

**Chapter 3**

# **The Operation of Stock Markets**

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## The Operation of Stock Markets

A securities market is at core a communication system and a trading mechanism. Its functions are: 1) to communicate orders for securities and the prices bid or offered for them (“quotes”), and 2) to match those orders and transform them into trades. Because of this, communication and computer technology (“information technology”) not only can, but inevitably will, change the nature and operations of securities markets. Their performance and efficiency must be evaluated in the light of what could be achieved with advanced information technology.<sup>1</sup>

The stock market crash in 1987 highlighted three problems that could cause future disasters—excessive short-term volatility, technological risk, and strains on the abilities of market-makers to perform their functions under stress. Neither the markets nor their regulators have completely solved those problems in the intervening 3 years.

Stocks are traded in two different kinds of markets—exchanges and over-the-counter (OTC) markets. These markets differ in several important respects. In exchange markets, member firms act for themselves and as agents (brokers) for customers, bringing their orders to a central facility—a “floor”—to be executed. These member firms are large securities companies such as Merrill Lynch or Goldman Sachs. Orders can be executed in two ways: against other orders—i.e., a bid to buy matching an offer to sell; or if there is no such order at an acceptable price, by a sale to or purchase from the “specialist”—a member designated by the exchange to be the sole market-maker for that stock.<sup>2</sup>

The largest U.S. exchange, by far, is the New York Stock Exchange (NYSE). Approximately 1,740

companies’ stocks are listed on the NYSE. The smaller American Stock Exchange (AMEX) lists approximately 860 stocks. In general, the stocks of the larger and better-known corporations are traded on the NYSE, which has more stringent listing requirements. The NYSE-listed stocks account for almost 95 percent of the trading volume in all exchange-listed stocks.

There are also five regional exchanges—the Midwest, Pacific, Philadelphia, Boston, and Cincinnati Stock Exchanges—that serve as alternative markets for stocks listed on the NYSE and the AMEX (and a few stocks listed solely on the regional exchanges).<sup>3</sup> Exchange-listed stocks are also traded over the counter. This is the so-called “third market,” which accounts for about 3.2 percent of the volume in NYSE-listed stock.

Many stocks do not trade on stock exchanges. They are traded only in the OTC market, operated by the National Association of Securities Dealers (NASD) as a self-regulatory organization. In this market securities firms can act as brokers (agents) or dealers (principals) with respect to any stock.<sup>4</sup> A firm receiving a customer’s order to buy stock can either sell the stock to the customer from the firm’s own inventory (if it is a dealer in that stock) or act as broker in purchasing the stock from another dealer. In this market, nearly every transaction involves a dealer as one party, whereas in exchanges, customer buy and sell orders can be matched. OTC orders are not routed to a central physical facility but handled by dealers working over the telephone or through a computerized small order execution system. About 4,900 actively traded OTC stocks are listed, and bids and offers for them are displayed, on NASD’s

<sup>1</sup>Some of the material in this Chapter draws on an OTA contractor report, Joel Seligman, “Stock Options, and Stock-Index Futures Trading,” University of Michigan Law School, August 1989. For further background on the issues discussed in this chapter, see Joel Seligman, “The Future of the National Market System,” 10 *Journal of Corporate Law* 79, 1984; Macy and Haddock, “Shirking at the SEC: The Failure of the National Market System,” 1985 *University of Illinois Law Review* 315; and Norman P. Baskin, “Restructuring the Stock Markets: A Critical Look at the SEC’s National Market System,” 56 *New York University Law Review* 883 (1981). See also U.S. Congress, *Progress Toward Developing a National Market System*, Report of the Subcommittees on Oversight and Investigations and Consumer Protection, Committee on Interstate and Foreign Commerce, U.S. House of Representatives, No. 96-89, Sept. 24, 1979. Contributions to this chapter were also made by contractors Professor David Ratner, Georgetown University School of Law, and Junius Peake, Peake/Ryerson Consulting Group, Inc.

<sup>2</sup>NYSE rules technically allow for competing specialists, but there have been none since 1975, and exchange procedures (including those procedures for disciplining specialists by reallocating stock assignments) are framed around the assumption that there will be only one specialist per stock.

<sup>3</sup>Share volume in NYSE-listed stocks in 1989 was: Midwest, 5.6 percent; Pacific, 3.1 percent; Philadelphia, 1.8 percent; Boston, 1.6 percent; Cincinnati, 0.5 percent.

<sup>4</sup>New York Stock Exchange member firms are, however, forbidden by NYSE rules to do so (Rule 390, discussed later).

Automated Quotation system, NASDAQ. Corporate bonds, municipal bonds, American Depository Receipts, and U.S. Treasury bonds and notes are also traded in the OTC market. Figure 3-1 and box 3-A illustrate the mechanics of a stock trade.

## OPERATION OF THE EXCHANGE MARKETS

A key function of securities markets is to facilitate capital formation by providing liquidity, i.e., to enable investors to buy and sell securities when they wish to do so. Many (not all) securities markets use intermediaries or professional market-makers to increase liquidity by helping would-be traders find each other or by themselves trading. Stock exchanges in the United States have a specialist, or designated market-maker, for each listed stock.<sup>5</sup>

U.S. stock exchanges are continuous auction markets. Members of the exchange bring their own or customers' orders to the exchange floor and, in face-to-face negotiations, offer to sell a specified number of shares at a specific price ("an offer") or to buy a specified number of shares at a designated price ("a bid").

The customers served by exchange members are increasingly institutional investors (e.g., pension funds, mutual funds, insurance funds). Over 55 percent of NYSE trading is for these institutions; another 26 percent is for securities firms' proprietary accounts, including those of specialists. Only 18 percent of trades are for individual investors.<sup>6</sup>

Stock exchange specialists act as both brokers and dealers. As brokers, specialists buy and sell for the public, by executing limit orders that are brought to

them on behalf of customers by floor brokers; they also execute market orders that reach them through the automated order routing system, SuperDOT.<sup>7</sup> (A limit order specifies the price at which an investor is willing to buy or sell. Limit orders are put in the specialist's 'book' until they can be executed at the designated price or a better price.<sup>8</sup> A market order is an order to buy or sell immediately, at the prevailing price.) Specialists are prohibited by law from handling customer orders other than limit orders.<sup>9</sup> The specialist's book was once a looseleaf notebook but now it is, for most NYSE stocks, a computer screen. The specialist is not, with some exceptions, required to show this screen to other traders, exchange members, or the public, although he must disclose aggregate price information.<sup>10</sup>

As dealers, specialists buy and sell for their own account. They have an "affirmative obligation" to do so when it is necessary to provide liquidity. Specialists provide liquidity by buying or selling when there are no other bidders or offerers at or near the market price. The specialist tries to keep prices from making big jumps, by making a bid or offer that acts as a bridge when there is a wide gap between bids and offers. The specialist also has a 'negative obligation,' not to trade for his own account when there are already customers wanting to trade at or near the market price.<sup>11</sup>

Specialists participate in a substantial proportion of NYSE trades. NYSE figures in 1990 show that specialists' purchases and sales as dealers account for 19 percent of all sales and 9 percent of all transactions (purchases and sales) on the exchange. One study in 1985 concluded that specialists might

<sup>5</sup>The exception is the Cincinnati Stock Exchange, which is completely computerized and uses "designated dealers." In other U.S. exchanges, the specialist is part of a specialist firm, or unit, that is a member of the exchange. Historically, specialist firms tended to be small, well-capitalized firms, distinct from the large broker-dealer firms that are better known to the general public; more recently, a few of the specialist firms are owned by brokerage houses such as Merrill Lynch. At the end of 1989, the NYSE had 52 specialist firms with 434 individual specialists making markets in 1,712 common stocks. [Source: NYSE, February 1990]

<sup>6</sup>Securities Industry Association, *Trends*, Mar. 16, 1989.

<sup>7</sup>Also as brokers, specialists "stop" market orders when they see that the order may be executed at a better price later (e.g., when a block trade is being negotiated). The specialist guarantees that the order will receive at least the price available at the time the order was stopped.

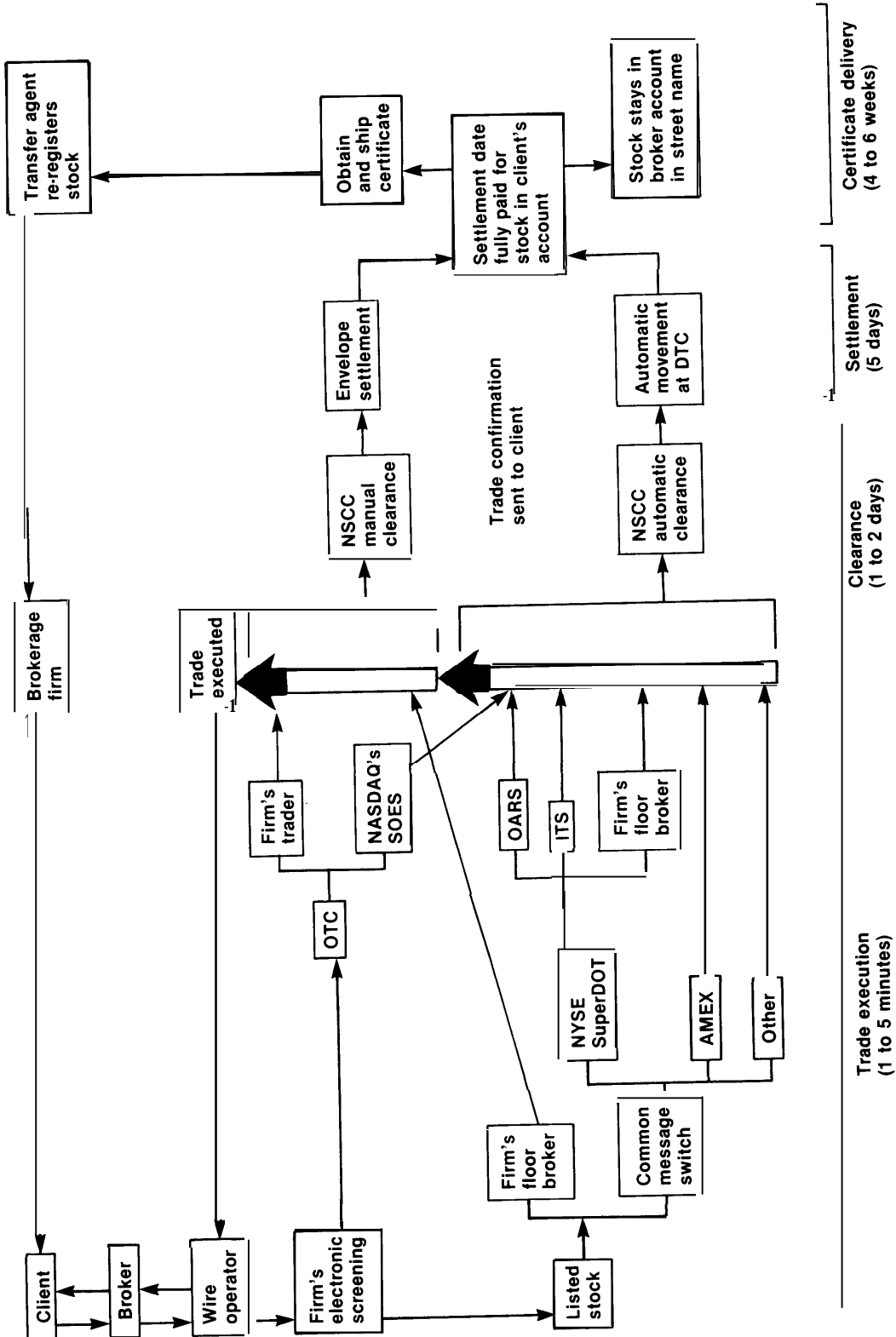
<sup>8</sup>A special kind of limit Order is a stop order, with which a customer specifies that the order should be executed when the stock price drops to a certain price level, or rises to a certain price level.

