropriate in the context of functional classification and regulation of trading systems.

A standards-based approach to the approval process clearly could be beneficial, if not too broadly applied. Ambiguities with respect to the frequency and nature of risk assessments, surveillance requirements, record keeping for system development and operations, and the like, can easily be avoided.[62] Consistent application across all trading systems of the current Automation Review Policy is one step in this direction. A system either conforms to the standards or not, the determination of which should then speed up the regulatory approval process.

A standards approach with respect to system configuration is not appropriate. One of the avowed aims of the SEC is to encourage innovation in trading market infrastructure. A reinterpretation of the theoretical work of Shy (1991) on international standardization suggests that the frequency of innovation is potentially much lower under a uniform standards approach to trading system configuration. The reason is that a market structure adopted widely is less likely to be abandoned by traders, causing an incentive problem with respect to the introduction of new market systems.[63] This problem has also been noted by Amihud and Mendelson (1989) in the context of SEC approval of an options market integration system. They characterize adoption of a certain standard in terms of "technological lockup," noting barriers to future innovation. An ex-

oversight will depend on the classification of the system with respect to execution and price discovery.

61. As opposed to the delineation of general categories of information that must be contained in those plans, for example. The exemption issue is posed in the context of exemption from exchange registration.

62. The model here is Securities Exchange Act Release no. 16900 (June 17, 1980), 45 *Federal Register* 41920, concerning clearing agency operations.

63. This incentive problem also explains why automated systems have not made much headway in replacing traditional market-maker and/or open outcry auction systems in the United States, while automated auctions are commonplace in countries without such traditions. See Domowitz (1993c).

ample to which their argument applies directly would be configuration standards that effectively mandate a formal market-making mechanism.[64]

It was argued earlier that fostering competition in the area of superior price discovery is appropriate, while such nurturing in the case of passive pricing systems is not in accordance with the SEC's definition of competition. A low-volume exemption for price discovery systems is justifiable on the same grounds as applied in the case of exemption from exchange registration. Large volume remains an important pressure for tighter regulation, all the more so since price discovery at low volumes is arguably less important to the overall price discovery function of the national market. Such a standard could, in principle, be unambiguously defined. In practice, however, this could be difficult. Lines of demarcation based on dollar volume would certainly depend on the particular securities traded on the system, for example. The same might be said for a standard including the number of market participants as a factor.

4.7 Concluding Remarks

If the SEC's decision classifying the Wunsch Auction System as an exchange is viewed as setting legal precedent, failure to reclassify some existing trading systems might bring about further legal action from established exchange markets. Such action could transpire in the event of a new continuous trading system that satisfied the guidelines laid down in the latest decision, but that applied for registration as a broker-dealer. Given the difficulties with redefining what is meant by an exchange, the SEC might be expected to justify its latest ruling by appealing to the single-price auction nature of the trading mechanism.[65] Legal precedent suggests that the SEC would win.

The strict definition of an exchange in terms of membership and two-sided quotations has been argued to be unsatisfactory, given the advances in technology and the current design of automated trading systems as exhibited worldwide. It is arguably the case that such systems fulfill all the trading functions of an exchange, including the likelihood of liquidity provision without two-sided quotations on a continuous basis.

This observation leads to the suggestion that the exchange/nonexchange distinction be dropped in favor of a more functional approach to the classification and regulation of trading systems. The nature of regulation is based on the functional lines of centralization for trade execution and price discovery. The dividing line distinguishes systems that engage in price production from those executing transactions based on passive pricing.

Classifying and regulating price discovery systems uniformly, subject to

64. See also Domowitz (1993a) on the potential harm to liquidity from tight regulation of system configuration.

65. This potential problem is consistent with the interpretation of Lee (1992), who regards the Wunsch decision as a regulatory anomaly, and provides a variety of reasons for the decision, none of which concern exchange redefinition.

possible volume exemptions, puts systems such as Instinet, the Wunsch Auction System, and Delta Government Options on the same footing as the floor of the NYSE. The exclusion from such regulation of brokers' broker systems, currently exempted from exchange classification and the proposed rule 15c2–10 based solely on the traditional classification of such operations as broker-dealers, would be considered inappropriate.

