

Chapter 38

STRUCTURE OF SECURITIES MARKETS¹

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Abstract

The entry reviews essential elements of market structure – the systems, procedures, and protocols that determine how orders are handled, translated into trades, and transaction prices determined. There are various contrasting alternatives, such as order-driven and quote-driven markets; consolidated vs fragmented markets; human intervention vs electronic trading; and continuous markets vs periodic call auctions. A major objective of market design noted in the discussion is to enhance the accuracy with which prices are discovered in a dynamic, uncertain environment. Lastly, the entry points out that market structures are rapidly changing, and that much remains to be learned about how best to structure a technologically sophisticated, hybrid market that efficiently services the varied needs of diverse participants.

Keywords: call auctions; consolidated markets; continuous markets; electronic trading; fragmented markets; hybrid market; market structure; order-driven markets; price discovery; quote-driven markets

The structure of a securities market refers to the systems, procedures, and protocols that determine how orders are handled, translated into trades, and transaction prices determined. To date, theoretical security valuation models have generally not considered the effect of a market's structure on asset prices. Formulations such as the Capital Asset

Pricing Model and the Arbitrage Pricing Theory, for example, address the risk and return dimensions of a security, but ignore considerations such as liquidity, trading costs, information costs, and transaction uncertainty. When these realities are taken into account, it is apparent that market structure matters, that it does affect the price and size of trades.

Market structures differ significantly among major international equity market centers (see Schwartz and Francioni, 2004). The New York Stock Exchange (NYSE) and other U.S. stock exchanges are agency/auction markets where the market maker (specialist) acts as both dealer and broker's broker. Examples of a dealer market include the Nasdaq market in the United States and the London Stock Exchange (LSE) before they introduced their electronic order-driven trading systems (Supermontage for Nasdaq and SETS for the LSE). The Tokyo Stock Exchange (TSE) is an agency/auction market where the market maker (saitori) handles the orders but does not take a dealership position. Markets also differ in the way in which orders are consolidated or fragmented, in the way in which information is disseminated, and in the degree to which trading is computerized.

Whether investors trade through an intermediary, as in a dealer market, or directly with each other, as in an agency/auction market, is one of the most important distinctions in market structure. In a dealer market, the market maker initiates

trades by posting bid and ask quotations that are publicly disseminated. The bid is the price at which public traders can sell to a dealer, and the ask is the price at which they can buy from a dealer. The bid–ask spread is the dealer’s compensation for providing marketability services. To achieve a trade in a dealer market, a customer (usually via a broker) contacts a dealer by telephone or electronically and accepts his or her quotation.

In an agency/auction market, public participants trade with each other, and floor professionals in an agency market such as the NYSE act in a brokerage (agency) capacity. When trading is active in a stock, floor traders gather in a “crowd,” and trading truly takes place in an auction environment. In the U.S. exchanges, orders are consolidated at the posts of specialists, who are market professionals who function as both principals and as agents. Specialists have an affirmative obligation to buy and to sell shares so as to make “a fair and orderly market” when counterpart orders do not provide sufficient liquidity. They also have a negative obligation: when a public order and a specialist’s quote are at the same price, the specialist must step aside and let the public order execute first.

Two types of orders are commonly used in an agency/auction market: limit orders and market orders. A limit order states the maximum price at which a public investor is willing to *buy*, or the minimum price at which the public investor is willing to *sell*, a specified number of shares. A market order is unpriced; it states the number of shares the investor wishes to trade “at market,” namely the price prevailing when the order is received by the market center. To execute a market order, limit orders must exist; for limit orders to exist, there must be a facility for maintaining public orders in a file (limit order book). This file characterizes agency/auction exchanges. Handa and Schwartz (1996) have examined the costs and returns to placing limit orders.

Trades may also be negotiated if they are difficult to handle because of their size. In an agency/auction environment such as the NYSE, a

buyer or seller may give a not held (NH) order to a floor trader who uses his or her discretion to negotiate with other floor traders or to expose the order to the limit order book. The floor trader is “not held to the price” if the order executes at a price inferior to that which existed at the time of its arrival. Large orders are also negotiated in the “upstairs market,” a network of trading desks of securities dealers and institutional investors who bring buyers and sellers together at mutually acceptable prices. Trades may also be negotiated with a dealer and/or electronically through a facility such as Liquidnet or Pipeline. Institutional investors commonly negotiate with the market makers to obtain larger sizes than the market makers are quoting and/or prices that are within the bid–ask spread. Large orders are also commonly broken up (sliced and diced) and brought to the market in smaller tranches for execution over an extended period of time.

A major function of a market center is to find the prices at which shares are traded. This process is known as “price discovery.” The accuracy of price discovery depends on the systems used for handling orders, disseminating information, and making trades. If an issue is traded in more than one market center, intermarket linkages including information systems and arbitrage operations must be implemented to ensure both adequate price protection for investors and price consistency across markets. Intermarket linkages also connect equity markets and derivative product markets (for example, the futures and options markets for stock indices in Chicago and the cash market for shares in New York).