<sup>9</sup>Securities Exchange Act, sec. 11(b), 1934.

<sup>10</sup>The NYSE is filing with the SEC a proposal for "A Look at the Book" Pilot Program, whereby limit orders for 50 stocks will be made available to the public through vendors. Information provided by the NYSE, July 16, 1990.

<sup>11</sup>Besides acting as brokers and dealers, specialists have a third function, which is to begin each trading session by overseeing or orchestrating the determination of the opening price.

Figure 3-1—Saga of a Stock Transaction



SOURCE: *The Individual Investor*, vol. 3, No. 3, June/July 1989.

### **Box 3-A—The Mechanics of a Stock Transaction**

What happens when you visit or call a stock broker to buy or sell stock? The following description traces the chain of events that results in a transaction by a small investor.

A. When you decide to buy or sell stock an Account Executive writes an order ticket, filling in the details—whether to buy or sell, the name of the security, how many shares, whether the order is to be executed at the market price or is a limit order (an order to buy or sell when the price reaches a specified level). The market order is passed to a teletype operator who keyboards the information and sends it immediately to an electronic system linking the broker to the various exchanges and over-the-counter dealers.

B. If the order involves an exchange-listed stock and there are no special instructions routing it to another market center, the order will enter the Common Message Switch, an electronic pathway linking brokerage firms and trading floors. This is the beginning of a journey that could carry the order to several alternative destinations.

C. Most orders in NYSE-listed stocks are routed to the NYSE's SuperDOT 250 system, where orders of fewer than 2,000 shares are executed. These orders can go either to the specialist's post on the floor of the exchange, or to the brokerage firm's floor booth (although with a small order, that is unlikely).

What happens next depends on the timing. On a typical day, between 15 and 20 percent of all orders are executed at the market opening. Through SuperDOT, *market orders* to buy or sell, routed to the specialist post prior to the market opening, are automatically paired with opposing orders. The specialist, after matching buy and sell market orders and checking outstanding *limit orders* and larger opening orders, sets an opening price for the stock. The specialist then executes all paired orders at one price and sends confirmation notices to originating brokers within seconds of the market opening, through the Opening Automated Reporting System (OARS).

Orders that arrive at the specialist's post through SuperDOT after the opening can be filled in several ways. Orders of up to 2,099 shares are usually filled at the best quoted price or better in the Intermarket Trading System (ITS). This system connects NYSE, AMEX, five regional exchanges, and NASD'S Computer Assisted Execution System (CAES). ITS quotes are displayed at the NYSE specialist's post for all floor traders to see. An order sent to ITS will be filled within 1 or 2 minutes at the best price among any of these markets.

For larger orders, or when a wide spread exists between bid and asked prices, the specialist will execute a SuperDOT order in the traditional way (see D). He can also execute the trades from limit orders in his "book." The specialist is obligated to get the best price available at that moment for the client.

D. Some orders are not handled electronically but rather by the broker firm's floor broker. Wire orders reach floor brokers when they are too large for SuperDOT (see C above) or are larger than the broker's chosen parameters for direct routing through SuperDOT

At the broker's floor booth, these orders are translated into floor tickets containing the essential buy/sell information necessary to make the trade. Floor clerks pass the details to floor brokers by hard copy (or through hand signals at the AMEX). The floor broker then presents the order at the specialist's post. There the stock is traded with another brokerage firm, or with the specialist, who may be acting as agent for a client on his books, or who may be acting for his own account. Or the floor broker may execute the trade on another exchange, if there is a better price posted on the ITS screen over the specialist's post. The above applies to exchange-traded stock.

E. If the stock is traded over the counter, and the quantity is more than 1,000 shares, the wire order goes to one of the broker's OTC traders at its main office. There, a computer on the OTC trader's desk displays the identities of all market-makers for that stock and their current bids and asked prices. The trader telephones the market-maker with the best price, and executes the trade.

If the brokerage firm itself makes a market in that stock and the broker's OTC trader is willing to match the best price shown on NASDAQ, the trader can buy or sell it as principal. In either case, at the press of a button on the trader's keyboard, the trade is executed and a confirmation notice is sent to the originating office.

If the OTC order is for 1,000 shares or less, and the stock is listed on NASD'S "National Market System," it will be automatically routed via NASDAQ'S Small Order Executive System (SOES) to the market-maker with the best price at the time of order. (If the stock is not on the National Market System, it must be for 500 shares

<sup>1</sup>A&pt~ from "The Saga of a Stock Transaction," *The Individual Investor* vol. 3, No. 3, June-July 1988 (American Association of Individual Investors).

maximum to go through this system.) Trades executed through SOES take less than 90 seconds from order wire to confirmation.

F. What happens next is “after the trade” activities, and the process depends on whether the trade was executed manually or electronically. Generally, the trade confirmation is sent back to the broker through the same pathway by which the order arrived, and the broker calls the customer to confirm the transaction.

Executed trades are also reported immediately to the brokerage firm’s purchase and sales department and to the exchange, so that the transaction will go on the Consolidated Ticker Tape. Once on the tape it is visible to the investor community, and to the exchange’s and regulatory agency’s surveillance analysts.

G. On or before the day following a trade, the brokerage firm sends its customer a written confirmation showing the details of the transaction. The customer has five business days from the trade date to pay for purchases delivery (i.e., to settle). About 95 percent of trades are settled through the National Securities Clearing Corp.

The Depository Trust Company (DTC) stores stock and other certificates and maintains records of ownership for brokerage firms and banks. Under normal circumstances, your stock certificate will be registered in DTC’S nominee name-’ held in street name’—for you as the beneficial” or real owner. Or you may choose to request physical delivery of the stock to you.

For customers who want physical possession of their stock certificates, these shares are registered in the customer’s name by the transfer agent of the issuer. Errors and delays can occur in the paperwork trail from brokerage firm to NSCC, NSCC to DTC, DTC to transfer agent, transfer agent back to DTC, DTC to brokerage firm, brokerage firm to customer. For this reason (and other good reasons) there is considerable interest in eliminating paper certificates (“dematerialization” and replacing these with electronic records, as some countries have already done.

be involved, either as dealers or brokers, in more than 70 percent of all NYSE trades at that time.<sup>12</sup>

## THE OTC MARKET AND NASDAQ<sup>13</sup>

Until 1939, the OTC market was largely unorganized and unregulated. In that year the Maloney Act Amendments to the Securities Exchange Act allowed the creation of the National Association of Securities Dealers as a self-regulating organization with responsibilities in the OTC market like those of securities exchanges.

Stocks traded in the OTC market are divided into two tiers—the 4,900 NASDAQ stocks, and 40,000 others. NASDAQ includes the more active stocks;

for these, the bids and offers of all registered market-makers (dealers) are shown and continuously updated on the automated quotation system, so that the broker or customer can identify the dealer offering the best quote. A NASDAQ market dealer can become a market-maker in a security merely by notifying NASDAQ operations of intent. There were an average of 10.6 market-makers per security in the NASDAQ market at the end of 1989.<sup>14</sup>

For 40,000 less active stocks, until mid-1990 dealers could advertise their prices only by printed quotations (the “Pink Sheets”). On June 1, NASD opened an electronic “Bulletin Board,” on which dealers may post and update quotes for these stocks.

<sup>12</sup>Hans R. Stoll, *The Stock Exchange Specialist System: An Economic Analysis*. New York University, Salomon Brothers Center for the Study of Financial Institutions: Monograph Series in Finance and Economics, Monograph 1985-2, p. 15. This was based on analysis of SEC data indicating that limit orders left with the specialist are involved in approximately 24 percent of all purchases and sales. Since the specialist would not be on both sides of a single transaction, this would mean that limit orders were behind 48 percent of total trades (24 percent of purchases added to 24 percent of sales). These figures will be somewhat different from year to year.

<sup>13</sup>Market data in this section supplied by NASD.

<sup>14</sup>National Association of Securities Dealers, Inc., 1989 *Annual Report*.

The Bulletin Board can be accessed by 2,700 terminals in the trading rooms of member firms.<sup>15</sup>

Until 1971, all OTC stock quotations were reported only in daily Pink Sheets, which listed bid and ask prices of each dealer for each stock for the previous trading day. To get up-to-the-minute quotations and meet commonly accepted "best execution" standards, a stockbroker had to telephone at least three dealers and compare their quotes. The time and effort involved in contending with busy signals and wrong numbers made this an ideal situation for using computer and telecommunications technology.<sup>16</sup> Since the introduction of the NASDAQ system in 1971, the volume of trading in NASDAQ securities has grown rapidly. In 1976 NASDAQ share volume was 31 percent of NYSE share volume. In 1989 it was 76 percent of NYSE share volume.<sup>17</sup> Now the NASDAQ market is the second largest stock market in the country. In the first half of 1989 daily volume was more than 134 million shares, up from 123 million at the end of 1988.<sup>18</sup> Increasingly the NASDAQ market is used by institutional investors as well as small investors, and block trades now account for 43 percent of total volume. This growth is largely due to technology; as computer systems supplement telephones, dealers can handle larger volumes and provide immediate automated execution for many trades, and customers can receive more competitive prices.

The NASDAQ-listed stocks are further divided. National Market System or "NMS" stocks are the most widely held and actively traded stocks, for which transactions are reported as they occur. Of the 4,500 stocks in the NASDAQ system, approximately 2,800 are NMS securities.

NASD is basically a telephone market supported by a computer screen quotation-display system (and the automatic execution system for small orders). Quotations are collected and disseminated by leased telephone lines from the NASDAQ Central Processing Complex to dealers' desktop terminals. For NMS securities, OTC dealers must provide last sale data within 90 seconds of a trade. For the second-tier stocks dealers need report only the aggregate trading volume at the end of the day.

NASDAQ quotations are indicative rather than firm for lots over 100 shares, except for orders eligible for small order automated execution, for which prices must be firm up to 1,000 shares.<sup>19</sup> In other words, NASDAQ market-makers do not disclose how many shares of stock (over 100 shares) that they are willing to buy or sell at their quotation prices.<sup>20</sup> The OTC dealers continue to display the minimum size (100 shares) required by NASDAQ rules. The price for transactions over that size must be negotiated.

Market-makers are required by now-mandatory SOES participation in the Small Order Execution System (SOES) to execute public small orders up to 1,000 shares in NMS stocks (the number varies by stocks) at market prices, and to maintain minimum SOES exposure limits up to five times that amount. However, SOES trades are less than 2 percent of NASDAQ volume.<sup>21</sup> The Securities Exchange Commission (SEC) has repeatedly encouraged NASD to change its NASDAQ requirements. An NASD proposal, submitted to the SEC on March 20, 1989 and not yet acted on at mid-1990, would require a NASDAQ market-maker's size display to be at least

<sup>15</sup>In the first week of operation, over 100 OTC dealers advertised prices for about 3,000 domestic and foreign securities. NASD says that 7,235 market-making positions were displayed. The Bulletin Board differs from the NASDAQ quotation system in several ways: 1) there are no listing standards; 2) dealer quotations need not be firm quotations, and can even be unpriced indications of interest; 3) the Bulletin Board does not transmit data to press wire services or to information services vendors, as does NASDAQ; 4) it has no equivalent of the NASDAQ's Small Order Execution System.

<sup>16</sup>For history of OTC trading, see Joel Seligman, 1982, *op. cit.*, footnote 1; and Simon and Colby, "The National Market System for Over-the-Counter Stocks," 55 *George Washington Law Review* 17, 19-34, 1986.

<sup>17</sup>About 27 percent by dollar volume, because the average price of OTC stock is much lower than the average price of NYSE stock.

<sup>18</sup>Source: NASD, February 1990.

<sup>19</sup>Professional-proprietary (dealer) orders, and customer orders over 1,000 shares, are not eligible for SOES.