This view would also promote the uniform regulation of execution services. The required oversight would still be considered less than for systems engaged in price discovery over and above execution. Such a uniform standard questions the exclusion of a number of broker-dealer systems from regulation under some form of proposed rule 15c2–10. It further suggests that some facilities of established exchanges, operating as passive pricing mechanisms, be regulated on an equal basis with proprietary trading systems that do not engage in active price discovery. Thus, the NYSE after-hours crossing network would compete on a level playing field with such crossing systems operated on a proprietary basis.

These observations have been made within the fairly narrow scope of stock trading systems, relative to overall financial market operations. This was considered necessary in order to be very specific with respect to the legislative details leading to the issues and the factors involved in the determination. Similar questions are arising in the derivatives markets, however, both in the context of established exchange operations and over-the-counter derivative market activity.[66] The Chicago Board of Trade is requesting an exemption from regulation as a "professional trading market," for all instruments that would otherwise be regulated under the Commodity Exchange Act. The Chicago Mercantile Exchange seeks regulatory exemption for its rolling spot currency contract, because it has close affinity to cash market instruments currently traded over the counter. The argument is that considerable benefits would accrue by allowing trading in this contract to operate on regulatory parity with the cash market. The implication of the analysis in this paper is that the establishment of additional statutory classifications, in the form of "new" market participants, is not necessarily an appropriate response to technological advances in market infrastructure or new product development. On the other hand, regulation along functional lines invites consideration of easing some restrictions on established exchanges.

66. See Bronfman (1995), for example, for discussion of Chicago Board of Trade and Chicago Mercantile Exchange initiatives aimed at exemptions from exchange regulations for certain types of trading participants and products.

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Comment

Ananth Madhavan

Ian Domowitz's paper concerns a timely and interesting topic. In a narrow sense, the key question posed by the paper is, what determines whether a trading system is an exchange or a broker-dealer? The proliferation of new trading systems complicates the task of regulators, who previously relied on definitions that corresponded relatively closely to economic realities (see, e.g., Madhavan [1992] for an analysis of various trading systems). Modern technology has blurred the traditional definitions and boundaries. For example, some crossing systems are classified as brokers, but these systems can be extended easily to incorporate computer algorithms that make possible some limited price discovery within the prevailing quotes (see, e.g., Leach and Madhavan [1992, 1993] for a discussion of price discovery). Exchanges argue that regulation places an unfair burden on them and limits their ability to innovate. The question is a crucial one for policymakers as well as market participants.

The answer to the narrow question proposed in this paper is that the function of the trading system should determine the appropriate classification, and hence the amount of regulation required of the trading system. Just as advances in genetic research raise new ethical questions (e.g., can a corporation patent a genetically engineered mouse?), the new technologies of trading create new challenges for regulators and policymakers. Taking a functional approach over the current statutory approach makes sense, given the rapidly changing technology. Domowitz makes a forceful argument that the functional approach should be based on price discovery, and that this would promote more efficient regulation as well as fairness.

However, there is a broader issue, that is, whether we need such classifications in the first place, and if we do, how to operationalize the functional definition proposed here. To answer the broader question, we need to step back and ask ourselves about the purpose of regulation. Public regulation of the securities markets is generally designed to build trust in the financial system, by protecting investors (especially "small" retail investors who may underestimate the potential risks associated with trading securities) from defaults, fraud, insider trading, and market manipulation of various types. In addition, regulation also serves as a method to monitor and control financial markets, a function that is important because these markets play a crucial role in financing new investment and allocating resources. From this perspective, the trading

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systems most important for regulation are those that have the highest volume, where trading by professional market participants (e.g., market makers and brokers) can affect the integrity of prices. These are the systems that should be subject to the most stringent regulation, that is, regulated as exchanges are today.

But the need for regulation must be balanced against the costs imposed by such rules. What are these costs? There are both explicit and implicit costs to regulation. Explicit costs imposed on exchanges include the costs of compliance, market surveillance, reporting requirements, and disseminating quotes and maintaining system access. The implicit costs imposed on exchanges by regulation are in terms of the limits placed on the ability to innovate because of the difficulty in changing trading arrangements.

