

**New York Stock Exchange
Systems and Trading Procedures**

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Preface

This paper provides a selective description of New York Stock Exchange systems, trading rules and procedures. The paper's primary objective is to provide researchers with a detailed institutional framework for studying quote and transaction data generated by U.S. securities trading. It is also meant to serve as a guide to the New York Stock Exchange system, for economics, business and legal scholars needing a reference aid for their research. Among the topics examined are: order entry and execution, trade and quote reporting, the audit trail, SuperDot, the Intermarket Trading System, crossing orders and the upstairs positioning of large block trades. The paper provides descriptions of New York Stock Exchange systems, rules and procedures that are constantly changing, as they were at the beginning of 1993.

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1. Introduction

This paper provides a selective description of New York Stock Exchange systems, trading rules and procedures.¹ The paper's objective is to provide researchers with a detailed institutional framework for studying and interpreting quote and transaction data made available by the Exchange.² The Exchange makes these data available to researchers in order to assist their research and teaching on U.S. securities markets and to enhance their contribution to the public policy process.

The Exchange's information and trading systems are many and diverse, and the Exchange's rules are often complicated. Over the years, the Exchange has adapted existing computer systems to take advantage of new technologies and to accommodate the changing needs of the marketplace. At the same time, the Exchange has introduced new systems alongside the old. As a result of this process, closely related functions may in fact be handled by completely different systems. Trades and quotes, for example, constitute the basic feed from the floor to the outside world. External subscribers see both seamlessly juxtaposed on their display screens. Yet almost from the moment these data are "produced," they follow distinct pathways that have important ramifications for researchers.

The complexity of some of the trading rules reflects the Exchange's attempt to balance the often conflicting and constantly changing needs of its diverse constituencies. For example, the intricacies of the rules governing the crossing of orders (see page 33) reflect the Exchange's attempt to maintain the auction market's order-exposure principle while accommodating the desire of member firms to explore interest "upstairs" before bringing certain large orders to the

¹ The paper assumes that readers already possess a passing familiarity with the NYSE. An excellent source of background reading is Schwartz (1988). The paper makes no attempt to be comprehensive. For example, it does not examine the role and regulation of specialists, both extremely important components of the NYSE market. For more details on specialists, see Hasbrouck and Sofianos (1992).

² The paper is designed to help users of the Exchange's TORQ and TAQ databases. The TORQ database (available on a single CD-ROM) is a three-month sample of quote, trade, system order and audit trail data (for details, see Hasbrouck (1992)). The NYSE plans to start releasing (also on CD-ROM) the TAQ database in early 1993. TAQ will provide, on an on-going basis, transaction and quote data for all NYSE, Amex and NASDAQ NMS issues. Historical quote and transaction data are available from the Institute for the Study of Securities Markets (ISSM).

floor.

The paper is arranged as follows. The next section describes the physical layout of the trading floor and identifies the key participants, their location on the floor and their functions. This description provides a spatial framework for what follows. Sections 3 through 6 discuss the Exchange's main information systems, the information that flows among the participants and the progression of the trading process. The four systems examined in these sections may be functionally described as order processing, trade reporting, quote reporting and the audit trail. Together these systems follow the chronological sequencing of trading activity. An order arrives and is acted upon (by execution, cancellation, etc.). If there is a trade, the transaction must be reported to the parties in the trade and to the world at large. If there is a quote change, this too must be reported. Finally, there must be a reconciliation of the two sides of the trade for clearance and settlement purposes. This information is also captured in the audit trail for surveillance purposes. Section 7 summarizes the Exchange's Rule 390, while sections 8 and 9 describe SuperDot and the Intermarket Trading System, respectively. Later sections discuss variations on the basic trading process: stopped stock, crossing orders, the upstairs market, circuit breakers, etc.

2. The NYSE Floor: Layout and Participants

The NYSE equity trading floor consists of four large adjoining rooms: the Garage, the Main Room, the Blue Room and the Expanded Blue Room.³ In the interior of the trading floor are located seventeen trading posts. All trading in a given stock is centralized at that stock's assigned trading post and panel location.⁴ It is here that specialists work and floor brokers congregate to transact, forming the "trading crowd." The specialist and his clerks remain at the post. Floor brokers are mobile and can represent orders in all securities. They may go to any post on the floor, but often concentrate on a few posts and transact predominantly in the securities traded at these posts. Against the walls of the floor are floor broker booths occupied by floor broker clerks. A booth serves as a communications link between floor brokers and their firms and customers.

Inside the posts, the specialist clerks perform a number of functions associated with order handling and the reporting of trades and quotes. The specialist himself stands outside the post. Brokers visit the post as their own trading needs dictate and floor reporters are on hand to report transactions. Floor Officials are readily accessible if needed. They must, for example, approve all transactions priced at specified amounts away from the last sale.⁵ Floor Officials must also approve, among other things, price indications relating to delayed openings and trading halts when there is a significant imbalance of orders (see page 43).

Specialists and floor brokers are NYSE members.⁶ Clerks are employees of the specialists and floor brokers while the floor reporters are employees of the NYSE.

³ NYSE-listed options and bonds are traded at a separate location adjacent the equity trading floor. Futures trading at the New York Futures Exchange (NYFE) also takes place at another location.

⁴ There are 340 trading post panels; most trading posts have either 18 or 22 panels. An average of eight issues (common and preferred) are traded at each panel location.

⁵ One dollar for a stock trading at less than \$20 and two dollars for a stock trading at \$20 or more.

⁶ NYSE membership is vested with *individuals* not firms. The individual members qualify their firms for NYSE membership.

3. Order Transmission and Execution

An order represents intent to buy or sell. Market orders request execution "at the most advantageous price obtainable after the order is represented in the Trading Crowd."⁷ Limit orders request execution at a specified price or better; they will be executed only if and when that price is reached. In addition to these two basic types of orders there are several order types specifying further conditions for execution (e.g., sell plus, buy minus, good 'til cancelled and stop orders).⁸ Orders also carry qualifications regarding trade settlement (e.g., regular way, cash, next day). Finally, orders can be subdivided into member orders (for a member's own account) or public orders (submitted by a member on behalf of a non-member, such as a retail client). For ease of exposition, the initial discussion will concentrate on public limit and market orders.

Orders originating off the floor reach the post and panel location where the stock is trading either electronically through the NYSE's SuperDot system or are walked to the post by floor brokers. In 1992, about 75 percent of orders reached the specialists via SuperDot. These orders, however, accounted for only 28 percent of executed NYSE share volume.⁹ Floor brokers, therefore, tend to represent larger, more difficult to execute orders.

Floor brokers typically receive orders as follows. A member firm's trading desk telephones large own-account and institutional orders to the firm's floor booth.¹⁰ The booth personnel page the floor broker who respond using one of many strategically located yellow telephones on the floor to contact the booth. The floor broker then walks the order to the post where the stock is traded. Once at the post, the floor broker either leaves the order with the specialist or joins the trading

⁷ NYSE (1992a) ¶ 2013 Rule 13 Market Order.

⁸ NYSE Rule 13 "Definitions of Orders" defines 21 different types of orders, NYSE (1992a) ¶ 2013.

⁹ This number is calculated as follows: total executed SuperDot orders in shares (from the NYSE's SOD data file) divided by twice total share trading volume. A 1,000-share trade, for example, may consist of a 1,000-share sell SuperDot order and a 1,000-share buy order in the crowd. The SuperDot share of this trade is 50 percent.