<sup>20</sup>NASD points out that in NASDAQ stocks, where dealers are exposed on an identified basis to both automated execution and other real-time quotation-execution processes, the display of size has impacts on dealers that do not exist in other markets. In NASDAQ each dealer quotation is displayed and the identity of each market-maker firm is disclosed. Actual execution size is as large, above the displayed minimum, as the quantity all competing dealers are willing to take into inventory at a particular time and price. Size in individual dealer quotations contains inventory-related information and it requires additional resources to update on a continuous basis. In simpler terms, if a dealer is offering the lowest offer, a competing dealer could "pick him off," i.e., buy all of his stock and then resell it at the second dealer's own (higher) price.

<sup>21</sup>A number of proprietary automated systems at dealer firms' also execute such small order trades.



the SOES required order size in the stock (i.e., up to 1,000 shares).

## THE NATIONAL MARKET SYSTEM

In the early 1970s and again in the late 1980s, the operation of American stock markets aroused congressional and regulatory concern. In 1969 to 1970, a series of operational and financial crises caused the collapse of a number of securities firms, and thereby provoked studies of the securities industry and markets by both Houses of Congress and by the SEC. These studies ultimately led to the passage of the Securities Acts Amendments of 1975, which included the most far-reaching revisions of the Securities Exchange Act of 1934 in more than 40 years.

A more recent wave of congressional and regulatory concern followed the October 1987 market crash. A number of reform proposals were made by special commissions, regulatory agencies, and Senators and Representatives. More were proposed after disclosure in 1988 and 1989 of a string of stock market abuses and frauds, and a near crash in October 1989. A few of these reform proposals were implemented by self-regulatory organizations, some are still before Congress or regulatory agencies, and some have been dropped for the time being.

The 1975 Amendments directed the SEC to “facilitate the establishment of a national market system for securities” and to order the elimination of “any . . . rule imposing a burden on competition which does not appear to the Commission to be necessary or appropriate in furtherance of the purposes” of the Act.<sup>22</sup> The basic objective of the 1975 Amendments was the development of a more efficient, fair, and competitive national market system that could provide:

- economically efficient execution of transactions;
- fair competition among brokers, dealers, exchange markets, and other markets;
- availability to brokers, dealers, and investors of information about quotations and sales;
- practicability of brokers executing customers’ orders in “the best market,” and

- “an opportunity, consistent with [other] provisions. . . for investors’ orders to be executed without the participation of a dealer.”

Congress said that these objectives were to be achieved through “the linking of all markets for qualified securities through communication and data processing facilities. . .,” but it did not specify the exact nature of these systems and facilities.

There is disagreement over whether the objectives of the Amendments, as subsumed in the phrase “a national market system,” have been fully achieved. The nature of the basic objective seemed to call for some necessary steps:

- a consolidated quotation and price dissemination system, so that market-makers could compete with each other to make better bids and offers;
- electronic order routing and execution systems, to speed up transactions, reduce transaction costs, and assure customers that their bids and offers are taken in order by price and time of arrival;
- a way of efficiently directing orders to the market or market-maker with the best quotation at that moment; and
- a national clearing and settlement system, making effective use of information technology.

The SEC’s efforts to develop a markets-wide communication system predated the 1975 Amendments. Until 1972, NYSE and AMEX ticker tapes and electronic displays gave a continuous report of transactions on those two exchanges. They did not report transactions in the same securities on regional exchanges or in the OTC market. Under SEC prodding, a consolidated *last-sale* reporting system was established in 1972 by the Securities Industry Automation Corp. (SIAC). SIAC is the central trade price processor and reporter for exchange-listed securities for the NYSE, AMEX, the five regional exchanges, and the NASD.

But a consolidated quotation system that would allow brokers to check all markets for the best price to execute a customer order was still not available for exchange-listed stocks at the time of the 1975 Amendments. In 1978, the SEC proposed requiring

<sup>22</sup>Securities Exchange Act, sec. 1 IA(a)(1). The Amendments also extended the Act to cover clearing agencies and information processors, and increased the SEC’s oversight powers over the Self-Regulatory Organizations (SROs) in the securities industry.

a universal message switch, a broker-to-market link through which a customer's order would automatically be routed by a broker to the market or dealer showing the best quote. The exchanges objected, and the next year the SEC shelved its proposal.<sup>23</sup> It approved, instead, the development of a market-to-market link—the Intermarket Trading System or ITS—as proposed by the exchanges. The ITS enables specialists and floor brokers on one exchange—not customers or non-member retail brokers—to transmit orders to market-makers on another exchange floor or operating over-the-counter, who have posted a better price on the consolidated quotation system. The market-maker receiving the order must respond within 1 or 2 minutes or the order expires.

The ITS does not require that an order be routed to the market with the best quote. The order can be executed in the market in which it is received, provided the specialist or a floor broker matches the best quote available elsewhere. The regional markets, most of the time, match NYSE quotes; i.e., their prices are derivative of those on the NYSE.

The Securities Acts Amendments of 1975 sought to increase competition by having the SEC review exchange rules “which limit or condition the ability of members to effect transactions in securities otherwise than on such exchanges. The SEC was to report its findings within 90 days and begin a proceeding “to amend any such rule imposing a burden on competition which does not appear to the Commission to be necessary or appropriate in furtherance of the purpose of this title.”<sup>24</sup> A “fail-safe” provision authorized the SEC to limit trading in listed securities to exchanges, but only if it were necessary to protect investors and maintain an orderly market, and after public hearings.

The most significant restraint on market-making in exchange-listed securities is NYSE Rule 390 (originally Rule 394), which prohibits members

from making markets off-exchange in listed stocks (i.e., they can act as dealer only as a specialist on an exchange). In a proceeding to determine whether it should eliminate Rule 390, the Commission found that the “off-board trading rules of exchanges impose burdens on competition” and that the SEC was “not now prepared to conclude that these burdens are necessary or appropriate for the protection of investors.” It proposed repeal of the rule. However, after 4 years of deliberation and hearings, the Commission announced in 1979 that it was withdrawing its proposal. It instead adopted an experimental rule, 19c-3, that allows NYSE members to make OTC markets in stocks first listed on an exchange after April 26, 1979.

A number of major stock exchange members then started making markets in newly listed exchange stocks, about 10 percent of the 100 most actively traded NYSE stocks, including the “Baby Bell” companies spun off in the split-up of AT&T. This market-making proved unattractive or unprofitable, either because of the small number of stocks or because of the competition, or for other unrevealed reasons. By 1983 member firms had largely withdrawn from that activity, although a few have since resumed marking markets.<sup>25</sup>

There are several arguments against abolishing Rule 390. Large member firms might internalize their trading by executing orders upstairs. This would, critics say, fragment the market for those securities, with none of the upstairs or off-exchange markets being liquid or deep enough to keep the spread narrow. However, it could also cause a screen-based market for those securities to develop, with competing market-makers providing good liquidity.

Critics also argue that abolishing Rule 390 could lead firms to execute customer transactions at less favorable prices than could be found on the exchange floor.<sup>26</sup> This is, however, also true for orders

<sup>23</sup>Sec. Ex. Act Rels. 14,416, 14 SEC Dock. 31, 1978; 14,805, 14 SEC Dock. 1228, 1978; 14,885, 15 SEC Dock. 1391978. See also: Norman Poser, “Restructuring the Stock Markets: A Critical Look at the SEC’s National Market System,” 56 *N.Y. University Law Review* 883, 923, (1981); Joel Seligman, “The Future of the National Market System,” 10 *Journal of Corporate Law* 79, 136-137, 1984.

<sup>24</sup>Securities Exchange Act, sec. 11A(c)(4). These provisions were deleted from the Act in 1987, as “obsolete,” on the ground that “these requirements were met several years ago.” Senate Rep. No. 100-105 at pp. 20-21, 1987. The 90-day provision was obsolete but there is not complete agreement that the substantive intent of the requirement had been met.

<sup>25</sup>Merrill Lynch dropped out in April 1983, followed by Paine Webber and Goldman Sachs.

<sup>26</sup>“Trade-through” rules could forbid brokers from executing orders at a price less favorable than that offered on any exchange or NASDAQ; but when trades are made on the floor the price is sometimes better than the published quotation—i.e., the trade is made “between the quotes” as a result of floor negotiation. There have been several proposals of various kinds of order-exposure rules, which would require orders to be exposed for a length of time before transactions; this could add to transaction costs or to dealers’ risks.

sent automatically by many brokers to one exchange (usually the NYSE); they may miss better prices off the exchange. The SEC has been reluctant to force the NYSE to change the rule on the basis that market participants—the members of the exchange—are best able to determine the effects of this NYSE rule.

Competition from overseas markets makes it important that Rule 390 be reexamined. With global securities trading,<sup>27</sup> Rule 390 is becoming increasingly burdensome. Many trades by large investors in 89 of the 100 most actively traded exchange-listed stocks are done after NYSE closing in the London market. (As discussed later, the NYSE is planning limited actions to try to recapture these trades with electronic trading mechanisms. These are likely to be ineffective if large investors want to trade these stocks “around the clock.” The SEC has been criticized for this hands-off attitude toward Rule 390. Congress may soon find it necessary to direct SEC to reconsider.

Another major barrier to competitive trading among markets has been the rule preventing exchange specialists from competing with OTC market-makers in trading unlisted stocks. The 1975 Amendments directed the SEC to grant unlisted trading privileges where “consistent with the maintenance of fair and orderly markets and the protection of investors.

For 10 years the SEC made only tentative moves to meet the intent of the 1975 amendments. In 1987, the SEC allowed exchanges, as a trial, to trade up to 25 NASDAQ securities. Only the Midwest Stock Exchange took advantage of this, and it captured only about 1 percent of the volume in those shares. On June 1, 1990, the SEC expanded this trial into a pilot program that will (in 9 months) allow up to 100 selected OTC stocks to be traded by the Midwest, Philadelphia, Boston, and American exchanges. Because it relies heavily on listing fees for revenue, the NYSE refused to participate. Companies might be reluctant to list with the NYSE if their stocks could be traded on the exchange without listing.

Some large corporations now traded only over the counter (e.g., Apple and Nike) may benefit by the added exposure, and investors may get better prices

because of increased competition. However, these stocks already have competing market-makers on NASDAQ, and it is uncertain how much additional exposure the smaller exchanges will provide.

## **CHALLENGES TO THE SPECIALIST SYSTEM**

### *Changes in Trading Patterns*

The stock exchanges and the NASDAQ system were organized to deal with moderate-sized orders based on a “round lot” of 100 shares. With the growing importance of institutional investors, this system became strained.<sup>28</sup> Institutional trading grew rapidly in the 1960s and thereafter. Institutions increasingly traded in large blocks (10,000 shares or more), that require special techniques because large volumes are difficult to handle in the usual manner. Between 1975 and 1988, the average size of an NYSE transaction increased from 495 shares to 2,303 shares. Comparable increases occurred in other markets. Brokers’ commissions were deregulated in 1975. Small individual orders (less than 1,000 shares) became too expensive to handle in the traditional manner. Techniques had to be developed to funnel these orders to the market-maker in a more efficient manner. Traditional techniques based on specialists became increasingly unsatisfactory for both small and large orders.

### *Small Orders*

Faced with either losing money on small-order transactions, or charging high commissions and driving away the small investor, the exchanges and NASDAQ developed automated order routing and execution systems for orders over a specified size.

The NYSE’S Designated Order Turnabout System (DOT later called SuperDOT), began in 1976. In 1988 the order routing system handled 128,000 orders a day. Orders are sent to the specialist post, where they are announced to the floor brokers, executed, and reported back. SuperDOT reduces the costs and eliminates most of the errors in executing, transferring, or reporting trades.

The AMEX Post Execution Reporting is much like DOT, allowing members to electronically route

<sup>27</sup>See OTA Background Paper, *Trading Around the Clock: Securities Markets and Information Technology*, OTA-BP-CIT-66 (Washington, DC: U.S. Government Printing Office, July 1990).

<sup>28</sup>In early 1990, institutional investors accounted for 45.3 percent of NYSE trading. The annual average, however, has been 55 percent by share volume.

orders up to 2,000 shares directly to the specialist. Routing may be done from the member's trading room or from the broker's desk on the floor, with an execution report generated automatically.