Both explicit and implicit costs are significant, but there are reasons to err on the side of excess. First, some of the explicit costs are for functions required of exchanges that might be performed anyway. For example, of the fifteen hundred or so New York Stock Exchange (NYSE) employees, roughly a third are involved in market surveillance required by law. However, even if there were no such regulations, the NYSE would probably still continue to devote resources to maintaining a "fair and orderly" market, simply because it is in the interest of the NYSE to develop a reputation for trust. Second, the explicit costs of collecting real-time market information and the ability to analyze these data (e.g., to detect episodes of insider trading) will continue to decline as the technology improves. Implicit costs, however, induced by the limits placed on innovation by cumbersome and slow regulatory approval for new changes, may be significant and may be growing. These costs are largely discretionary, however, and can be reduced by shortening the approval process. These arguments would suggest that we exercise some caution in terms of changing the regulatory environment too rapidly in the direction of less regulation.

Given this, how should the functional approach be implemented? Again, although I agree with the basic thrust of Domowitz's argument, I would argue for caution in implementing his proposal. Extending the regulatory burden to small trading systems trying to develop new methods for price discovery may ultimately reduce the incentives for innovation. To some extent, this is the approach practiced now. For example, the Arizona Stock Exchange, an electronic batch auction system providing price discovery, is exempted from the traditional requirements imposed on an exchange because its volume is low. This makes sense; it allows newer systems the freedom to experiment and alter their trading arrangements to capture more volume without costly and lengthy regulatory oversight. Similarly, less regulation of high-volume trading systems without price discovery may expose investors to potential risks that may damage trust in the financial system.

In summary, the paper provides a very careful and insightful analysis, and raises a number of highly important issues for further research. Domowitz's proposal deserves to be taken extremely seriously, and his paper should be required reading for all those affected by this issue.

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Comment Chris A. Hynes

Ian Domowitz's paper focuses on the problem of market regulation of computer-based trading facilities. After categorizing the various systems according to functional criteria, he traces the history of regulatory thought and action concerning them.

While discussing this history, he raises the issue of the confusion generated by the definition of an exchange contained in the Securities Exchange Act. This definition is critical to the level of regulatory burden placed upon the system, or exchange, as the interpretation may determine, and forms a battleground between the traditional exchanges and their newer competitors, the proprietary trading systems.

He then goes on to define the requirements for categorization as an exchange, and discusses the issues involved. Two important items discussed are "inside liquidity" and "outside liquidity." Inside liquidity is supplied to an exchange or system by its market makers, while outside liquidity is provided by investors. The consistency of liquidity, and the immediacy that results from this consistency, are important to the SEC. However, since market makers rarely provide enough liquidity to provide immediacy for large institutional investors, and retail investors can generally satisfy their demands for immediacy through the bids and offers of market makers, is it any wonder that retail investors are happy with exchanges and third-market-maker executions, while an increasing share of institutional business is moving to trading systems offering outside liquidity? Perhaps Domowitz should examine the significance of this difference between traditional exchanges and the new electronic marketplaces, even if they are classified as exchanges.

When discussing the system/exchange attributes of passive pricing versus price discovery, Domowitz has the insight that, while price discovery systems need another layer of regulation relative to passive pricing systems, this burden needn't be excessive. He also points out that the differential regulatory burden

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alone shouldn't cause a market share drain from one system/exchange to another. This point should be emphasized, since cross-border proprietary trading systems are having a difficult time gathering business, even though they have a dramatically lower regulatory burden than the international bourses. The problem is simple: investors are reluctant to trade passively unless they have a price discovery system providing accurate information to the passive pricing system.