¹⁰ Some firms are also linked to their floor booths through SuperDot (see page 22) or through proprietary communications systems. Non-members can telephone orders directly to floor broker booths.

crowd and bids for (or offers) the stock on behalf of his customer. Using floor brokers to transmit orders is very labor-intensive, so this method is generally used only for orders that require special care. The most common instances involve large orders that must be "worked" (exposed to the market bit-by-bit over time) or upstairs-facilitated large trades that are being crossed.¹¹

SuperDot orders come in from member firm trading desks over data communications lines that feed into the Exchange's Common Message Switch (CMS).¹² Orders pass through CMS to SuperDot which processes and forwards them to the Post Support System (PSS). PSS then routes the orders to the specialist post. At the post, most orders appear on the specialist's Display Book screen.¹³

The Display Book is an electronic workstation that keeps track of all limit orders and incoming market orders. The Display Book screen typically shows the near-the-market portion of the limit-order book for each issue handled by the specialist. Various window-like applications allow the specialist to view one or more issues at a time at various levels of detail.

Incoming SuperDot limit orders automatically enter the Display Book. The Display Book sorts the limit orders and displays them in price/time priority. Similarly, when a floor broker gives the specialist a limit order, the specialist's clerk can enter the order into the Display Book using the keyboard. SuperDot market orders are displayed at the terminal and await further action. The specialist may execute a market order against another order in the book, against his or her inventory, or against an order represented by a floor broker in the crowd.¹⁴ The order will be

¹¹ See page 33.

¹² CMS and SuperDot are discussed in greater detail in Section 8.

¹³ Very rarely, certain qualified orders are printed out on the post printer. Odd-lots and the partial round lots of larger orders also do not appear on the Display Book (see Section 13).

¹⁴ The specialist may also use ITS (see page 24) to get the order executed on another market that displays a better quote.

executed at or inside the displayed quote; the specialist may also "stop" the market order.¹⁵

Orders are almost never executed automatically. The only exceptions are odd-lots and the non-round-lot portion of larger orders (see page 39) as well as small orders stopped for longer than 30 minutes (see page 31).

The message that an order has been executed (in part or in whole) is called a report. The report goes from the specialist via PSS, SuperDot and CMS to the members who entered the orders involved in the trade. Trades involving more than one SuperDot order will generate more than one report.¹⁶ Even though the report is a formal notice that a trade has occurred, it is not publicly available and is not the same as the "print" of the transaction that appears on the Tape.¹⁷ The ultimate destination of the execution report is the investor who placed the order and the path taken by the report is in most cases the reverse of the path that brought the order to the post in the first place.¹⁸

¹⁵ For a discussion of stopped orders see Section 10.

¹⁶ A 1,000-share SuperDot market order trading with two 500-share SuperDot limit orders will result in three reports.

¹⁷ For research purposes, the time stamp on the report is a useful indication of when the trade took place.

¹⁸ SuperDot also handles order cancellations and administrative inquiries. Order cancellations become effective as soon as they are received and processed by SuperDot. Cancellation is not contingent on approval by the specialist. *Through SuperDot, member firms may also request order status reports at any time.*

4. Trade Reporting and Dissemination

The Exchange disseminates, in real time, trade information consisting of symbol, execution price, trade size, and special trading conditions.¹⁹ Occasionally, the Exchange disseminates additional messages indicating, for example, delayed openings and trading halts.²⁰

Rule 11Aa3-1 of the Securities and Exchange Commission (SEC) governs the reporting and dissemination of trade information. According to this rule, all U.S. securities exchanges and the National Association of Securities Dealers (NASD) must implement SEC-approved "transaction reporting plans" for the real-time collection, processing and dissemination of "trade reports" for listed securities.²¹ Accordingly, the exchanges and NASD submitted and the SEC approved the Consolidated Tape Association (CTA) Plan.²² The Plan requires the exchanges and the NASD (the Plan "Participants") to collect and report to the Securities Industry Automation Corporation (SIAC) for dissemination on the Consolidated Tape (the "Tape") last sale data (symbol, trade price and size, etc.) in "eligible securities."²³ Eligible securities are any common stock, right, long-term warrant or preferred stock listed on the NYSE or the Amex as well as certain securities

¹⁹ On the Tape, special trading conditions are usually identified by adding a suffix to the symbol. For example, a sold (out of sequence) trade in ABC is identified as ABC.SLD, and a next day settlement trade is identified as ABC.ND. A stopped stock trade (see page 29) is identified by an "s" over a "t" following the stopped stock trade price. In the Consolidated Trade (CT) data files -- available on the TORQ and TAQ databases -- special trading conditions are summarized by the G127 (e.g., 200 indicates stopped stock) and COND fields (e.g., Z indicates a sold trade).

²⁰ See page 43.

²¹ SEC Rule 11Aa3-1 "Dissemination of Transaction Reports and Last Sale Data with Respect to Transactions in Reported Securities." The rule defines the term *trade report* to mean "a report containing the price and volume associated with a transaction involving the purchase or sale of one or more round lots of a security." [There are other requirements for over-the-counter \(OTC\) securities.](#)

²² The CTA Plan participants are the American Stock Exchange, Boston Stock Exchange, Cincinnati Stock Exchange, Midwest Stock Exchange, New York Stock Exchange, Pacific Stock Exchange, Philadelphia Stock Exchange, Chicago Board Options Exchange and NASD. Prior to March 1, 1993, Instinet (not a Plan participant but an NASD member) was designated as "other reporting party." As such, Instinet used to send--during participant trading hours--their last sale information in eligible securities directly to CTS (through SIAC). Instinet's Tape-hours trading volume could therefore be separately identified. On March 1, 1993, Instinet dropped its "other reporting party" status and began sending all their last sale information to CTS through the NASD. As of this date, therefore, Instinet trades are included in the NASD total.

²³ CTA Plan (1992) Section VII "Collection and Reporting of Last Sale Data."

listed on other U.S. securities exchanges.²⁴ The Plan requires each Participant to report last sale data as promptly as possible and to ensure that, under normal conditions, not less than 90 percent of such last sale data are reported within 90 seconds after execution.

Each Participant is responsible for collecting last sale data on eligible securities trades executed in its market and transmitting these data to the SIAC-operated Consolidated Tape System (CTS). CTS processes these data and distributes them to visual moving tickers ("the Tape") and via high speed lines to approved subscribers of the CTS service for worldwide redistribution to their customers. CTS disseminates last sale data during the hours the Participants are open for trading.²⁵

At the NYSE, it is the duty of the member representing the seller to ensure that a trade has been reported.²⁶ The actual trade reporting is done either directly through the Display Book or by floor reporters. Display Book reporting of trades consisting exclusively of SuperDot orders is effected automatically at the same time the execution report is generated. Display Book reporting of other trades is effected by the specialist clerk who enters the relevant information using the Display Book keyboard. From the Display Book the data travel through PSS to the Exchange's Market Data System (MDS). MDS performs certain validation checks, and then forwards the information to CTS. At the end of 1992, 80 percent of NYSE stocks accounting for 55 percent of trades had Display Book reporting.²⁷ The trend toward more Display Book reporting is continuing.

²⁴ For a security listed on an exchange other than the NYSE or the Amex to be eligible it must, at the time it was listed, meet the original listing requirements of the NYSE or the Amex. For full details see CTA Plan (1992) Section VI "Eligible Securities" pp. 23-26.

²⁵ For details and qualifications see CTA Plan (1992), Section X, "Operational Matters" p. 55. The NYSE's regular trading hours are 9:30 to 16:00. The NYSE, however, also disseminates via the Tape trade information from its after-hours Crossing Sessions, 16:00 to 17:15. So, last sale data are disseminated via the Tape from 9:30 through 17:15. This time span includes the late closing time of the Pacific Stock Exchange -- 16:50 Eastern Time. Section V(c) of the Plan lists trades that are not required to be disseminated (e.g. odd-lot trades, see page 39).