Four regional exchanges have developed small-customer-order-execution systems that operate as derivative pricing mechanisms, basing prices on NYSE quotes. (The fifth, The Cincinnati Exchange, is completely automated.) Brokers or trading rooms can electronically route an order to a specialist at a regional exchange. The specialist must accept the order at the best price available in the Consolidated Quotation System, or at a better price. (The Philadelphia system does not allow the specialist to better the price.) If the specialist does nothing, at the end of 15 seconds these systems execute the order automatically on behalf of the specialist and report it back. These systems have helped the regional exchanges to increase their share of NYSE-listed volume.<sup>29</sup>

On NASDAQ'S small order execution system, SOES, orders of up to 1,000 shares are automatically executed at the best market price.<sup>30</sup> No telephone contact with a dealer is needed. At the end of 1988 only about 9.4 percent of NASDAQ transactions by value (1.4 percent by volume) were being handled through SOES. However, SOES is the standard for a number of proprietary automated execution systems in NASDAQ stocks. About 70 percent of NASDAQ trades are "SOES eligible" (i.e., within SOES size limits), so this allows the automatic execution of a large proportion of NASDAQ trades.

### ***Block Trading***

**The** big problem with trading large blocks is not cost, but liquidity. Big blocks usually have to be broken up, and their execution often sharply changes the prevailing market price. Neither the specialist system on the exchanges nor the NASDAQ system in the OTC market were designed to provide instant liquidity for very large transactions near current market price.

Block trades involve 10,000 or more shares, or have a market value of \$200,000 or more.<sup>31</sup> Transactions of this size were rare 25 years ago. They

increased rapidly because of the growth of large investment funds with large assets for investment and trading. Block trades made up only 3.1 percent of reported NYSE share volume in 1965, with an average of 9 block trades a day. In 1988, more than 54 percent of reported share volume on the NYSE involve block trades, with an average of 3,141 block trades per day. About 20 percent of these block trades involve over 250,000 shares. Block trades accounted for 43 percent of share volume on NASDAQ in NMS stocks in 1988, and on the AMEX they accounted for 42 percent.

Specialists were increasingly strained to fulfill their affirmative obligations to provide liquidity and smooth out price jumps when these large blocks came to the floor. The NYSE responded by developing procedures for "upstairs" trading of blocks.

Under these procedures, an institutional investor goes to an exchange member (a large securities firm such as Goldman Sachs or Merrill Lynch) that has registered as a "block positioner."<sup>32</sup> The block positioner usually commits itself to execute the entire block at a specific price, itself taking all of the shares that it cannot sell to others. The positioners primarily work "upstairs" in their trading rooms rather than on the exchange floor. They are, in effect, making markets, although they have no affirmative obligation to do so as does the specialist.

A positioner who receives an order for the purchase or sale of a block is required by NYSE Rule 127 to "explore in depth the market on the floor," and must "unless professional judgment dictates otherwise, ask the specialist whether he is interested in participating in the transaction. Rule 127 also requires the specialist to "maintain the same depth and normal variations between sales as he would had he not learned of the block," in other words, to act as though he has not been warned.

In advertising the block, the positioner may find additional interest on the same side as well as on the other side—i.e., in the case of a block to be sold, additional sellers as well as potential buyers—and may agree to handle these shares also. Once the positioner has put together as many buyers and

<sup>29</sup>CTS Activity Report, December 1989. NYSE Strategic Planning and Marketing Research.

<sup>30</sup>These limits vary according to the security—they may be 200 shares, 500 shares, or 1,000 shares.

<sup>31</sup>New York Stock Exchange Guide (CCH) Rule 127.10, sec. 2127.10.

<sup>32</sup>In October 1989 three were 57 firms registered with NYSE as block positioners (source: NYSE) as compared to 66 in 1986, according to the Brady Report, VI-9.

sellers as it can find, the positioner may buy for its own inventory any shares left over, or the specialist may do so when the block is taken to the floor.

When the order is carried to the floor, the negotiated price may be above the current offer or below the current bid. There are elaborate rules to make sure that customers with limit orders on the book at or near the current price will not be disadvantaged, as they could be if their orders were executed just before the price moved as a result of the block trade. Instead, their orders are supposed to be executed at the 'cross' price (i.e., the block trade price).

Because of strong competition among the block positioners, institutional customers pay very low broker commissions. Possibly for this reason, securities firms now appear increasingly unwilling to risk their capital in block positioning. The block positioners have no affirmative obligation to make markets. SEC officials assert that while these block procedures worked well in addressing the volatility encountered with block trading in the late 1960s, they do not handle program trading well, and there is evidence that liquidity for the large blocks may now be decreasing.<sup>33</sup>

There is currently a tendency for large institutional trades to be executed on regional exchanges rather than the NYSE. According to the Midwest Stock Exchange, the reasons are to suppress advance information about the impending trade, and to make it less likely that "others will intervene before the institutional trader can play out a particular (positioning) strategy."<sup>34</sup> Brokers like to put together "crosses" (i.e., to match buyers and sellers) without going through the specialist or the floor crowd so that they can collect commissions on both sides. They may go to a regional exchange to avoid the NYSE limit order book, because in New York "the block probably would have gotten broken up," or a specialist may "try to come in late on a deal that's already established."<sup>35</sup>

## COMPETITION IN STOCK MARKETS

Assessing competition in the stock markets is difficult because of several structural features. First, stock markets involve many services, including execution of transactions, market-making, and information processing and dissemination. Competitors may provide one or more of these services, and a firm that provides one service may either provide or be a customer for another service. Second, the nature of trading requires that competing firms cooperate with one another by adopting standardized procedures that enable the market to function. Finally, the exchanges and the NASD are membership organizations whose goals and practices reflect the interests of their members. The membership of these organizations overlaps. A firm that is a member of all or most of these organizations may oppose practices in one organization that adversely affect the firm's operations in another.

The three areas of competition which have been most controversial since the 1975 amendments are: 1) competition among market-makers, 2) competition among market facilities, and 3) competition among customer orders.

### *Competition Among Market-Makers*

The SEC has been strongly criticized for not moving toward a national market system by forcing the repeal of NYSE Rule 390. That would permit NYSE member firms to compete in OTC markets in listed stocks. This would in turn encourage the development of proprietary electronic trading systems that could become, in a sense, competing exchanges.

There are reasons to approach such radical change cautiously. There is experience with exchange (specialist) markets and with competing dealer (OTC) markets. There is no real experience with a market where traditional floor-based specialists

<sup>33</sup>"Ketchum Says Stock Firms Are Balking at Putting Capital in Block Positions, " 21 *Sec. Reg. & L. Rep. (BNA)* 547, 1989.

<sup>34</sup>Midwest Stock Exchange brochure: *Institutional Traders and Regional Exchanges*.

<sup>35</sup>*Ibid.*

compete with multiple dealers or automated execution systems.<sup>36</sup>

The closest approach to competition of this kind is the “third market” (non-members of exchanges dealing in listed stocks over-the-counter) and the “fourth market” (trading between investors on proprietary electronic trading systems). But these do not show how such a market might develop if the dominant large brokers of listed stocks become market-makers. Experience with Rule 19c-3 indicates that most firms will not make markets in a small number of stocks. If they were able to route orders in all stocks to themselves as market-makers (or even to a neutral electronic facility), market-making might be more attractive.

Some people predict that if Rule 390 were rescinded it would have a negligible impact on the market. Others argue that exchanges would be abandoned and all trading shifted to an OTC market modeled on NASDAQ or on the International Stock Exchange in London. There is disagreement about whether investors are best served by an exchange or an OTC market.

While NYSE members cannot compete on the exchange in market-making for NYSE-listed stocks, there is competition between the NYSE and other markets. Trading of NYSE-listed stocks on regional exchanges, NASDAQ, proprietary trading systems such as Instinct, and overseas markets now accounts for 30 percent of all trades in those stocks and more than 15 percent of the share volume. The third market alone-OTC dealers-accounts for 3.2 percent of volume in NYSE-listed stock. Some dealers now pay brokers for directing order flow to them rather than to exchanges (where the broker would pay a transaction cost).

The NYSE also must compete with the NASD for listings. It has successfully retained almost all of its

listed companies (it is nearly impossible for a corporation to “delist” from the NYSE),<sup>37</sup> and has even lured some large companies from NASDAQ. NASD, on the other hand, has been successful in holding many large companies that qualify for NYSE listing. One measure of NASDAQ’s success is that on many days there are almost as many stocks that trade more than 1 million shares on NASDAQ as on the NYSE.<sup>38</sup>

There were once competing specialists within the NYSE, but the last disappeared in 1967.<sup>39</sup> Now NYSE procedures, customs, and technology are geared to a single market-maker. Another way to get internal competition would be for member firms to compete for the privilege of being the specialist in a particular stock, but the turnover in specialist assignments is very low.

### *Competition Among Market Facilities*

The SEC has also been criticized for not insisting on more competition among market facilities. It approved the ITS instead of pressing for a universal message switch (UMS) that would automatically route brokers’ orders to the market where the best price was being displayed. The critics’ assumption is that a UMS would encourage the regional exchange specialists to more effectively compete by offering better prices than offered by the NYSE or AMEX specialist. The regional systems compete with the NYSE and AMEX through speed and transaction costs under the ITS, but there is no inducement to compete by bettering NYSE prices. They need only match the NYSE price.

The regional exchanges warmly defend ITS.<sup>40</sup> In 1989 the Midwest received more than 10 percent of its trades (15 percent of its share volume) from ITS. The number of stocks listed on ITS has grown from 300 in 1978 to 2,082 (of which all but 300 are NYSE-listed). The number of shares traded on ITS

<sup>36</sup>The American Stock Exchange and the Philadelphia Stock Exchange have a specialist and competing dealers (On the floor) in certain of the options which it trades. However, because of the complexity of options (puts and calls, different prices, and different expiration dates), this may be more an example of sub-markets than a model which would work in the single market for the single class of stock.

<sup>37</sup>To delist its stock voluntarily, a corporation must have two-thirds of the shares voted to delist and no more than 10 percent of the shareholders opposed to delisting.

<sup>38</sup>NYSE and NASDAQ volume figures are not completely comparable, since all NASDAQ trades involve a purchase or sale by a dealer while some NYSE trades involve a direct transaction between two investors. Customer to dealer to customer is two sales; customer to customer is one sale.

<sup>39</sup>In 1933, there were 466 NYSE stocks with competing specialists, in 1963 there were 37.

<sup>40</sup>For example, a vice president of the Midwest Stock Exchange says that ITS “is vital to the continued competitive viability of all market centers that compete with NYSE. . . . Without ITS there would be insufficient liquidity on markets other than on NYSE to adequately service most investor needs.” Allan Bretzer, Oral Statement before the OTA Advisory Panel on Securities Markets and Information Technology, Jan. 22, 1990. Text provided by Mr. Bretzer.

annually has grown from 42,000 in 1978, its first year, to 2.3 billion in 1989.

ITS is not sophisticated; it is simply a communication system. After the 1987 market crash, the SEC concluded that “the present configuration of ITS is not designed to perform efficiently in high volume periods.”<sup>41</sup> ITS has been modernized and expanded since the crash; some of its critics have moderated their criticism. Other critics say that one of the objectives of a national market system is not being fully met—that of inter-market competition.<sup>42</sup> It is still much simpler for brokers to route orders routinely to the NYSE than to spread them among exchanges, especially if the price differences are small or nonexistent. Only with automatic routing of customers’ orders to the market with the best price will regional and OTC market-makers have a full incentive to provide competing quotations. This is a chicken-or-the-egg situation.