Continuing the quest for the level, rational playing field, Domowitz suggests that separate facilities of exchanges devoted to passive pricing structures be separated from the regulation of the parent and carry a regulatory burden equal to that of stand-alone systems with similar structure. Is it sensible, though, that regulatory burdens for systems/exchanges with electronic audit trails, even with different pricing structures, should be substantially different in cost? While he has previously stated that the difference needn't be excessive, he is implying here that it is important enough to be a concern. He has also pointed out the desirability of the low-volume exemption for new systems. Since so much of the regulatory burden is designed to stop fraud occurring when agency and principal functions are mixed, and to ensure that trading rules are followed, why should there be a great regulatory cost when participants are on an equal footing and algorithms enforce trading rules?

This question is indirectly addressed as the article moves on to standards, where Domowitz points out that standards can be valuable in the approval process, but pose a danger to innovation in the control of system configuration. According to the SEC's definition of competition, says the author, fostering competition for superior price discovery is appropriate, while doing so for passive pricing systems is not. The SEC should realize that both are quite valuable to the investment ecosystem. To fight competition from a passive pricing system, a price discovery system has to tighten its markets to decrease the price paid for immediacy relative to the passive market. It would help if the size of markets increased to provide real immediacy to the institutional investor population. In this way, the existence of passive pricing systems fores the improvement of price discovery systems, and should certainly be worthy of some nurturing.

I am concerned about the article's conclusion that regulation move to a more functional approach. Without major legislative overhaul, this would place proprietary trading systems with no principal-agency conflicts directly into a regulatory scheme fixed years ago that contemplates these conflicts as being at the heart of the regulatory mission. We cannot adopt a functional approach without functional legislation.

Author's Reply

You must not say, what is this? Why is that? All things have been created for their proper functions.

—Sirach 39:21

The regulation of trading markets is a sensitive, even emotional, subject for many people. Mention of the topic itself strikes at the heart of what individuals and organizations believe "should be done" to organize market activity in non-market fashions to protect the public interest. One response is to turn immediately to a discussion of the purpose and function of market regulation. This reaction was particularly pronounced in open discussion at the NBER Conference. Opinions varied, ranging from "regulation is unnecessary" to the use of trading system classification as an antitrust device.

Ananth Madhavan outlines the functions of regulation as the building of trust, participant protection, and the monitoring and control of market activity. Government regulation is thought to be necessary in support of these functions. Chris Hynes does not appear to disagree with the desirability of such goals, but believes that the market user base can be relied on as the sole regulator. I concur with the functional description, and have some sympathy with both of these positions. Both can muster theoretical support, depending on the assumptions made on the underlying nature of the market and the potential for market failure with respect to one or more of these functions.

My paper, however, is not about the purpose and functions of regulation, nor does it address the issue of "what should be" in the context of trading market regulation. There is already a large literature on the former, and many opinions exist with respect to the latter. I take as given the functions outlined by Madhavan, broadly interpreted. I would add only the consenting opinion that the functions of trading systems and the functions of regulation are not independent. I implicitly adopt the pragmatic view that government regulation of trading markets exists and will continue. The paper concerns the nature of that regulation. Legislative history and legal precedent are used to develop a taxonomy of system classification that is shown to be at the core of regulatory policy. This taxonomy is compared to the new developments in the technology of trading market structure. It is argued to be weak in some respects and inconsistent in others with respect to its use in establishing policy, in the face of these technical advances. Functional regulation is suggested, in part because it is more closely related to the taxonomy than is the current institutional structure. The purpose of the remainder of the paper is simply to delineate some lines of

The author has benefited greatly from conversations with James E. Shapiro and George Sofianos.

inquiry with respect to a shift from institutional to functional regulation of trading systems.

Once the hurdle of the purpose and function of regulation is passed, the discussants' broad concerns are quite similar. The issues are regulatory costs, competition for exchange services, and practical implementation of the functional approach along the lines suggested in the paper.

Madhavan correctly notes the need for balance between the need for system regulation and costs imposed by the rules. He would discount regulatory cost in the equation on the basis that much of it would be incurred anyway as a natural by-product of providing quality exchange services. I am inclined to agree, but industry participants, if not the facts, are seemingly against us. System operators uniformly have made a concerted effort to avoid costs associated with regulation as a registered exchange. The comment letters from existing exchanges cited in the paper forcefully argue that the lower cost associated with avoiding exchange registration is a strong competitive advantage in the exchange services business. The SEC has made the same point, but used it as a rationale to promote new system development, allowing the avoidance of such costs through nonregistration.