²⁶ NYSE (1992a) ¶ 2128A Rule 128A.10 Duty of Seller.

²⁷ In the Consolidated Trade (CT) data files -- available on the TAQ and TORQ databases -- trades reported to CTS from the Display Book can be identified by the value in the G127 field.

A floor reporter is an NYSE employee who stands by the specialist on the trading floor. The specialist or the floor broker representing the seller calls out the terms of the trade (ticker symbol, price, size, and the seller's badge number). For trades not reported through the Display Book (including trades involving SuperDot orders), the floor reporter records the information by filling in boxes on a "mark-sense" card. The floor reporter then enters the information by feeding the card into one of the several readers at the post. The information then follows the same path as in the case of Display-Book reporting: the data travel through PSS to MDS and on to CTS.

For executed SuperDot orders, the NYSE order-processing and trade-reporting procedures generate two trade-time stamps: the time recorded on the SuperDot execution report received by the trade participants and the CTS print time. These two time stamps are not fully synchronized; in most cases, the execution report time is earlier than the CTS print time.²⁸ Chart 1 shows the distribution of the time differences between the two time stamps for 144 stocks over the first five trading days in November 1990. Out of a total of 51,270 trades, 28,584 took place on the NYSE with at least some SuperDot involvement. The median CTS print delay for these trades is 14 seconds. Fifteen percent of these 28,584 trades were Display Book reported.²⁹ The median print delay time for these trades is 6 seconds (their distribution is given in Chart 2). The median print delay time for the 24,200 trades that were reported by floor reporters is 16 seconds (their distribution is given in Chart 3).

In addition to the real-time trade-reporting requirements described above, the New York Stock Exchange requires member firms to report daily details of their program trading transactions.³⁰ The NYSE defines program trading as any trading strategy involving the simultaneous or nearly simultaneous purchase or sale of fifteen or more stocks with a total aggregate value of one

²⁸ Sometimes, however, particularly for closing trades, the execution report may lag the CTS print.

²⁹ This percentage is no longer representative: since November 1990, the percentage of trades reported from the Display Book has increased sharply.

³⁰ This requirement has been in effect since May 1988.

million dollars or more.³¹ This reporting requirement applies to both member firm own-account (principal) and customer-account (agency) transactions. The requirement covers all program trades in all stocks (not just NYSE stocks) irrespective of where and when they were executed. Member firms, for example, must report program trades executed off-shore as well as off-hours.³² The Exchange disseminates summary information on program trading activity on a weekly basis.

Prior to January 1993, transactions in NYSE-listed stocks occurring when the Tape was not running and all transactions occurring outside the United States were not reported to the Exchange (with the exception of program trades). In November 1992, the SEC approved new NYSE Rule 410B requiring member firms to report to the Exchange all their trades in NYSE-listed securities "whenever such trades are not otherwise reported to the Consolidated Tape."³³ The new rule became effective on January 4, 1993 for the 29 most active member firms and will become effective for all member firms on April 5, 1993.

Under this new rule, member firms must report both own-account and customer-account trades effected outside business hours as well as in foreign markets.³⁴ Member firms need not report program trading transactions they already report to the Exchange.³⁵ Member firms must report the date and time of the transaction; symbol; price; number of shares; where the transaction was executed; whether the transaction was a buy, sell or cross; whether it was a principal or an agency transaction; and the name of the contra-side broker-dealer. Member firms transmit program trading and Rule 410B data to the Exchange electronically.

³¹ Members, however, must report index arbitrage trades of all sizes.

³² For a discussion of the program trading data, see Harris, Sofianos and Shapiro (1992) and Sofianos (1990).

³³ NYSE Rule 410B, Reports of Listed Securities Transactions Effected Off the Exchange. NYSE Market Surveillance Information Memos 92-32 and 92-33 (both dated November 13, 1992) provide details.

³⁴ Own-account and customer-account trades by foreign affiliates of a member firm *that are arranged in the United States* must also be reported. However, "Rule 410B does not generally apply to transactions effected for the account of an affiliate of an NYSE member or member organization, or transactions effected by such an affiliate for the account of a customer of such an affiliate," Information Memo 92-32 op. cit.

³⁵ Odd-lots and several other types of transactions are also excluded, see Information Memo 92-32 op. cit.

The combination of real time, Rule 410B, and program trade reporting provides the Exchange with a comprehensive record of the overall member firm trading activity in NYSE-listed stocks. There are, however, off-hours transactions in NYSE-listed stocks executed by non-member firms, both at home and abroad, which are not reported to CTS or the NYSE.³⁶

The Exchange also requires specialists to submit daily computerized reports detailing their proprietary trades and dealer positions. These reports are used by NYSE's Market Surveillance Division to monitor and evaluate specialist performance.

Finally, the NYSE requires each member firm to keep and make available to the NYSE upon request records of orders. These order records describe each order (security, size, type) and provide information on the time the order was received, the time the order was transmitted to the NYSE and the time the execution report was received.³⁷

³⁶ Fourth Market trades that do not involve broker-dealers are also not reported.

³⁷ NYSE (1992a) ¶ 2410 Rule 410 Records of Orders.

5. Quote Reporting and Dissemination.

Quote information disseminated by the Exchange consists of the highest NYSE bid and lowest NYSE offer price per stock as well as quote sizes (the minimum number of shares that can be bought or sold at these prices). The Exchange also disseminates special quote conditions such as "non-firm quotes" in unusual market conditions and "indications of interest" during opening delays and trading halts (see page 43). Quotes may represent the specialist's own trading interest, trading interest in the crowd, limit orders in the specialist's Display Book, or some combination.³⁸ Irrespective of whose interest a quote represents, it is the specialist's responsibility to ensure that trades take place at prices no worse than the disseminated quotes.³⁹

According to SEC Rule 11Ac1-1 (b) "every exchange shall . . . collect, process and make available to quotation vendors the highest bid and the lowest offer communicated on the floor of that exchange . . . by any responsible broker or dealer . . . for each reported security listed."⁴⁰ In the case of the NYSE, "responsible broker or dealer" is the specialist.⁴¹ The SEC therefore, requires the NYSE to disseminate to quotation vendors the best quote "communicated" to the crowd by the specialist or a floor broker. To fulfill this requirement, the Exchange requires that specialists "promptly report" the highest bid, lowest offer and quotation sizes in their securities.⁴² Irrespective of whose interest a quote represents, therefore, it is the specialist's responsibility to

³⁸ At the NYSE, there are no systems that automatically set stock quotes. In some regional exchanges, however, systems automatically change quotes to match or bracket the NYSE quotes. Such automatically adjusted quotes are known as "autoquotes." ITS Plan participants (see page 24) agreed that no autoquotes "shall be for more than 100 shares," ITS Plan (1991) p. 51.

³⁹ One exception is when quotes are in "non-firm mode" (see page 43). Also, special procedures apply for crossing blocks outside the prevailing quote (Rule 127, see page 35)

⁴⁰ SEC Rule 11Ac1-1 "Dissemination of quotations for reported securities" paragraph (b)(1)(i). The rule covers all U.S securities exchanges and associations. NYSE Rule 60 "Dissemination of Quotations" implements the SEC Rule to the New York Stock Exchange. The full text of Rule 11Ac1-1 is reproduced in NYSE (1992a) ¶ 2060.