Is real market-making competition among exchanges (as they are currently organized) either a realistic or desirable expectation? The benefits of a central market, with a physical floor and specialists to whom all orders are routed, are touted by those who think an electronic market would be fragmented and less liquid. There is some inconsistency in extending this defense to five or six competing floors with specialists, each receiving a portion of the order flow. The regional exchanges have chosen to compete: 1) by offering less expensive service to brokers for the automatic execution of small trades, and 2) enabling block positioners to complete crossed transactions without exposing orders to the NYSE specialist or customer orders on the NYSE floor. Less expensive services may pressure the major exchanges to reduce the costs of executing small transactions,<sup>43</sup> but their services to block positioners may result in denying to customers whose orders have been routed to the NYSE floor an opportunity to participate in the crossed transaction.

The advantages of the regional exchanges for small orders or for block trades might or might not ensure their competitive survival if a UMS routed orders to the market with the best price. A UMS might not strengthen the regional exchanges as competitors with the NYSE but might instead create an integrated electronic market in which all of the exchanges would become only service centers for brokers and issuing companies, and perhaps regional regulatory organs.<sup>44</sup>

### *Competition Among Customers’ Orders*

The most far-reaching criticism of the failure of the SEC to ‘facilitate the establishment of a national market system’ is that it has not pushed for the establishment of a single system in which:

1. all customer orders would have an opportunity to meet,
2. customers’ orders could be executed against one another without the participation of a dealer, and
3. any dealer would be permitted to make markets.

Such a system would differ from today’s stock exchange system (which does not meet the first and third criteria), and from today’s OTC market (which does not meet the first or second). Some experts argue that this would require the SEC to replace the exchanges and NASDAQ with a computerized system in which all orders and quotes would be inserted and all transactions would be executed. Such a system is technically feasible and it would hold the promise of cost reductions in trading securities. The basic questions are: Would it work? Would it be an improvement over the current system? What are the risks? Other possibilities are discussed later in this chapter.

<sup>41</sup> SEC Division of Market Regulation, *The October 1987 Market Break, 1988; Report of the Presidential Task Force on Market Mechanisms, 1988* [the Brady Commission Report]. The NYSE acknowledged that extremely high trading volumes generated backlogs of orders. According to the Brady Report, SEC suggested that ITS might adopt default procedures ensuring that if a commitment to trade was not accepted or rejected during the specified time period, execution would automatically occur.

<sup>42</sup> Seligman, contractor report to OTA, op. cit., footnote 1.

<sup>43</sup> The success of the regional exchanges in this competition can be gauged by the fact that they currently account for more than 30 percent of the trades (not volume) in NYSE-listed stocks, most of their activity being in small trades.

<sup>44</sup> France plans to integrate its regional bourses with an electronic network, and officials anticipate an outcome such as sketched here. See OTA background paper, op. cit. footnote 27.

## THE 1987 MARKET BREAK AND THE PROBLEM OF VOLATILITY

The stock market crash in 1987 focused attention on three important problems—volatility, technological risk, and market-maker performance. Several times in 1986 and 1987 there was extraordinary short-term volatility in the stock market.<sup>45</sup> The break came in October 1987. From the close of trading on October 13, to close of trading on October 19, the Dow fell 769 points, or 31 percent. In the frost hour of trading on October 19, the Dow fell 220 points, or over 11 percent. In all, the drop on that day was 508 points, nearly 23 percent, with a record volume of 604 million shares. On the next day, October 20, there was great volatility, with the market rising nearly 200 points in the frost hour, declining more than 200 points in the next 2 hours, and rising again by 170 points just before closing, with a new volume record of 608 million shares. On the third day the market rose 10.1 percent, the largest one-day rise in history; but there was another one-day fall of 8 percent the following week. These losses were paralleled by similar declines in the U.S. regional exchanges and OTC markets, and in stock exchanges around the world.

Several special studies by task forces, regulatory agencies, and exchanges reached different conclusions about the cause of the 1987 crash.<sup>46</sup> In the following 2 years no general consensus has emerged. Blame has been placed on rising interest rates, trade and budget deficits, decline in value of the dollar, new financial instruments such as stock-index futures, program trading for portfolio insurance, too much and too little inter-market linkage, discussions in Congress about changing tax laws, investor irrationality, over-reliance on computer systems, and under-use of computer systems.

It is also possible that increasing volatility is nearly inevitable given the increased volume of trading, coupled with computerized trading. The average daily volume has increased from about 30 million shares in the mid-1970s to 165 million in 1990. Peaks in volume can go much higher; on October 19, 1987, 604 million shares were traded. The NYSE said at that time that it was preparing—technologically—for a billion share day. The rate of turnover (number of shares traded as a percentage of total number of shares listed) has also been increasing. Between 1951 and 1966, the turnover rate never exceeded 20 percent. Between 1967 and 1979, turnover ranged between 20 and 30 percent; it then began to increase rapidly. Since 1983, turnover has exceeded 50 percent every year, reaching a peak of 73 percent in 1987. This is one of the forces that raises doubts about the continued capability of traditional trading mechanisms to cope with increased pressure.

### *The Debate About Volatility*

Whatever the cause of the 1987 market break, a more persistent concern is the appearance of excessive short-term volatility in the stock market before and since the crash. By *some* estimates the 1987 volatility was roughly twice the level of volatility over the preceding 4 years.<sup>47</sup> On at least four occasions in April, 1988, there were abrupt rises and falls; for example, on April 21, 1988, the Dow fell 36 points in 30 minutes. On October 13, 1989, the market dropped about 190 points, or 7 percent, most of it in the last hour of trading.

Many experts nevertheless deny that there is excess volatility. There is disagreement over how much is “excessive” or how volatility should be measured (e.g., changes in price from day to day,

<sup>45</sup>On Sept. 11 and 12, 1986, the Dow declined 6.5 percent with daily volume of 238 and 240 million shares. On Jan. 23, 1987, it fell 5.4 percent in 1 hour.

<sup>46</sup>Brady Report, VI-47; SEC Market Break Report, 7-48; T-J. S. Congress, General Accounting Office, *Preliminary Observations on the October 1987 Crash, 1988*; N. Katzenbach, *An Overview of Program Trading and Its Impact on Current Market Practices*, Dec. 21, 1987 [the Katzenbach Report]; Commodity Futures Trading Commission, Divisions of Economic Analysis and Trading and Markets, *Final Report on Stock Index Futures and Cash Market Activity During October 1987, 1988*.

<sup>47</sup>Report of the Presidential Task Force on Market Mechanisms, 1988, pp. 2-4. This did not, however, approach the volatility of 1933, when on 10 percent of all trading days there were moves of over 5 percent.



during the day, during half-hour periods, etc.) If stock prices actually reflect “fundamental values,” how much up-and-down movement is inevitable as the market homes in on a consensus about value? Professor G. William Schwert of the University of Rochester concludes that the volatility of rates of return to broad market portfolios of NYSE-listed common stocks has not been unusually high in the 1980s, except for brief periods such as October 1987.<sup>49</sup> Volatility has seemed high to the public, Schwert says, because the level of stock prices has risen over the last 20 years, and a drop of many points is actually a relatively small percentage drop.

Some theorists contend that any attempt to curb volatility makes markets less efficient and is undesirable. But the historical objective of “fair and orderly markets” implies that at some level volatility becomes excessive. Fast rising markets raise fears of “bubbles,” and sudden unexplained drops cause many investors to withdraw from the market.

### *The Debate Over Program Trading*

Many people who are concerned about excessive short-term volatility place the blame on portfolio trading, program trading, portfolio insurance, or index arbitrage. These terms are often loosely used by the media, with considerable overlap. This gives rise to much public confusion. Generally, portfolio trading means the buying or selling in a single order or transaction of a large mixed group (portfolio) of stocks. Some trades involve hundreds of different stocks. “Program trading” means the same thing. It is defined by the NYSE, Rule 80A, as either: a) the buying or selling of 15 or more stocks at one time or as part of a single maneuver, when such trades involve at least \$1 million; or b) index arbitrage. The term usually also means that a computer program is used to guide trading decisions and to route the orders.

Portfolio insurance is a kind of program trading designed for hedging (protecting one’s investment by an offsetting investment or transaction). Portfolio insurance calls for balancing transactions in several markets (e.g., the stock and futures markets) in order to reduce risk. (When the average price of a basket of stock changes adversely, an investor holding a stock-index futures contract covering that basket has locked in the more advantageous price. See ch. 4.) With “passive hedging,” there is relatively little turnover of stock. “Dynamic hedging” portfolio insurance can lead to many large institutional investors deciding to sell baskets of stock (and large blocks of each stock) at the same time, when the stock prices are already declining. This can make the decline even more precipitous.

Several forces caused program trading and associated trading strategies to increase in the mid- 1980s: 1) the growth of investment funds with very large portfolios and a legal obligation to make prudent profitable investments; 2) computers and telecommunications for making complex, multi-asset transactions simultaneously; 3) the development of computer algorithms for managing dynamic trading strategies; and 4) the invention of stock-index futures.

Institutional investors often hold an “index” of stocks, i.e., a portfolio matched to the stocks used in an indicator index such as the Standard and Poors 500 (S&P 500). In this way, fund managers can be sure that their investment fund does at least as well as the market average (and usually no better). About 20 percent of all stock owned by pension funds, for example, is in indexed funds.<sup>50</sup> These institutional investors often use hedging techniques involving stock-index futures (as described in ch. 4) to protect the value of their portfolios. Some of these strategies require rapid switching of assets among stocks, stock-index futures or options, cash, or other markets. They may turn over every share in the portfolio

<sup>48</sup>See, for example: Merton H. Miller, *Financial Innovations and Market Volatility*, Mid America Institute for public Policy Research, 1988; Theodore Day and Craig M. Lewis, “The Behavior of the Volatility Implicit in the Prices of Stock Index Options,” Owen Graduate School of Management Vanderbilt University, June 1988; Steven P. Feinstein, “Stock Market Volatility,” Federal Reserve Bank of Atlanta, *Economic Review*, December 1987; James F. Gammill Jr., and Terry Marsh, “Trading Activity and Price Behavior in the Stock and Stock Index Futures Markets in October 1987,” *Journal of Economic Perspectives*, vol. 2, No. 3, Summer 1988, pp. 25-44; G. William Schwert, “Why Does Stock Market Volatility Change Over Time,” 1989, and other papers on volatility, University of Rochester Bradley Policy Research Center; Robert J. Shiner, “Causes of Changing Financial Market Volatility,” presentation at Federal Reserve Bank of Kansas City Symposium on Financial Market Volatility, Aug. 17-19, 1988; Adrian R. Pagan and G. William Schwert, “Alternative Models for Conditional Stock Volatility,” University of Rochester Bradley Policy Research Center, BC-89-02.

<sup>49</sup>Schwert, “Stock Market Volatility,” New York Stock Exchange Working Paper No. 89-02, December 1989.

<sup>50</sup>The largest pension fund indexed investors are now TIAA-CREF (\$26 billion), New York State and Local (\$15.9 billion), New York State Teachers Fund (\$13.7 billion), California Public Employees (\$13 billion), and California State Teachers Fund (\$12.7 billion). One hundred Percent of these portfolios are indexed (1989). *Pensions & Investment Age Magazine*, Jan. 22, 1990, p. 38.

several times in a year. The effect of program trading on stock price volatility is related to the strategy used to direct the switching of assets. If the strategy calls for selling stock when the price is declining and buying when the price is rising, this “positive feedback” will accelerate price movements and increase volatility. This is particularly so if very large blocks of shares are traded and if many investment funds are using similar trading strategies.

Program trading of all kinds accounts for about 21 million shares a day on the NYSE,<sup>51</sup> about 13 or 14 percent of NYSE trading.<sup>52</sup> About half of the program trading on the exchange is in the form of index arbitrage (trading in order to profit by temporary discrepancies or mispricing between stock and stock-index futures prices). Much of the rest is various hedging behaviors for the purpose of risk management rather than profit on trading volume, but they sometimes lead to behavior similar to profit strategies-rapid shifting of assets.