Hynes addresses costs in the context of an implication of the functional view, that regulatory burdens carried by electronic crossing facilities of exchanges should be on the same level as that born by stand-alone systems with the same structure. He queries the sense in assuming that regulatory cost differences exist. Under the Securities Exchange Act, a crossing facility operated by a registered exchange is necessarily subject to regulatory costs associated with registered exchanges. A stand-alone system is not bound by the same requirements if registered as a broker-dealer or under the proposed rule 15c2-10. Hynes also points out that there should not be a large regulatory cost for automated systems, when participants are on an equal footing. I agree, but the point is that automated systems are not currently competing on a completely level regulatory playing field. Further, the details of system design may mandate different levels of regulatory oversight; this point is discussed in Domowitz (1993).

Both discussants mention some details with respect to the competition for exchange services. This is an area that deserves much more attention on theoretical, empirical, and policy levels. Madhavan believes in more stringent regulation for higher-volume systems, and cites a low-volume exemption as a tool for promoting competition through innovation in exchange design and implementation. I agree, and these points are discussed in more detail in the paper.

Hynes indirectly gets to the heart of the issue of competition in the presence of both price discovery and execution-only markets. On the one hand, he notes that passive pricing trading systems require price discovery systems that produce accurate prices. On the other, he argues that passive pricing systems are important to the investment ecology, and that a price discovery market must decrease the price paid for immediacy relative to the passive market in order

to compete. The desirable balance between these markets and the equilibrating forces promoting a healthy trade-off between accurate price discovery and lower price for immediacy are not well understood. A fully specified equilibrium model of both price and nonprice competition in the exchange services industry would be most helpful in qualifying the balance between system types as a function of services and costs. This model has yet to be formulated. Regulation cannot mandate the growth of market size suggested by Hynes as a solution to the problem; it can only encourage it.

The discussants also touch upon the implementation of the functional approach to market regulation, with seemingly different perspectives that are not too far apart as a practical matter. Madhavan reiterates the point concerning low-volume exemptions as a policy tool, noting that the regulatory apparatus is already in place for its use. The discussion of this issue in the paper further supports his argument. He also mentions the difficulty of deciding upon the demarcation between price discovery and passive pricing systems. This is a very practical concern, requiring consideration of pricing activity within quotes put out by a market that is obviously of a price discovery type. The issue might be resolved, for example, by maintaining the current regulatory standard for price discovery in terms of quotation activity. Computer-generated quotations at or at most an eighth away from "primary market" quotes also might not be reasonably classified as a price discovery mechanism.

The link to Hynes's concern about implementation is that the legal focus of inquiry will naturally shift to the definition of price discovery. Hynes cites the necessity of major legislative overhaul to accommodate a functional approach, noting that the current system was put in place years ago. Both points are correct and important. In fact, legal scholars at the conference termed the Securities Exchange Act obsolete in the presence of the technological advances in market structure. Discussion in the paper notes that even a redefinition of an exchange to accommodate the current system would occasion a major revision of regulatory law in order to allow its application and enforcement. In other words, a rewriting of the law may be necessary in any case. The paper simply asks whether such a regulatory rewrite might be oriented toward functions that are more stable than their associated institutions in the light of continued innovations in trading market infrastructure.

Finally, the discussants both raise the issue of the level of regulation. This is a return to the "what should be" question noted at the beginning of this reply. The paper has nothing to say about the absolute level of regulation. The emphasis is on the relative levels of regulation across market environments. As Hynes says, this is a quest for the level, rational playing field. The point is not that more or less regulation is needed to fulfill the goals and perform the functions of regulation. Rather, a need for a shift in focus of the ways in which these ends are achieved in the current technological environment is the logical conclusion of the analysis in the paper.

Reference

Domowitz, Ian. 1993. Automating the Price Discovery Process: Some International Comparisons and Regulatory Implications. *Journal of Financial Services Research* 6:305–26.

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