⁴¹ NYSE (1992a) ¶ 2060 Rule 60 (a)2. For exchanges, SEC Rule 11Ac1-1 (a)(3) defines "responsible broker or dealer" as *any* exchange member quoting on the floor of the exchange. The Exchange implements the SEC quote rule by imposing on the specialist the legal obligation to fill the quote--effectively making the specialist "responsible" for the quote. According to the NYSE rule, the specialist is responsible "to the extent of the quotation size he specifies."

⁴² NYSE (1992a) ¶ 2060 Rule 60 (e)(1) and (2). Also SEC Rule 11Ac1-1 (c)(1).

disseminate quote information.⁴³

To understand exactly what information must be disseminated under the SEC quote dissemination rule it is important to distinguish between "a quote" and "an order" and to clarify what the term "communicated" means. An order is not a quote (subject to dissemination) until the specialist (or floor broker) exposes ("communicates") the order to the crowd as a quote. The term "communicated" specifically refers to the announcement by the specialist (or a floor broker) to the crowd of a bid or an offer at which the specialist (or a floor broker) is willing to trade.

According to NYSE Rule 79A.10, a member may specifically request that its quote-improving limit order (agency or proprietary) be displayed as the quote and the specialist must honor the request.⁴⁴ On March 30, 1993, the NYSE issued an Information Memo stating that all quote-improving limit orders received by specialists through the SuperDot system implicitly contain this request.⁴⁵ Specialists must, therefore, reflect SuperDot limit orders in the Exchange's published quotation at their limit prices as soon as practicable following receipt of the orders. The specialist may not display a hand-delivered quote-improving limit order if the floor broker representing the order expressly asks him or her not to.

Because the NYSE specialist must expose market orders to the crowd and does not automatically execute them against the posted quote, "price improvement" is possible: market orders may be executed at better than the quoted price and limit orders may be executed at better than the limit price.⁴⁶

⁴³ In active crowd trading, floor brokers may bid and offer inside the posted quotes and quickly trade. Provided these bids and offers in the crowd are quickly filled, the specialist does not have to revise the posted quotes.

⁴⁴ NYSE (1992a) ¶ 2079A Rule 79A.10

⁴⁵ NYSE Market Surveillance Information Memo 93-12, March 30, 1993.

⁴⁶ Market orders may also get price improvement if they are "stopped" (see Section 10). Blume and Goldstein (1992), Lee (1992) and Petersen and Fialkowski (1992) estimate the amount of price improvement in different markets.

Example XYZ is quoted 20 bid for 30,000 shares, 20,000 shares offered at 20 1/4. Floor broker A comes in with a market order to buy 5,000 shares. In an attempt to do better than the offer price, broker A bids 20 1/8 for 5,000. Floor broker B "hits" the bid and the two brokers complete the transaction. Floor broker A got price improvement: instead of buying at 20 1/4 (the posted offer), he or she bought at 20 1/8.

The SEC also requires that posted quotes be firm for the sizes indicated.⁴⁷ The specialist, using broker judgment, determines the quotation size to be displayed.⁴⁸ The displayed quotation size may be less than the aggregate size of the at-the-quote limit orders in the book. Alternatively, the specialist may display a larger quotation size than is in the book by adding his or her own (or the crowd's) interest at that price.⁴⁹

The exchanges and NASD implemented the SEC's quote dissemination rule by adopting the SEC-approved Consolidated Quote (CQ) Plan.⁵⁰ The Plan requires the participating exchanges and NASD to collect and report promptly to the SIAC-operated Consolidated Quote System (CQS) all SEC-required quote information (bid, offer, quotation size, stock symbol, market and qualifying messages). CQS processes this quote information, consolidates it into a single data stream, appends a national "best bid and offer" and distributes it in the sequence in which it was received to approved subscribers of the CQS service.⁵¹ In the past, reporters on the floor of the NYSE typically entered quote changes into CQS in the same way they report trades.⁵² Since September 1989, however, specialist clerks have entered 95 percent of quote changes from the

⁴⁷ SEC Rule 11Ac1-1 (c)(2): "every responsible broker or dealer shall be obligated to execute any order at a price at least as favorable as the bid price or offer price comprising such responsible broker's or dealer's published bid or published offer in any amount up to his published quotation size." For a discussion of non-firm quotes in unusual market conditions see Section 15.

⁴⁸ NYSE (1992a) ¶ 2060 Rule 60 (c)(1) Normal Mode.

⁴⁹ Orders in the Display Book have priority over the specialist's own-account trades [at the same price](#).

⁵⁰ The parties to the CQ Plan are the same as for the CTA Plan (see footnote **Error! Bookmark not defined.**).

⁵¹ According to the CQ Plan, quote dissemination hours are 9:00 through 18:30. CQS transmits quote information to its subscribers via a high speed data transmission facility (the "high speed line").

⁵² The mark-sense card used to report transactions also has a section for specifying quotes.

Display Book.⁵³

The difference in reporting mechanisms for trades and quotes may occasionally lead to incorrect sequencing on the Tape and in the quote and transaction data used by researchers. A common occurrence involves a quote that is changed subsequent to a trade. The specialist, for example, may say "two thousand XYZ at 20-1/2, make the market 20-1/2 to 3/4." The specialist clerk, working on a keyboard, will quickly change the quote. The floor reporter is slowed by the need to fill in the boxes on the mark-sense card and place the card in a reader. In the data stream, the time stamp on the quote may precede that of the trade by a few seconds.

⁵³ The switch to Display Book quote reporting was initiated June 19, 1989 and took several months to implement.

6. Audit Trail

The audit trail is a comprehensive trading record that supports NYSE surveillance operations and assists members in resolving trade disputes.⁵⁴ The audit trail is a chronological reconstruction of trading in each stock, identifying the time and size of each trade and providing information on the orders involved in each trade. The audit trail also indicates whether the members participating in a trade acted as agents for customers or traded for their own account.

In the audit trail data file, a trade consisting of a single buyer trading with a single seller will have one record.⁵⁵ On the other hand, a trade consisting of one seller trading with three buyers will have three records with information on the buy side matched with one record with information on the sell side. Table 1 shows an example of the kind of information in the audit trail. The example shows a single "regular way" trade in stock AA that was reported to the Tape at 9:43 a.m. The trade price was $70 \frac{7}{8}$ and the trade size was 2,600 shares. The sell side of the trade involved a member firm's proprietary account and was represented by a floor broker (badge 0717) in the crowd. The sources of the buy side of the transaction were two SuperDot orders: a 2,000 share limit and a 500 market order (both from firm KP). The specialist (account S) completed the trade by buying 100 shares for his or her own account.

The audit trail is comprehensive because it integrates data from several different sources. The principal sources are: CTS, SuperDot, clearance data from the National Securities Clearing Corporation (NSCC) and member firm input via the Overnight Comparison System. The audit trail integrates the data using sophisticated computerized matching algorithms. The algorithms perform up to twenty-eight passes on the data, with each pass applying different criteria to match the buy and sell comparison data with the Tape print.

⁵⁴ NYSE Rule 132 governs the submission of trade information for audit trail purposes, NYSE (1992a) ¶ 2132.

⁵⁵ The audit trail data file is called the Equity Consolidated Audit Trade File (CAUD). A sample of CAUD can be found on the TORQ database.

In general, the accuracy of the audit trail correlates with the degree of automation involved in the capture of all elements of a trade. If a SuperDot buy order is executed against a SuperDot sell order and the trade is reported to CTS through the Display Book, the comparison and transaction data (the Tape print) are generated simultaneously, ensuring an almost perfect match. When a floor reporter reports the trade to CTS, however, there may not be an exact time match between the comparison data and the Tape print. In this case, the audit trail algorithms attempt a match on nearly contemporaneous events.