Just before the 1987 market break, the use of portfolio insurance was increasing rapidly. It is likely that when stock prices fell rapidly on October 19, this triggered selling of stock-index futures, causing their price to fall. This in turn led arbitrageurs to sell stock in order to buy futures, causing stock prices to fall more rapidly. (As discussed in ch. 4, this thesis is still a subject of controversy, and is challenged by the futures industry and its regulators.) The SEC reported that at least 39 million shares were sold by institutions on that day because of portfolio insurance strategies that called for stock

sales either in lieu of futures transactions or as a supplement to them.<sup>53</sup>

On October 19, 1987, portfolio insurance sales accounted for only 15 percent of total sales. The effect may have been magnified for two reasons.<sup>54</sup> First, about half of reported sales are accounted for by direct and indirect market-making (specialist activities, block positioners, arbitrageurs, etc.), so that the portfolio insurer sales were about 30 percent of ‘true sales. The volume of such attempted sales was perhaps twice the volume that insurers were able to complete, again doubling the perceived demand for liquidity. Secondly, market participants could not know how persistent these sales would be, or how far they might go. Specialists saw that their fins’ capital could quickly be exhausted.

Many market participants say that “portfolio insurance” of the kind that provides strong positive feedback loops has been largely abandoned and is unlikely to become popular again, since it failed to protect portfolios. Other observers are skeptical of this conclusion. The more one believes that others have given up portfolio insurance, the more strongly one may be tempted to try to beat the market by using it.<sup>55</sup> Many firms said they were giving up program trading, or some forms of program trading, after the 1987 break, but gradually resumed it. After sharp declines on the afternoon of Friday, October 13, 1989, there were renewed demands for ‘abolishing” or “controlling” program trading, with little attempt to distinguish among the kinds of program

<sup>51</sup>See monthly NYSE Program Trading Releases. In September 1989 program trading amounted to 13.8 percent of NYSE trading; this is about the level of early October 1987, prior to the crash. In 1988, program trading was down somewhat, to about 8 to 13 percent depending on the month. There is large variation from week to week, however.

<sup>52</sup>There is much argument over how program trading volume should be calculated. The NYSE calculates it as the sum of shares bought, sold, and sold short in program trading, divided by total reported volume. Some experts think this is double-counting (the same shares are bought and sold), and would prefer to calculate program purchases as percentage of total purchases, or program sales as percentage of total sales, or program purchases and sales as percentage of twice total volume. However, many transactions do not involve program trading on both sides of the trade; and program trading may have one leg in stock markets and one in futures markets; therefore the NYSE believes that its method is a more reliable indicator of the contribution of program trading to volume.

<sup>53</sup>Securities Exchange Commission, *The October 1987 Market Break*, p. 1.

<sup>54</sup>According to R. Steven Wunsch, then Vice President of Kidder Peabody, in discussions with OTA project staff and in “Phoenix Rising From the Gas@” *Institutional Investor*, December 1988, p. 25. Wunsch also notes that most specialists stayed at their post”. . . and many probably deserve medals for doing so, particularly stock specialists who in many cases suffered severe financial and personal strain living up to their affirmative obligations to make markets. . . .”

<sup>55</sup>A substitute for portfolio insurance developed in the form of brokers writing put options for institutional investors to “insure” their stock portfolios. When stock prices declined on Oct. 13, 1989, these brokers attempted to hedge, or adjust their hedges, by selling stock. This was identified as a contributor to the rapid price decline. CFTC, Division of Economic Analysis, *Report on Stock Index Futures and Cash Market Activity During October 1989*, May 1990, p. 3; SEC, Division of Market Regulation *Trading Analysis of Oct. 13 and 16, 1989*, May 1990, p. 5.

trading or determine exactly how it could be controlled.<sup>56</sup>

To the extent that “program trading” means the trading of diversified portfolios or “baskets” of stock simultaneously (with or without the assistance of computers), it is probably an essential procedure for institutional investors trying to manage very large portfolios. A “blue ribbon panel,” established by the NYSE to consider the problem after the 1989 market break, did not recommend restraints on program trading.<sup>57</sup> Significant restraints on the practice would certainly run the risk of driving institutional funds into off-exchange or foreign markets where much program trading is already done. According to the NYSE, in a recent week, 78 percent of program trading (in equities) took place on that exchange, 5.2 percent in other domestic markets, and 16.8 percent in foreign markets.<sup>58</sup> Some of this program trading was done in the “fourth market”<sup>59</sup> on two electronic, off-exchange, trading systems: Instinet’s “Crossing Network” (owned by the British company, Reuters), and “Posit,” a system operated by a Los Angeles brokerage firm.<sup>60</sup> Currently only about 400 institutions trade over these systems. Many of the large program trades cannot be executed on these systems because of limited liquidity. However, if program trading were to be forbidden on the exchange, these systems could become a preferred alternative.

Whether it is possible or wise to reduce program trading by abolishing stock-index futures, by adjusting their margin requirements, or by changing the way in which they are regulated, is another question, which is considered further in chapter 4. The question here is whether or how markets can be helped to cope with the problems that arise when many large investors make instantaneous sales (or

purchases) of large baskets of stock. One approach is the increased use of “circuit breakers”—techniques for halting trading when prices move rapidly.

### *The Debate About Circuit Breakers*

The perception of excessive short-term volatility raises the issue of circuit breakers, which were first widely advocated after the 1987 crash, especially by the Brady Report. Circuit breakers are procedural or operational ways of halting trading when there is an abrupt or sustained decline in market prices and a volume of trading that threatens to overload the markets’ capacity. Circuit breakers may be designed to be triggered by price limits, volume limits, order imbalances, or trading halts in a related market.

Critics, including free-market advocates, claim that circuit breakers unfairly prevent some investors from leaving the market when they are frightened. This, they say, makes panic worse, and sell orders pile up until the dam breaks. Circuit breakers also inhibit use of some hedging and arbitrage strategies.

Proponents say that circuit breakers allow time for people to consider fundamental values, for traders to determine who is solvent, for credit to be arranged, and for imbalances to be advertised so that bargain hunters can be located and get into the market. Circuit breakers could counter the “illusion of endless liquidity” that tempts institutional investors to try to sell huge amounts of stock quickly.

Market breaks produce ad hoc circuit breakers, in any case. Technological systems overload and break down; some market-makers abandon their posts; communications become chaotic. But to be effective, circuit breakers must be mandatory, be in place

<sup>56</sup>Shearson Lehman Hutton announced in October 1987 that it would not do program trading for itself, and announced in October 1989 that it would do no program trading for customers. Many other securities firms took similar actions. Several stock-issuing companies were reported to be putting pressure on securities firms to end program trading; the chairman of Contel Co. said program trading was turning the NYSE into “a gambling casino.” William Power, “Big Board Faces Fight on Trading,” *Wall Street Journal*, Nov. 30, 1989. See also, Sarah Bartless, “Wall St.’s 2 Camps,” *New York Times*, Oct. 23, 1989, D1; Alan C. Greenberg, Chairman of Bear, Stearns, & Co., “How To Reduce Stock Market Injury Potential,” letter to the editor, *New York Times*, Nov. 14, 1989. In May 1990 Kidder Peabody resumed program trading.

<sup>57</sup>The panel was made up of 19 corporate executives and business leaders chaired by Roger B. Smith, chairman of General Motors Corp. It reported to the exchange on June 12, 1990.

<sup>58</sup>In the preceding weeks, the comparable percentage figures were 78, 8.7, and 13.3. NYSE Weekly Program Trading Data, Mar. 20 1990; data was for the week of Feb. 20-23.

<sup>59</sup>“Fourth market” refers to off-exchange (i.e. directly between institutions) trading of stock that is listed on an exchange. Exchanges are the first market and OTC dealers make up the second market; OTC trading of listed stock is the third market.

<sup>60</sup>About 13 million shares are sold daily on Instinet, according to Reuters; the number sold on posit is not known. Most of the “fourth market” program trading does not involve stock-index futures, but is for the purpose of liquidating or balancing a portfolio after exchange closing. All of Instinet’s Crossing Network trades and 10 percent of Posit trades are executed after NYSE’s close-of-business, at closing prices.

ahead of time and hence predictable, and be coordinated across stock, futures, and options markets.

Some circuit breakers were put into effect by exchanges following the crash, and others have been proposed. Under specified conditions, the stock exchanges and futures exchanges execute coordinated halts for 1 or 2 hours. This formalizes ad hoc procedures used during the crash (when, for example, the Chicago Mercantile Exchange (CME) suspended trading of stock-index futures in reaction to halts of trading of individual stocks on the NYSE). Some circuit breakers are designed to interrupt program trading rather than halting all trading. The NYSE has adopted a circuit breaker that is activated if the Dow declines or advances 50 points or more in 1 day. It prohibits members from entering program trading orders into the, SuperDOT system. When it was first applied on a voluntary basis, 13 of 14 exchange members then engaged in index arbitrage continued program trading manually instead of by computer. More arbitrage selling was done for customer accounts during this voluntary restraint than before it was imposed.<sup>61</sup> Under an NYSE rule that replaced the voluntary collar, when the stock-index future traded on CME (S&P 500) falls a certain amount, program trading orders will be automatically routed by SuperDOT into a separate file (a "sidecar") for delayed matching and execution.

An NYSE panel, created after the October 1989 market break to consider the problems of program trading and excessive volatility, has recommended new and stronger circuit breakers to halt equity trading in all domestic markets when the market is under pressure.<sup>62</sup> A movement in the Dow Industrial Average of 100 points (up or down) from the previous day's close would call for a 1-hour halt; 200 points would call for 90 minutes, and a 300 point movement would call for a 2-hour pause.

The proposed Stock Market Reform Act (H.R. 3657) would give the SEC authority to suspend trading in stocks and options for up to 24 hours during a 'major market disturbance.'<sup>63</sup> With Presi-

dential approval, the SEC could extend this for two additional days. (Congress is considering whether the SEC should be given regulatory authority over stock-index futures. Such authority would enable the SEC to coordinate trading halts across markets.) The Market Reform Act would also give the SEC authority to require large-trader reporting, that would improve the Commission's ability to monitor inter-market trading and effectively analyze the results of program trading.

In the meantime, the SEC is being urged to reconsider the oldest form of circuit breaker, the "short sale" rule. Rule 10a-1, adopted in 1938, prohibits traders from selling stocks short<sup>64</sup> when the price is falling. If prices fall and traders believe that the price will continue to fall, they can profit by selling short. This would accelerate a price decline. Efficient-market theorists and many practitioners argue that Rule 10a-1 keeps market professionals from immediately expressing new information, thereby distorting the market function of price discovery. They say, moreover, that the rule is ineffective against panic selling and can be circumvented by trading stock in London. Defenders of the rule point out that negative expectations are not 'new information,' and that selling short on down-tick merely manipulates the price to the practitioner's advantage. The SEC last reviewed the rule in 1976 but declined to abolish it, and is not expected to do so in the immediate future.

## THE 1987 MARKET BREAK AND THE PERFORMANCE OF MARKET-MAKERS

The 1987 market break also exposed problems with the ability of market-makers to respond to the challenges of rapid downward price movement and unprecedented high volume. The performance of exchange specialists and OTC market-makers was criticized. One lesson that may be drawn from the market break, however, is that neither the specialist system nor a system of competing market-makers

<sup>61</sup>Memorandum to SEC Chairman Ruder from Richard G. Ketchum, Director of SEC Division of Market Regulation July 6, 1988. The event described was on Apr. 14, 1988.

@sw footnote 57 for the makeup of the panel.

<sup>63</sup>The Commodity Futures Trading Commission, which regulates futures markets, already has this power. The SEC can now suspend trading for 24 hours but only with prior Presidential approval.

<sup>64</sup>Selling short is the practice of selling borrowed stock, or stock that one does not yet own. It is done in the belief that one can, before settlement, buy the stock to be delivered at a lower price than one has sold it for, thus making an instant profit.

can assure liquidity in a period of intense selling pressure caused by aggressive trading institutions.