Another feature of market structure is the means by which information concerning current market conditions (floor information) is transferred among participants. The informational signal transmitted by a quote differs significantly from that transmitted by a transaction price. A quote reflects an individual’s willingness to trade; it is firm only up to its stated size and may be improved on in terms of price and/or quantity. Quotes may also reflect trading strategy and

gaming by market participants. A transaction price has actually been accepted by both counterparties to a trade, but relates to the past and does not necessarily represent the price at which one can trade in the present. Nonetheless, latest transaction prices do reflect current market conditions when transactions occur frequently. For this reason, transaction price reporting has been introduced in both the U.S. and London dealer markets (see Seguin, 1991).

The extent to which orders are fragmented or consolidated in trading also defines a market's structure (see Cohen et al., 1986). A competitive dealer market is naturally fragmented in the sense that orders are routed to one of several dealer firms. This may be desirable because of the competition for marketability services that fragmentation implies. Most apparent is that bid-ask spreads are tightened in a competitive dealer environment compared to a monopoly dealer environment (see Ho and Stoll, 1983). However, given the fragmented nature of a dealer market, dealers may not be as closely regulated as the specialists in the agency/auction market. This may create incentives for dealers to collude (see Christie and Schultz, 1994a,b). In 1996, the justice department settled with the Nasdaq dealers on accusations of spread collusion.

Another problem of the dealer market is that fragmenting the order flow across different dealer firms can obscure information and impair the accuracy of price determination (see Neuberger and Schwartz, 1990). However, in a screen-based system such as the US Nasdaq market, each dealer firm does see the quotes posted by the others. A dealer market with fragmented orders may also reduce the opportunity for the interaction of all buying and selling interest in that security and thus reduce price competition. In 1997, the U.S. Securities and Exchange Commission enacted the Order-Handling Rules (OHRs), which required that public limit orders be exposed in the national best bid and offer (NBBO). The rules set in motion the transition of the Nasdaq market from a predominantly quote-driven, dealer market towards an order-driven, agency market.

Order flow in an agency/auction environment is by its nature more consolidated than in a competitive dealer market. Consolidation is desirable because it allows orders to be matched against each other with a minimum of broker-dealer intervention. Furthermore, the consolidation of orders facilitates the enforcement of order exposure and trading priority rules. The primary priority rule is price; highest-priced bids and lowest-priced asks have precedence. A secondary priority rule specifies the sequence in which orders at the same price execute; usually, the first order entered at the price is the first to execute (time priority). However, too much consolidation may lead to monopoly power for a single market center, which may lead it to lose its incentive to reduce transaction costs and to innovate.

An agency/auction market is fragmented when shares are listed on more than one exchange, traded in-house by a brokerage firm, on an Alternative Trading System (ATS) and/or on an Electronic Communications Network (ECN). This fragmentation may be desirable if it truly represents competition between market centers. It is not desirable if one market center free-rides on the prices discovered by another market center. For example, a satellite market may guarantee trades at the best price quoted in a major market center and charge lower commissions for the service.

Order consolidation facilitates the consolidation and transference of floor information. For example, NYSE specialists are in a unique position from which to observe the order flow and to set prices that are reasonable given the current demand for shares. But, like the *saitori* in Tokyo, specialists are not permitted to receive orders directly from customers, which restricts their access to information. In contrast, both dealers can receive orders directly from customers, including institutional traders. This contact enables them to obtain further information about market conditions.

In addition to being spatially (geographically) consolidated, orders can be consolidated temporally (over time). Orders are temporally consolidated when they are bunched together in call auction

trading. In continuous trading, orders are executed whenever they cross during trading hours and, in a continuous market, trades are generally bilateral. In contrast, in call auction trading, orders are stored for simultaneous execution in multilateral trades at predetermined times when the market is “called.”

Call market trading has certain advantages (see Schwartz and Francioni, 2004). In particular, dependence on the intermediation of dealers and brokers is lessened and trading costs are reduced. Since everyone trades at the same price, at the same time and under the same conditions, call market trading is fairer, and the procedure can produce prices that are more accurate and less volatile. But, traditional call market trading has had its limitations. Accessibility to the market was restricted and the dissemination of floor information poor in the old call markets of Europe. These limitations can be overcome with the use of computer technology. Pagano and Schwartz (2003) have found that the introduction of electronic call auctions at market closings on the Paris Bourse (now Euronext Paris) reduced transaction costs and improved price discovery.