"Non-system" sides (executed crowd orders) are more difficult to document. Since 1985, NYSE Rule 132 has required that broker badge numbers be reported for all floor transactions ("badge capture"). Over time, this rule and NYSE enforcement efforts have been strengthened.

Compliance is high despite the element of human error that is involved in the collection and processing of audit trail data. Currently, 95 percent of the crowd input to the audit trail matches the Tape print based on time. By this and other criteria, the overall accuracy of the NYSE audit trail is approximately 98 percent.

7. Order Flow Concentration and NYSE Rule 390

The purpose of NYSE Rule 390 is to encourage order flow concentration and to discourage member firms from matching orders internally without exposing them to the auction process. Rule 390 prohibits, with certain exemptions, member firms from effecting proprietary trades and in-house agency crosses in NYSE-listed securities off an organized exchange. In 1976, the SEC limited the scope of Rule 390 by exempting agency transactions, provided the same member firm does not represent both sides of the trade (in-house agency crosses): *member firms may effect one-sided agency trades anywhere, anytime.*⁵⁶ In addition, SEC Rule 19c-3 exempts from Rule 390 securities *initially* listed on a U.S. exchange after April 26, 1979.⁵⁷ Member firms may trade, at any time, NYSE-listed securities on any organized domestic exchange where the securities are cross-listed or have unlisted trading privileges (see page 19) as well as on organized foreign exchanges.⁵⁸ Outside of Exchange business hours, member firms may also trade NYSE-listed securities in *foreign* over-the-counter markets. Broker-dealers that are not members of the NYSE are not subject to Rule 390.

Examples Broker-dealer John is a NYSE member and stock XYZ is listed on the NYSE since 1968 (XYZ is a "Rule 390 stock"). John cannot buy or sell XYZ for his own account in the U.S. over-the-counter market even outside NYSE trading hours.

John has a 1,000-share customer buy order in XYZ and a 1,000-share customer sell order also in XYZ. During NYSE trading hours, John must cross the two orders (agency cross) on an organized (domestic or foreign) exchange. Outside NYSE trading hours, John may cross them in a foreign over-the-counter market.

John, however, can buy or sell XYZ for a customer (a one-sided agency trade) in the U.S. (or in a foreign) over-the-counter market during NYSE

⁵⁶ In-house (two-sided) agency crosses remain subject to Rule 390.

⁵⁷ A security initially listed on another exchange that subsequently transferred to the NYSE is subject to Rule 390 if the initial listing day (on the other exchange) was before April 26, 1979. Such a security is subject to Rule 390 even if the transfer to the NYSE occurred after April 26, 1979 (see example 6).

⁵⁸ Trading of U.S. securities on foreign exchanges is subject to the registration and listing requirements of those exchanges.

trading hours.

John can buy XYZ for his own account in a foreign over-the-counter market outside NYSE trading hours.

Stock ABC was initially listed on the NYSE in 1992; it is therefore a "19c-3 stock" and is not subject to Rule 390. John can buy or sell ABC for his own account in the U.S. over-the-counter market even during NYSE trading hours.

Stock CBA was initially listed on the Amex in 1973. In 1992 the stock moved to the NYSE. Stock CBA is subject to Rule 390.

Broker-dealer Mary is not a member of the NYSE and therefore is not subject to Rule 390. Provided Mary is not restricted by the rules of other U.S. exchanges she is a member of, she may buy and sell XYZ in the U.S. over-the-counter market even during NYSE trading hours.

At the end of 1992, 54 percent of NYSE-listed stocks were classified as 19c-3 stocks and were not subject to Rule 390.⁵⁹ In December 1992, 19c-3 stocks accounted for 40 percent of NYSE share volume and 31 percent of NYSE dollar volume. The Exchange accounts for 82 percent of the share volume in 19c-3 stocks and 83.2 percent of the share volume in Rule 390 stocks.⁶⁰

A security listed on a U.S. exchange may trade on another U.S. exchange provided it is either listed or has unlisted trading privileges (UTP) on that exchange.⁶¹ Once a security is listed on an exchange, other exchanges can apply to the SEC for unlisted trading privileges in that security.⁶²

Although approval of UTP for listed securities is virtually automatic, the SEC takes 30 to 45 calendar days to process a UTP application.⁶³ Until the SEC approves the UTP application, a

⁵⁹ Of 2,678 issues (including common stocks, preferred stocks, warrants and rights), 1,457 were not subject to Rule 390.

⁶⁰ Common stocks and warrants only. The market share figures are for the first six months of 1992.

⁶¹ Section 12 (f) of the Securities Exchange Act of 1934 governs UTP.

⁶² Exchanges may also apply for UTP in unlisted NASDAQ securities.

⁶³ The SEC must solicit and wait for comments on the UTP application.

newly-listed security can only trade on the exchange where it is listed, on the over-the-counter market and overseas, but not on other U.S. exchanges.⁶⁴

⁶⁴ Over-the-counter market makers do not need UTP to trade listed securities.

8. The SuperDot System

The SuperDot system is part of an electronic communications network that transmits orders from member firms to the NYSE trading floor and execution reports from the floor back to member firms. Orders travel over data communication lines from member firms to the Central Message Switch (CMS). CMS is a store-and-forward message-switching device that connects member firm and Exchange systems. CMS forwards the orders to SuperDot which processes them (sequences, attaches addresses for routing, etc.) and passes them on to the Post Support System (PSS). PSS is an internal switching device that allows multiple processing systems to communicate with floor devices and provides queue management to help reduce instantaneous loads on processing systems.⁶⁵ From PSS orders travel over the NYSE Floor Network to the appropriate specialist post. Execution reports follow the same path in the opposite direction. While CMS and PSS are switching and communication devices, SuperDot is the engine that makes the system run.

SuperDot embraces a number of subsystems that were historically distinct: Designated Order Turnaround (DOT) for market orders, Limit II (LMT) for limit orders and Opening Automated Report System (OARS).⁶⁶ The DOT system began operating on a pilot basis on March 1, 1976. OARS was introduced in March 1980. SuperDot was introduced November 16, 1984 and was originally called SuperDot 250. The "250" in the title referred to the system's volume capacity at the time in millions of shares per day and was later dropped as capacity expanded. SuperDot can now handle a one billion-share day without significant communications delay at intraday peaks; the system can handle much more with some queuing.⁶⁷

⁶⁵ PSS also provides an electronic interface with ITS (see page 24).

⁶⁶ To users of the Consolidated Audit Trade data file -- available on the TORQ database -- these distinctions are useful in identifying trade participants (see Hasbrouck's (1992) discussion of the CONTRA, BTYPE and STYPE fields in TORQ). A preliminary description of the system orders is given in Harris and Hasbrouck (1992).

⁶⁷ While "shares per day" is a popular way to view NYSE capacity, the Exchange measures capacity in terms of messages per second. CMS can now handle 210 messages per second while SuperDot can handle 200 messages per second.

NYSE member firms "may transmit orders by means of the System of such size the Exchange may specify from time to time."⁶⁸ In 1976, only market orders of less than 200 shares and limit orders of 100 shares or less could be routed through the system. Currently, the order size limitations are 30,099 shares for market orders and 99,999 shares for limit orders. Table 2 lists the changes in SuperDot's size restrictions from 1976 to the present.