### *NYSE Specialists*

NYSE specialists were net buyers of 9.7 million shares between October 14 and 16, 1987, and made net purchases of 21.2 million shares on October 19, in a futile effort to stem the tide. They were “often the primary, and sometimes the only, buyers” during the crash.<sup>65</sup> By the end of trading on October 19, however, 13 of the 55 specialist units had no buying power left. On the next day, October 20, specialists were net sellers of 9.1 million shares.<sup>66</sup> By contrast, “upstairs firms” (non-specialist members) sold a net 7.6 million shares from their own inventory from October 14-16, and were net sellers of 4.5 million shares on October 19 and 9.6 million shares on October 20.

The President’s Task Force on Market Mechanisms (the Brady Task Force) evaluated the NYSE specialists’ performance during the crash. It reported that as the market collapsed, most specialists “were willing to lean against the downward trend in the market at a significant cost to themselves.”<sup>67</sup> But there were exceptions. Of 50 specialists, 30 percent were net sellers on October 19. Of 31 stocks on October 20, specialists contributed to, rather than countered, the market’s fall in 39 percent. The Brady Report acknowledged that some of the poor performance by specialists may have been caused by “exhaustion of their purchasing power following attempts to stabilize markets.” For others, however, it seemed hopeless to attempt “to stem overwhelming waves of selling pressure.”

Studies after the 1987 market break confined that the performance of specialists is highly variable. Some specialists fulfill their obligations to “lean

against the market’ more aggressively than others. The SEC criticized the NYSE for not using its power to punish specialists for poor performance during the preceding 10 years by reallocating their stock to other specialists.<sup>68</sup> After the crash, however, the NYSE reallocated 11 stocks from 7 specialist units, and in 1989 reallocated stock from another specialist unit. The SEC, in its report on the market break, suggested that the NYSE develop regular comparative evaluations with a view to reassigning stocks from less effective to more effective specialists. The NYSE rejected this suggestion at the time. However, in 1990, the exchange began an experiment with a specialist performance questionnaire system, scored entirely on the basis of relative ranking of specialist units’ performance. After further experience, the exchange intends to develop formal performance standards.<sup>70</sup>

In June 1988 capital requirements for specialist firms were substantially increased over those that prevailed during the 1987 crash. Each specialist unit or firm must be able to buy or sell 15,000 shares of each common stock in which it is the registered specialist. Each must have additional net liquid assets equal to 25 percent of those position requirements or \$1 million.<sup>71</sup> Some market professionals conclude that the capitalization of specialist firms—in the context of growth in market volume and market capitalization—is inadequate and will become more inadequate. Stanley Shopkorn, Vice Chairman of Salomon Brothers, Inc., says:

New York Stock Exchange specialists in the aggregate have slightly over a billion dollars of capital. . . . [T]his capital cannot make a meaningful contribution to stability on days when \$15-25 billion in stock changes hands on the exchange.<sup>72</sup>

<sup>65</sup>SEC Division of Market Regulation *The October 1987 Market Break*, February 1988, Pp. 4-24 to 4-26.

<sup>66</sup>Data in this paragraph on specialists’ and upstairs firms’ performance was supplied to OTA by the NYSE, Apr. 17, 1990.

<sup>67</sup>Report of the Presidential Task Force on Market Mechanisms, Op. Cit., footnote 41, PP. 49-50.

<sup>68</sup>SEC, *The October 1987 Market Break*, op. cit., footnote 41, p. 4-29. When in 1972 the SEC assembled evidence of poor performance by 14 specific specialists, the Exchange committee on Floor Affairs (of whose 11 members 7 were specialist) refused to take disciplinary action, citing as extenuating circumstances “unusual market conditions” or “thinness of the book.” This is summarized in U.S. Congress, Senate Committee on Banking, Subcommittee on Securities, 4 *Securities Industry Study Hearings*, 92d Cong. 2d sess., 1972, pp. 34-46.

<sup>69</sup>Between 1984 and 1989, the NYSE censured, suspended, and/or freed 28 specialists, and barred 4 specialists either permanently or conditionally from membership, employment, or association with any member firm. Source: New York Stock Exchange.

<sup>70</sup>Correspondence from the NYSE, July 1990.

<sup>71</sup>Note that upstairs firms on Oct. 19, 1987, were net sellers of 4.6 million shares; if the average price at sale were \$30, it would require \$138 million to offset these one-day sales, averaging \$3 million per specialist firm. On Oct. 20, upstairs firms sold yet another 9.6 million shares.

<sup>72</sup>From a letter signed by Mr. Shopkorn and sent to clients of Salomon Brothers, Inc., and reprinted with permission in *Commodities Law Letter*, November-December 1989.

In 1986, before the crash, the NYSE and AMEX had implicitly acknowledged strains on the specialist system by requesting and getting SEC approval for rule changes to encourage large broker-dealer members to become (buy or affiliate with) specialist firms.<sup>73</sup> The Commission hoped that:

The financial backing of well-capitalized upstairs firms would serve . . . to strengthen the financial resources available to specialists to withstand periods of market volatility.

However, no broker-dealer acquired a specialist firm until the crash, when Merrill Lynch acquired the financially troubled A.B. Tompane, Inc. Acquisitions were later approved for Bear Stearns & Co. (already a specialist firm), for Drexel Burnham Lambert, Inc. (now bankrupt), and for Smith New Court, Carl Marks, Inc., only four approvals since the rule change.

Both SEC and NYSE reports on the 1987 crash noted the problem of the market's ability to absorb institutional portfolio trading. The reports recommended developing a "basket-trading product" that could restore program trades to more traditional trading techniques. Such a product could provide better information "by identifying program trade executions and overhanging program orders in individual stocks, and provide an efficient mechanism for trading, clearing, and settling baskets [of stock] in a cost-efficient way."<sup>74</sup>

A basket product was approved for trading in late 1989. "Exchange Stock Portfolios" or ESPs are standardized baskets of stocks traded at an aggregate price in a single execution on the exchange's stock trading floor. The initial contract contains the 500 stocks represented in the Standard and Poor 500 Index, and is designed to sell for about \$5 million. It is subject to normal margin requirements.<sup>75</sup>

The NYSE elected not to use the traditional specialist system to trade ESPs. Instead, it developed a special adaptation that makes use of advanced

information technology. The ESPs, or basket contracts, are assigned to "competitive basket market-makers" (CBMMs) who are not required to be on the floor, as are specialists. They operate upstairs, using special terminals. They do have affirmative obligations as do specialists.<sup>76</sup> However, there has been almost no trading in ESPs since their introduction.

Block trading procedures, the 1986 rule change and the increased specialist capitalization requirements, and the competitive market-maker arrangements for ESPs, are all intended to reduce the strains on the specialist system, as markets try to adapt to increasing pressures.

### *OTC Market-Makers*

The competitive OTC market-makers also performed poorly during the market break. Volume on NASDAQ jumped to 223 million shares on October 19, and reached record levels of 284 million and 288 million on October 20 and 21. (However, NASDAQ share volume on October 19 increased only 49 percent over its average daily volume of the preceding 9 months.)<sup>77</sup> This points to differences in the functioning of the exchange and OTC markets. The NYSE had to halt trading in many stocks for long periods on October 19 and 20. On the other hand, the Brady Task Force found that there were trades reported in 36 of the 50 leading NASDAQ stocks during each quarter-hour on those 2 days and for the remainder of those 50 stocks, trades were not reported in only one or two 15-minute periods. However, the volume of trading that customers were able to do in the OTC market was far less than the volume on the exchanges, as many market-makers either withdrew, ignored telephone calls, or only traded the 100-share minimum they are required to accept.

Prior to the break, 46 of the 50 top NASDAQ market-makers participated in the Small Order Execution System (SOES), in which they are obli-

<sup>73</sup>This had not been prohibited before, but was discouraged by prohibitions or restrictions on member firms trading securities that were assigned to specialist firms affiliated with them. See SEC Release No. 34-23765, Nov. 3, 1986.

<sup>74</sup>SEC Rel. 34-27382, Proposed Rule Changes Related to Basket Trading, approved Oct. 26, 1989.

<sup>75</sup>That is, users must put up 50 percent initial margin and maintain 25 percent maintenance margins, as with other stock transactions.

<sup>76</sup>CBMMs may make proprietary bids and offers only in a manner consistent with maintaining a fair and orderly market, must help alleviate temporary disparities between supply and demand, and must maintain a continuous two-sided quotation in the basket product subject to a specified bid-ask parameter. CBMMs must meet a \$10 million capital requirement over and above other capital requirements. They are treated as specialists for margin purposes.

<sup>77</sup>NASDAQ Shine volume, which was equal to more than 80 percent of NYSE volume in the weeks prior to the market break, was equal to only 37 percent of NYSE trading on Oct. 19, 47 percent on Oct. 20, and 64 percent on Oct. 21. Brady Report at VI-50.

gated to buy or sell up to 1,000 shares. (Participation in SOES was then voluntary.) At times during the break, up to one-third of these firms completely withdrew from SOES (thus reducing their exposure to the 100 shares mandated by NASDAQ for non-SOES transactions) and others reduced the number of securities in which they were SOES participants.<sup>78</sup>

Non-SOES trading also became difficult, because market-makers' telephone lines were overloaded and some market-makers simply stopped trading. Market-makers withdrew from 5,257 market-making positions (over 11 percent), according to the SEC.<sup>79</sup> NASD maintains that these may have been inactive positions that were abandoned to allow market-makers to concentrate on more important active positions. The average spread of NASDAQ quotations expanded by over 36 percent.

## THE 1987 MARKET BREAK AND THE LIMITATIONS OF TECHNOLOGY

Experience during the market break indicates that information technology, if not developed and utilized wisely, can worsen imbalance and volatility instead of correcting them. All markets had pile-ups of sell orders that could not immediately be executed and therefore overhung the markets for long periods. The NYSE'S SuperDOT system, designed to make trading by small investors more economical, was overwhelmed by institutions executing their program trades. However, the order pile-ups could have been worse without the technology. Almost certainly clearing and settlement mechanisms would have failed.

The NASDAQ Small Order Executive System (SOES) was disabled by "locked" or "crossed" quotations (i.e., bid quotes equal to or higher than asked quotes). SOES was programmed to require human intervention when that occurred.

The consolidated tape system became overloaded and there were several computer breakdowns at SIAC. These were mostly isolated incidents that were quickly remedied.<sup>80</sup> But prices of derivative products such as stock-index futures depend on last

transaction prices for stocks. Even short delays in reporting those prices can lead to spurious discounts of index futures prices to stock prices. This could cause volume surges on one or the other markets, generated by computer-trading strategies.

After October 1987, the exchanges and the NASD increased the capacity of their systems and took steps to prevent repetition of the practices which made it impossible for public customers to get their orders executed. The NYSE increased the capacity of its SuperDOT system and the number of electronic display books, increased the capacity of the Intermarket Trading System, and constructed a second SIAC data processing facility. The NYSE says it could now handle 800 million trades in 1 day. It now gives small orders of individual investors priority in routing to the specialist when markets are stressed. The NASD made SOES participation mandatory for all market-makers in National Market System securities. The system was modified so that it will continue to execute orders even when quotations are locked or crossed. An order confirmation and transaction service (OTC) was put in place so that dealers can negotiate trades and confirm executions through NASDAQ when they cannot do so by telephone. Other forms of automation have also been put in place, including an Automated Conflation Transaction service that allows telephone-negotiated trades to be "locked in" through automatic reporting, comparison, and routing to clearing organizations.

## AUTOMATION AND STOCK MARKETS: THE FUTURE

The fundamental problems with technology during the crash may have resulted from the fact that the automated systems currently in use in the securities markets were designed for the purpose of facilitating, not replacing, preexisting trading practices. The Brady Report stated in assessing the performance of the NASD'S automated system, but in language that is equally applicable to the automated systems on the exchanges:

Many of the problems emanated from weaknesses in the trading procedures and rules which were programmed into the automated execution sys-

<sup>78</sup>Brady Report, *op. cit.*, footnote 41, VI-53.