One of the more striking changes in market structure that occurred as the twentieth century drew to a close was the advent of electronic trading. At its inception, electronic systems tended to mimic existing systems; now they are more commonly developing their own distinctive functionality. The first electronic exchange, the Computer Assisted Trading System (CATS), was introduced by the Toronto Stock Exchange in 1977. CATS is based on the principle of continuous trading in an agency/auction environment. The success of CATS has led to the implementation of similar systems in Tokyo (1982), Paris (1986), and elsewhere. Small order execution systems were also introduced in the U.S. and London dealer markets in the 1980s. Now most national equity markets around the globe provide floorless, electronic trading platforms. The major exceptions, the New York Stock Exchange in the U.S., is in the process of converting to a hybrid structure that integrates an electronic platform (Direct+) with its trading floor.

Electronic technology has strong advantages: it gives participants direct access to markets and control over their orders regardless of geographic location; it provides direct access to information concerning current market conditions; it provides anonymity; it enables the investors to trade without a broker and thus reduce transaction costs; and, as systems become increasingly sophisticated, the computational power of the computer facilitates the handling of institutional-sized orders and the negotiation of trades. Investors in the 1990s have witnessed a proliferation of fourth-market organizations. Electronic facilities such as Instinet and Archipelago allow members to post orders and to match that of other traders in the system. Crossing systems such as Posit and Instinet’s Crossing Network allow investors to trade portfolios directly without a bid–ask spread. Liquidnet and Pipeline allow participants to find each other on their screen and negotiate their trades electronically.

Electronic technology solves the major problems associated with call market trading: restricted accessibility to a market and inadequate dissemination of floor information (see Pagano and Schwartz, 2003). Reciprocally, a call market environment may be more suitable than the continuous market for the use of electronic technology. In particular, the submission and handling of institutional-sized orders can be accommodated in an electronic call (see Schwartz and Francioni, 2004).

Because of strong vested interests, technological inertia, and the ability of an established market center to retain order flow, the superiority of a new system may not ensure its acceptance. Market structure has evolved slowly in the United States since trading moved from coffee houses and curbs into exchanges (the American Stock Exchange did not move indoors until 1921). The pace of change accelerated in the mid-1970s with the passage of the U.S. Securities Acts Amendments of 1975, which precluded fixed commissions and mandated the development of a national market system. London’s Big Bang in 1986 also precluded fixed

commissions, broadened competition between dealers and brokers, and further spurred the globalization of trading. More recently, the NYSE and Nasdaq have completed a conversion from fractional to decimal prices under the pressure of the SEC. Technological developments, inter-market competition, and regulation will no doubt continue to reshape securities markets around the world. However, achieving meaningful change in market structure is not an easy task; much remains to be learned about how best to structure a technologically sophisticated, hybrid market that efficiently services the varied needs of diverse participants.

NOTE

1. This material is modified from an equivalent entry from: *The New Palgrave Dictionary of Money and Finance*, by Peter Newman. Reprinted with permission of Palgrave Macmillan. Copyright © Newman, Peter.

REFERENCES

- Amihud, Y., Ho, T. and Schwartz, R.A. (eds.) (1985). *Market Making and the Changing Structure of the Securities Industry*. Lexington, MA: Lexington Books.
- Cohen, K., Maier, S., Schwartz, R.A., and Whitcomb, D. (1979). "Market makers and the market spread: a review of recent literature." *Journal of Financial and Quantitative Analysis*, 14: 813–835.
- Cohen, K., Maier, S., Schwartz, R.A., and Whitcomb, D. (1986). *The Microstructure of Securities Markets*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Christie, W.G. and Schultz, P.H. (1994a). "Why do NASDAQ market makers avoid odd-eighth quotes?" *Journal of Finance*, 49: 1813–1840.
- Christie, W.G., Harris, J., and Schultz, P.H. (1994b). "Why did NASDAQ market makers stop avoiding odd-eighth quotes?" *Journal of Finance*, 49: 1841–1860.
- Handa, P. and Schwartz, R.A. (1996). "Limit order trading." *Journal of Finance*, 51: 1835–1861.
- Ho, T. and Stoll, H. (1983). "The dynamics of dealer markets under competition." *Journal of Finance*, 38: 1053–1074.
- Neuberger, A. and Schwartz, R.A. (1990). "Current developments in the London equity market." *Finanzmarkt und Portfolio Management*, 3: 281–301.
- Pagano, M. and Schwartz, R.A. (2003). "A closing call's impact on market quality at Euronext Paris." *Journal of Financial Economics*, 68: 439–484.
- Schwartz, R.A. and Francioni, R. (2004). *Equity Markets in Action: The Fundamentals of Market Structure and Trading*. New Jersey: John Wiley.
- Seguin, P. (1991). "Transactions reporting, liquidity and volatility: an empirical investigation of national market system listing." Paper given at Western Finance Association Meetings, Jackson Hole, Wyoming, June.
- US Securities and Exchange Commission (SEC) (2000). NYSE Rulemaking: Notice of filing of proposed rule change to rescind exchange rule 390; Commission request for comment on issues related to market fragmentation. Release No. SR-NYSE-99-48.