Exchange rules spell out the specialists' obligations towards SuperDot orders. In general, a specialist is required to:

execute [SuperDot] system orders in accordance with Exchange auction market rules and procedures, including requirements to expose orders to buying and selling interest in the trading Crowd and to cross orders before buying or selling for his own account. All market orders, regardless of size, routed to the specialist's post by means of the System are "held" orders, and a specialist may be deemed to have "missed the market" if any such order is not executed against the prevailing contra side of the market at the time he receives the order.⁶⁹

Moreover, in evaluating specialist performance, the Exchange takes into account SuperDot turnaround times.⁷⁰ The Exchange, for example, will initiate actions to improve specialist performance whenever a specialist unit does not turn around 90 percent of its SuperDot market orders in 60 seconds or less during any two quarters over a "rolling" four-quarter period.⁷¹

⁶⁸ NYSE (1992a) ¶ 2123B Rule 123B (a). Special features of the system (e.g. commission-free execution) may be available only to smaller orders "as the Exchange may specify from time to time."

⁶⁹ NYSE (1992a) ¶ 2123B Rule 123B (d). Special procedures apply in some cases (e.g. stopped orders, see page 29).

⁷⁰ "SuperDot turnaround time" as calculated by the Exchange is the time interval from when the specialist receives an order to the time the specialist sends out the execution report.

⁷¹ The 60-second turnaround standard became effective April 1, 1993; prior to this date there was a two-minute turnaround standard (NYSE (1992a) ¶ 2103A Rule 103A Supplementary Material (C)(i)). Once system enhancements are in place, the Exchange plans to reduce the turnaround standard to 30 seconds. The Exchange's goal is to reduce the average turnaround time from 28 seconds to 15 seconds.

Currently, SuperDot market orders are turned around on average in 28 seconds. Table 3 provides more details on SuperDot order turnaround times.

Order Entry

As described in Section 3, the most common point of entry for SuperDot orders is CMS. However, specialists' clerks may also enter limit orders from the floor via Texas Instruments Personal Computers (TIPCs, "tipsies") and directly via the Display Books. Both devices are located inside the post. The TIPCs are generally employed only when backup assistance is required or when labor is being divided between two clerks, since TIPCs do not have full Display Book functionality.

Order Routing

Most SuperDot orders are routed directly to the specialist Display Book. A SuperDot order, however, may also be routed via CMS, SuperDot and PSS (Post Support System) to the entering member firm's floor broker booth on the trading floor.⁷² The routing decision is made using an algorithm with parameters set by the member firm. Generally, member firms route to their floor booths those orders most likely to benefit from personal representation by their floor brokers. This class includes large market orders or limit orders with prices close to the current quotes or most recent transaction price ("near the market"). Once at the booth, the firm's clerk can either return the order to SuperDot electronically (if no broker is available) or give the order to a floor broker. Orders unlikely to benefit from such representation (small orders and orders "away" from the market) go directly to the post without any further action or guidance from the entering firm.⁷³

Specialist Information

SuperDot provides the specialist with detailed real time order flow information. Aside from the

⁷² NYSE (1992a) ¶ 2123B Rule 123B (b)(4) Booth Support System. A member firm may also route SuperDot orders to the booth of another member firm.

⁷³ See Hasbrouck's (1992) description of the BOOK field in the TORQ database.

obvious features of the order necessary to execute it properly -- ticker symbol, buy or sell, market or limit, size, tick-sensitivity, etc. -- SuperDot orders also contain other identifying fields which the specialist may view on the Display Book. The specialist, for example, may view the entering firm's mnemonic, branch number and sequence number.

The Exchange requires member firms to specify account types with their SuperDot orders (program trading, index arbitrage, principal, agency, etc.). Account type information is not available to the specialist real time, although it is present in the SuperDot order record after-hours.⁷⁴ The Exchange, however, requires member firms to send program orders over specially dedicated "program trading" lines. The specialist knows the mnemonics associated with these lines and can therefore identify program orders.

NYSE Rule 115 prohibits specialists from disclosing to any person, other than Exchange officials, any information with regard to the orders entrusted to them. In June 1991, this rule was amended. It now allows the specialist to provide inquiring members with "information about buying or selling interest in the market at or near the prevailing quotation provided that the specialist shall make the same information available in a fair and impartial manner to any member who shall so inquire."⁷⁵ There is presently, however, no *direct* way for off-floor market participants to obtain this information.

Specialists (and other member broker-dealers) also receive a complete SuperDot "activity log" each night. This log contains information on the orders handled by the specialist (or member broker-dealer) on a given day.⁷⁶

⁷⁴ In the System Order Database (SOD) file -- available on the TORQ database -- the ACCTYP field identifies the various types of accounts.

⁷⁵ NYSE (1992a) ¶ 2115 Disclosure of Specialists' Orders Prohibited. The specialist is not allowed to disclose the identity of any buyer or seller represented on his book unless expressly authorized to do so by the broker entering the order.

⁷⁶ The log may be in hardcopy or machine-readable form. These logs are used to reconcile uncomparared trades, to conduct research, etc.

9. The Intermarket Trading System

Congress encourages U.S. exchanges and the NASD to link "all markets for qualified securities through communication and data processing facilities."⁷⁷ Accordingly the exchanges and the NASD submitted, and the SEC approved, a plan setting up the Intermarket Trading System (ITS).⁷⁸ ITS is an electronic communications network that links the participating exchanges and the over-the-counter (OTC) market, and facilitates the execution of orders *in eligible securities* at the best ITS quote.⁷⁹

Only exchange specialists, floor brokers and OTC market makers in eligible securities can *directly* access ITS.⁸⁰ OTC market makers access ITS through the NASD's participation to the System and must be ITS/CAES registered market makers to do so.⁸¹ The NASD's ITS participation is limited to 19c-3 securities; for OTC market makers to access Rule 390 securities through ITS they must be members of a participating exchange.⁸² Therefore, even though the CQS and ITS participants are the same, the best CQS quote may differ from the best ITS quote.

According to the ITS Plan, when a market (or marketable limit) order arrives in a market with an inferior quote, the market maker receiving the order, to avoid a "trade-through" complaint, must do one of two things:⁸³ he or she can send, through ITS, a "commitment to trade" to the best-

⁷⁷ Securities Exchange Act of 1934, Sec. 11A.(a)(1)(D) and Sec. 11A.(a)(3)(B). These requirements are part of the 1975 Securities Acts Amendments.

⁷⁸ The ITS Plan participants are the same as the CTA Plan and CQ Plan participants (see footnote **Error! Bookmark not defined.**).

⁷⁹ Eligible securities are defined as in the CTA Plan (see page 7). At the end of 1992, there were 2,532 eligible securities.

⁸⁰ NYSE floor brokers can directly access ITS by filling "mark-sense cards" and feeding them in the readers by the specialist posts.

⁸¹ CAES (Computer Assisted Execution System) is an NASD inter-dealer automated execution system for listed 19c-3 securities. CAES is the NASD's link to ITS. If an NASD dealer wishes to make markets in listed securities he or she must register as an ITS/CAES market maker for those securities.

⁸² For a discussion of NYSE Rule 390 and SEC Rule 19c-3 see page 18.

⁸³ For details on "trade-through" complaints see page 26.

quote market and try to have it executed there; or he or she can execute the order in the receiving market at the best ITS quote ("quote-matching"). If the order size is larger than the best-quote size, the market maker must satisfy the superior market before trading in his or her market at an inferior quote.