<sup>79</sup>SEC, *October 1987 Report, op. cit.*, footnote 41, pp.9-19.

<sup>80</sup>*The October 1987 Market Break, op. Cit.*, footnote 41, pp. 7-3 t" 7-7.

terns. . . From the beginning . . . each advance in automating the market was greeted with apprehension by many if not most of the market makers . . . To ease that apprehension and, more importantly, to sell the systems to its membership, the NASD found it necessary to build in trading procedures and rules which were not necessarily aimed at achieving the most efficient trading system but were believed necessary by the membership to protect their economic interests. . . Unfortunately many of these compromises came back to haunt the over-the-counter market during the October market break.<sup>81</sup>

This judgment applies to exchanges as well as OTC dealers. The American stock markets have by and large used technology to facilitate and support, rather than replace, traditional trading methods and practices. The exchanges and OTC markets have each automated some of their functions (order routing, data display and communication, monitoring and analysis, and small order execution), but they have preserved the central role of the market-maker.

### *Domestic Exchanges of Tomorrow*

The capabilities of information technology in data collection, matching, aggregation, manipulation, storage, and dissemination have enormously increased over the last four decades and can reasonably be expected to make comparable advances over the next four decades. The limitations and vulnerabilities of information technology are also becoming better known. Information technology could be used more extensively for automatically routing orders among market-makers, matching like-priced bids and offers, automatically executing and recording the transaction, carrying it through the clearing and settlement process, and providing an audit trail for regulatory purposes.

Alternatively, technological and personal-intermediation trading systems might be operated in parallel, with the customer and/or broker given a choice. Technology might be used to change the nature of exchanges from continuous auctions to periodic single-price auctions, or to offer other alternative trading mechanisms—some of which are growing up around and outside of traditional securities markets, as proprietary trading systems. The fundamental policy question is whether it is desirable to encourage and facilitate the replacement of the

current exchange and OTC market structures with fully automated trading systems, or to allow this to happen incrementally, slowly, or not at all. There are assuredly risks in either course.

Proponents of computerized trading systems say that they provide more information more equally to all participants, reducing the advantage that market professionals have over public investors, and that they would provide better liquidity by encouraging bids and offers anonymously from all geographical locations and aggregating them for all to see—thus encouraging new buyers (or new sellers) to enter the market when an imbalance exists and bargains are to be found.

Opponents of computerized trading systems extol the advantages of personal presence on the floor for both stimulating and gathering or perceiving information (i.e., better price discovery), and providing the incentives for vigorous trading. They stress the advantage to investors of the obligation of the specialist to assure liquidity and immediacy, and the specialist's ability to negotiate prices. Opponents of electronic markets also insist that specialists (or other intermediaries and market-makers) are uniquely able to position and manage large block trades.

The SEC has approved Rule 144a, to allow institutional investors to trade unregistered securities (usually corporate bonds) without the financial disclosure otherwise required. In the past, investors who bought private placement securities often had to hold them. Now the market should be more liquid, and many foreign corporations may participate. But there is a real risk that such developments may accustom institutional investors to using electronic trading systems off-exchange, and in so doing create a two-tiered market where the best prices and deals occur in an electronic market for institutions only, while individuals are left in outmoded physical markets.

The only example of a fully automated trading system in the United States is the Cincinnati Stock Exchange. Its National Securities Trading System is a "black box" that lets brokers instantly execute orders up to 2,099 shares through the computer. Bids or offers are entered automatically, the highest bid or lowest offer is filled first, and identical bids/offers are taken in the order in which they arrived, except that public orders take precedence over specialist or

<sup>81</sup> Brady Report, *op. cit.*, footnote 41, VI-52-53.



dealer orders. However, the Cincinnati Stock Exchange failed to attract customers and does little business (0.46 percent of trades in NYSE-listed securities in 1989). The Exchange is now only a computer at the Chicago Board Options Exchange, of which it has become an affiliate.

A number of securities markets in other countries have recently installed computerized trading systems. The Toronto Stock Exchange has a Computer Assisted Trading System, or CATS. This is an order-driven system. Those wishing to trade put their orders (with price and size of the order) into a computer that establishes a queue of bidders and offerers arranged first by price, and then by the time of arrival of each order at that price. The computer also displays the number of shares offered or bid for. When the order at the top of the queue is filled (that is, when the offer is taken or the bid accepted) it is replaced by the next order at the same (or the next best) price. A complete record of all trades is automatically generated. In this system, there is still a "registered trader" who is committed to buy or sell for his own account when the size of orders does not match—i.e., when the number of shares offered at the best price is not sufficient or is in excess of the number of shares bid at the matching price. Equity, futures, and options "floor traders" use CATS to maintain their responsibilities for designated stocks and to trade on their firm's or their own behalf. Other users are upstairs traders, with CATS terminals on their desks.<sup>82</sup>

CATS now handles about half of Toronto-listed stocks and 22 percent of the **total** trading volume **on the exchange**. Toronto also has an electronic execution system for small-sized floor transactions. As a result, automated assistance applies **to at least 75 percent** of Toronto trading. The volume of trading in Toronto is, however, extremely small compared **to that at the NYSE**. Only about 50,000 trades a day, on average, are done on CATS, with a projected **maximum** trading capability of 250,000 trades.

Interviews at the Toronto Exchange indicate a high degree of support and enthusiasm for the

automated systems, as allowing the exchange 'to be more competitive in the cost and level of service. . . .'<sup>83</sup> Some skeptics feel that the CATS will not be able to handle the needs of traders for the kind of information **that they think comes** only from perceptive observation on the trading floor. Others are concerned that an attempt to improve market quality and service might have an opposite effect. It could give people with sophisticated computer support an unfair advantage over others, and encourage institutional dominance of the market. Some are concerned that computer techniques could encourage market manipulation (in Canada, surveillance has historically not had adequate computer support).<sup>84</sup> Finally, there is a concern that a failure in computer systems could cause catastrophic losses.

Other foreign exchanges are also automating. The Paris Bourse, the Belgian Bourse, the Spanish exchanges, and the Sao Paulo exchange in Brazil have all adopted CATS. The Copenhagen stock exchange is being restructured and will eventually include three automated trading systems, one based on CATS.

As another possible alternative **to the current** systems in the United States, several experts argue that a computerized single-price auction should either supplement or replace the continuous auction market and the specialist function.<sup>85</sup> In a single-price auction, trading takes place at specific times, as contrasted with a continuous auction market. All outstanding bids and offers are collected, compared by computer, and executed at the price that will come closest to clearing the market. Bids above or offers below the clearing price are held for the next round. A single-price auction might be held once or twice during a trading day, with a continuous auction on the side for those who want to trade immediately. It would provide an automated and open display of the specialist book. It might replace the specialist system, because "a continuous market requires the participation of a dealer who is willing to trade

<sup>82</sup>Contractor Report on Canadian Market Systems, prepared for OTA by Digital Equipment of Canada, Limited (Robert G. Angel, marketing manager, Capital Markets), July 241989. Hereafter cited as "Digital Report to OTA."

<sup>83</sup>Ibid. The report also describes extensive upgrading and enhancement in the Montreal Exchange, with introduction of a FAST automated trading system which includes a screen based knit order book with executable orders.

<sup>84</sup>Digital Report t. OTA, op. cit., footnote 82, p. 4.

<sup>85</sup>Steven Wunsch, in written communication to OTA, February 1990; see Steven Wunsch, "SPAworks-The Single Price Auction Network: Question-and-Answer Series," manuscript provided by author; and Joel Chernoff, "Trading Plan Stirrs Debate," *Investment Age*, July 25, 1988.

immediately, while a call market can operate without dealers.’<sup>86</sup>

It may also be necessary to consider whether the national market system that might evolve because of current economic pressures should be a unitary system, or should include “subsystems for particular types of securities with unique trading characteristics,” as contemplated by the 1975 amendments.<sup>87</sup> The NYSE and the AMEX use the same trading system for all listed stocks, regardless of the level of trading activity, even though this varies from fewer than five trades per day for some stocks to several hundred, or more than a thousand, trades in a day for others. On the Tokyo Stock Exchange, by contrast, the trading of the 150 most active stocks is done though a continuous auction process (without the intervention of dealers), while 2,000 less active stocks are traded by matching orders through computer terminals. The early development of proprietary trading systems operated by market data service vendors (and soon by U.S. futures exchanges) is discussed in chapter 7.

### *Around-the-Clock, Around-the-Globe Trading*

U.S. OTC dealers, through the National Association of Securities Dealers, have begun several initiatives aimed at competing in international markets. NASD is installing computer facilities in London to extend the NASDAQ network to the United Kingdom. In September 1990 NASDAQ will begin “dawn trading sessions,” beginning at 3:30 a.m. e.s.t., to coincide with the London opening and continuing until just before the regular NASDAQ trading day begins at 9:30. In addition, NASD has opened the “PORTAL” system for electronic trading by institutional investors of private placement stock issues around the globe.

Until mid-1990, there was no discernible movement by security exchanges to recognize the growing international securities markets, or to prepare for 24-hour trading.<sup>88</sup> In June 1990 the NYSE announced that it was planning a five-step process “to prepare for continuous 24-hour trading by the year

2000.’ The NYSE’S plan is conservative, cautious, and limited in scope.

The first step consists of proposed rule changes filed with the SEC a year ago. It would extend pricing procedures now used on “expiration Fridays,”<sup>89</sup> which guarantee that already-paired orders received at “close-of-market” will be executed at the market’s closing price. These trade executions can be done within a few minutes after the exchange closes. This change, to be implemented as soon as approved by the SEC, merely seeks to recapture some of the trades now done in Tokyo or London after the NYSE closes.

The second step would involve a 45-minute “crossing session” immediately after the end of the trading session, using SuperDOT Members could, as the market closes, submit either matched or unmatched orders, to be executed on a first-in, first-out basis at the closing price. This step too is intended to recapture trades now lost to London, by letting index arbitragers rebalance or close-out their positions. A third step would add to this a second “crossing session” of about 15 minutes, in which paired orders that are part of inter-market trading strategies (i.e., related stock/stock-index futures or options transactions) could be completed rather than being done on the domestic fourth market (i.e., Instinct or Posit).

The fourth, and comparatively more daring, step could involve several single-price auctions—as described above—in which all 1,700 listed stocks might trade. These computer-assisted auctions might occur, for example, at 8 p.m., midnight, and 5 a.m. e.s.t. The NYSE says that these “pricing sessions” would be essentially the same procedures now used by the specialists to open each day’s trading system; but it is not yet clear whether they would involve a dealer or even the daytime specialist firm.

Only the fifth step, which the NYSE does not envision occurring for another decade, would allow continuous 24-hour trading, possibly but not surely from remote locations. NYSE officials are not convinced that there is or will be any real demand for such trading until 2000.

<sup>86</sup>Stoll, *op. cit.*, footnote 12, p. 3.

<sup>87</sup>Securities Exchange Act 11A(a)(2).

<sup>88</sup>See OTA background paper, *op. cit.*, footnote 27.

<sup>89</sup>The last Friday in each annual quarter, on which stock-index futures and stock-index options expire—the “triple witching hem.”

Immediately after the NYSE announcement of its plans, which would not have been made so soon except that they were prematurely disclosed by the press, three other stock exchanges (the AMEX, the Cincinnati, and the Chicago Board Options Exchange) announced that they were working with Reuters to develop plans for systems for eventual 24-hour trading. U.S. futures exchanges and Reuters have already developed a system (GLOBEX, described in ch. 4) for global trading of futures contracts. The NYSE strategy emphasizes the need to encourage many brokers and vendors to plan ways

to supply the services NYSE would need for providing global access to investors, to avoid “becoming the captive of one vendor. The suggestion here is that when the original contract between exchange or exchanges and a vendor expires, exchanges could be left without a viable mechanism for serving (and monitoring) remote members. With the NYSE strategy, however, vendors may decide independently to offer transaction services before the NYSE target year of 2000. These risks have to be compared in planning strategy for the future.