Example The NYSE quotes XYZ 20 bid for 5,000 shares, 8,000 shares offered at 20 1/4 while the Midwest Stock Exchange (MSE) quotes it 20 1/8 bid for 1,000 shares, 1,000 shares offered at 20 3/8. A 2,000-share sell market order arrives at the NYSE. To avoid a trade-through complaint, the NYSE specialist should execute at least 1,000 shares at 20 1/8 by sending a commitment to MSE. Alternatively, the NYSE specialist could match the MSE quote and execute the order at 20 1/8.⁸⁴

ITS commitments (electronic messages routed through ITS) are the vehicles through which market makers (and floor brokers) try to execute orders in the best-quote market. Market makers may price outgoing commitments "at the market" or at the best ITS bid or offer. If by the time a commitment reaches its destination the quote has changed, "at the market" commitments run the risk of being executed at the new prevailing quote. By designating a limit price, market makers avoid this risk. According to the ITS Plan, incoming commitments always trade with the prevailing quote and are not exposed to the auction market.

A market maker receiving a commitment will execute it if the quote is still available or cancel it if the quote has changed. The commitment may also expire if not acted upon. The market maker sending the commitment chooses whether the commitment will expire in one or in two minutes.⁸⁵ From the time ITS receives the commitment until it expires, the commitment is irrevocable. After a commitment expires, the originating market maker may try and resend the commitment or execute the order at the next best ITS quote. According to the ITS Plan,

⁸⁴ To avoid a trade-through complaint, the NYSE specialist will have to execute the whole 2,000-share order at 20 1/8 bid even though the Midwest's best ITS bid is for only 1,000 shares. If the NYSE specialist executes 1,000 shares at 20 1/8 and tries to execute the remaining 1,000 shares at the NYSE bid at 20 he or she will be trading through the Midwest's bid.

⁸⁵ ITS Plan (1991), page 33.

however, market makers should execute incoming commitments immediately or promptly cancel them. Market makers may cancel incoming *priced* commitments only if they have changed their quotes, traded, or are in the process of trading. Market makers may cancel an "at the market" commitments only if the commitment represents a sell-short order and the tick restriction for short sales is not satisfied.

Table 4 shows that in December 1992, ITS routed on average 11,000 commitments per day. ITS market makers executed 9,611, cancelled 1,177 and allowed 179 of these commitments per day to expire. During this month, the NYSE sent out, on average, 3,000 and received 5,500 commitments per day. ITS share volume accounted for 3.8 percent of all share volume reported to CTS in December.

An ITS trade-through occurs when a transaction takes place outside the best ITS quote. In such cases, the market traded through has the right to complain to the executing market and the executing market must make an adjustment. The complaint takes the form of an administrative message sent via the ITS communications network. It must be received by the executing market within five minutes of the trade print. When a market maker that caused a trade-through receives a legitimate complaint, he or she must satisfy through ITS the quote traded-through *in its entirety*. Alternatively, the market maker (or floor member) may correct the price of the trade-through transaction to a price at which a trade-through would not have occurred.⁸⁶

Example As in the previous example, the NYSE quotes XYZ 20 bid for 5,000 shares, 8,000 shares offered at 20 1/4 while the Midwest Exchange quotes it 20 1/8 bid for 1,000 shares, 1,000 shares offered at 20 3/8. A 500-share sell market order arrives at the NYSE through SuperDot and the specialist executes it at the NYSE bid of 20. The Midwest XYZ market maker sees the trade print on the Tape and complains--within five minutes--to the NYSE. The NYSE specialist must take one of two actions:

⁸⁶ Under certain circumstances involving principal orders originating on the floor, the trade-through transaction must be cancelled. For full details see ITS Plan (1991), Exhibit B, "Trade-Through Rule" pp. 3 and 4.

a. Correct the trade price from 20 to 20 1/8.⁸⁷

b. Let the original print stand at 20 and sell to the Midwest's posted bid 1,000 shares (not just 500) at 20 1/8.

There are several exceptions to the trade-through rule. For example, the rule does not apply if the size of the bid or offer traded-through was 100 shares and it does not apply to non- "regular way" trades.⁸⁸ Moreover, some apparent trade-throughs may be only the result of information-processing lags (such as in updating quotes or reporting trades).

ITS is not an *automatic* order-routing system. Each market maker is responsible for monitoring and using the system appropriately. NYSE specialists, for example, are constantly aware of the best ITS quote for their stocks through a "montage" application at their post. When another market displays the best quote (and the specialist does not want to match that quote), the specialist clerk at the direction of the specialist will send out ITS commitments by entering the relevant information on their Display Book keyboards. The specialist clerk processes incoming commitments in a similar way.

Part of the ITS traffic is created when off-floor broker-dealers send their orders to markets with inferior quotes. This may seem strange. After all, the best consolidated quote is widely disseminated real-time through CQS, so that off-floor broker-dealers have the information needed to route their orders directly to the best-quote market. Why don't they? There are several reasons for this, here are some examples:

- Some broker-dealers are not members of all ITS-participating markets. Consider a firm that is a member of the Boston Stock Exchange but not of the NYSE. Suppose the firm wants to send an order to the NYSE, which is displaying the best quote. The firm must either use an NYSE member as a broker intermediary, or send the order to Boston where,

⁸⁷ For this to happen, either the buy side in the trade must agree to the higher price which is unlikely, or the specialist must make up the extra 1/8.

⁸⁸ ITS Plan (1991) Exhibit B "Trade Through Rule," page 5.

because of ITS, the order will most probably execute at the NYSE quote.

- Broker-dealers may send large orders to the market with the greatest depth even though that market does not have the best ITS quote -- quoted prices are only one aspect of what constitutes a best quote. For example, the Midwest Stock Exchange may have the best ITS quote 20 bid for 1,000 while the NYSE bids 19 7/8 for 50,000. An order to sell 20,000 is likely to go to the NYSE because of the quoted depth.
- Between the time the broker sends the order and the time the market maker receives it, quotes may change so that another market is displaying the best quote.
- Some market makers attract orders away from the best-quote market by paying broker-dealers for their order flow, a practice known as "payment for order flow."
- Broker-dealers may divert orders away from the best-quote market to market-making operations they own.

ITS facilitates the execution of orders at the best ITS quote. However, because price improvement varies across markets,⁸⁹ the existence of ITS does not guarantee that an order will receive the best possible price irrespective of the market to which it is sent.

Example The NYSE has the best ITS quote, 20 bid, offered at 20 1/4. A broker-dealer sends a sell market order to the Boston Stock Exchange. Boston executes the order at the best ITS bid. Alternatively, Boston sends an ITS commitment to the NYSE and the NYSE specialist, following ITS rules, executes the order against the posted bid. Either way, the order will be executed at 20. Now suppose the broker-dealer sent the order directly to the best-quote market (the NYSE in this example), the specialist would have exposed the order to the crowd (or stopped the order) and the order could have been filled at 20 1/8.

⁸⁹ For a discussion of price improvement and references to the literature, see page 13.

10. Stopped Orders

In general, an incoming market order is exposed to the crowd to provide opportunity for price improvement. Once exposed, the specialist will execute the order at the improved price in the crowd, against the posted quote, or the specialist may "stop" the order.⁹⁰ By stopping a market order, the specialist guarantees execution at the stop price (the prevailing quote) while attempting to execute the order at a better price.⁹¹ A stopped order, therefore, is best described as a *guaranteed-or-better* order and should not be confused with a stop order or a stop limit order.⁹² In 1992, 26 percent of post-opening SuperDot market orders were stopped and 62 percent of these stopped orders were executed at a price better than the stopped price.

New York Stock Exchange rules distinguish between stopping orders in a minimum variation market (usually 1/8-point spreads) and stopping orders when the quoted spread exceeds minimum variation (typically 1/4 point or more).⁹³ First consider the more common case of stopping orders in markets with spreads of 1/4 or more. In this case, the specialist should narrow the quotation spread by making a bid or offer, as appropriate, on behalf of the order that is being stopped.

⁹⁰ The specialist may stop orders *only* when it is requested by another member. (See NYSE Market Surveillance Information Memo 91-12, April 3, 1991.) SuperDot market orders are presumed always to have a "try to stop" request. **When a floor broker brings a market order to the specialist, the broker will either immediately execute the order or ask the specialist to stop it.** Currently, there is no way for market orders entered through SuperDot to require immediate execution. For "fill or kill" orders a stop is considered an execution (NYSE (1992a) ¶ 2013 Rule 13).

⁹¹ If the order is inadvertently executed at a less favorable price than the stop price, "the member who agreed to stop the securities shall be liable for an adjustment of the difference between the two prices," NYSE (1992a) ¶ 2116, Rule 116, "Stop" Constitutes Guarantee.

⁹² A stop order to buy (sell) becomes a market order when a transaction in the security occurs at or above (below) the stop price after the order is represented in the crowd. A stop limit order to buy (sell) becomes a limit order executable at the limit price or better when a transaction in the security occurs at or above (below) the stop price. (NYSE (1992a) ¶ 2013 Rule 13.)

⁹³ SEC approved the stopping of orders in a minimum variation market on March 21, 1991, on a one-year pilot basis. The approval was subsequently extended for an additional year until March 21, 1993. Prior to March 1991, a specialist could stop stock only when the quotation spread was at least twice the minimum variation (i.e., for most stocks at least 1/4 point).

Example XYZ is quoted 30 bid, offered at 30 1/4, 1,000 by 20,000. The specialist receives a market order to buy 500 shares. If not stopped, the order would be executed at 30 1/4, the prevailing offer. The specialist stops the order, guaranteeing that the order will receive no worse than 30 1/4. The specialist then bids 30 1/8 on behalf of the stopped order. XYZ is now quoted 30 1/8 bid, offered at 30 1/4, 500 by 20,000. If a seller subsequently hits the 30 1/8 bid, the buyer's stopped order obtains price improvement (the buyer bought at 30 1/8 instead of 30 1/4). Suppose that instead of a sell order, the specialist receives another 500-share buy market order. The specialist may stop this order too (the spread is now 1/8th, so stopping the order is subject to the rules for stopping orders in minimum variation markets--see below). Alternatively, the specialist may now feel the market is moving up and potential price improvement at 30 1/8 is unlikely. Therefore, he or she first executes the new buy order and then the stopped order both against the 30 1/4 offer and the stopped order receives its guaranteed price.⁹⁴

In minimum variation markets, the specialist may stop, without Floor Official approval, market orders of 2,000 shares or less, up to an aggregate of 5,000 shares in unexecuted stopped orders.⁹⁵

The Exchange prohibits specialists from stopping orders routinely in minimum variation markets: "An order should be stopped in such a market only in situations in which there is an imbalance on the opposite side of the market from the order being stopped, and the imbalance is of sufficient size, given the characteristics of the security, to suggest the likelihood of price improvement."⁹⁶ In stopping an order in a minimum variation market, the specialist should change the quoted bid or offer size to reflect the size of the order being stopped.⁹⁷ The stopped order goes behind, in terms of time priority, any limit orders already on the specialist's book at the quote but will be executed *before* any specialist interest at that price.⁹⁸

⁹⁴ If after executing the new buy order there are no limit orders in the book at 30 1/4, the specialist may have to execute the stopped order -- at the stop price -- against his or her inventory.

⁹⁵ The specialist must obtain Floor Official approval in order to stop larger size orders or exceed the aggregate size limitation. No such size limitations apply in markets with spreads exceeding the minimum variation.

⁹⁶ NYSE Market Surveillance Information Memo 91-12, April 3, 1991.

⁹⁷ If the specialist contributes to the quoted size, stopping an order in minimum variation markets may not affect the quoted size; the stopped order may simply displace the specialist's contribution to the quote.

⁹⁸ The specialist essentially makes a bid or offer, as appropriate, on behalf of the order that is being stopped and

Example XYZ is quoted 30 to 30 1/8, 1,000 shares by 20,000 shares and the bid consists entirely of public orders. The large imbalance on the offer side suggests that a buy market order, if stopped, is likely to receive price improvement. The specialist may therefore stop a buy order of less than 2,000 shares without Floor Official approval.⁹⁹ Suppose the specialist receives a market order to buy 500 shares. If not stopped, the order would be executed at 30 1/8, the prevailing offer. The specialist stops the order, guaranteeing that the order will receive no worse than 30 1/8 and adds the order to the bid of 30. XYZ is now quoted 30 bid, offered at 30 1/8, 1,500 by 20,000. The 1,000-share public orders already at the bid have time priority over the stopped 500 shares (the 500 shares are still guaranteed no worse than 30 1/8).

If a stopped order of *less than 2,000 shares* is not executed within 30 minutes of the stop and the specialist takes no action to extend the length of the stop, the Display Book issues an execution report at the guaranteed price and notifies the specialist of the transaction (which is against his or her inventory).¹⁰⁰

Stopping stock can also reduce short-run price reversals. In a quarter-point market, for example, a series of rapidly arriving alternate buy and sell orders would, in the absence of any stops, result in a sequence of transactions at successive 1/4-point price variations. In such situations, stopping market orders would result in most transactions occurring at the spread midpoint, benefitting both buy and sell market orders.

Stopping works to the benefit of incoming market orders, but may delay the execution of limit orders against which they are stopped.¹⁰¹ For example, when a buy market order is stopped,

the stopped order is, therefore, subject to the usual NYSE time priority rules, NYSE (1992a) ¶ 2072 Rule 72 Priority and Precedence of Bids and Offers.

⁹⁹ To stop larger orders, the specialist must get Floor Official approval.

¹⁰⁰ The Display Book issues an alert 25 minutes after a market order is stopped warning the specialist that if no action is taken, the stopped order will be executed in 5 minutes at the stop price against his inventory. (The specialist after receiving the alert may re-stop the order.) If there are limit orders in the Display Book at the stop price, the specialist must ensure that the stopped order is filled against the limit orders and not against his own inventory, in accordance to NYSE Rule 92.

¹⁰¹ The posted quote may consist entirely of specialist proprietary orders.

execution of limit sell orders at the posted offer is -- at least temporarily -- delayed. If the stopped buy order is executed against an incoming sell market order, execution of limit buy orders at the bid may also be delayed.¹⁰² The possibility that a market order may be stopped and get a better price, however, should encourage submission of market orders making it more likely that limit orders at the posted quotes will be hit. The net effect of stopped orders on the execution of limit orders is, therefore, uncertain.

¹⁰² The sell market order, however, may have been attracted by the revised quotes resulting from the stopped order.

11. Crossing Orders

Brokers will occasionally bring to the floor orders representing both the buy and sell side of a transaction, with the intention of crossing them. Crossing orders is subject to the auction market's order-priority, order-exposure and price-improvement principles. NYSE Rule 76 specifically requires that a broker, before proceeding with a cross, must make a public bid and offer on behalf of both sides of the cross, offering at a price one minimum variation higher than his or her bid.¹⁰³ Orders may be crossed at or inside the prevailing quote. Orders of 10,000 shares or more ("blocks") may also be crossed--subject to special procedures (see page 35)--outside the prevailing quote.

Crossing orders inside or at the prevailing quote

First, consider a simple cross inside the prevailing quote.

Example XYZ is quoted 20 bid for 30,000 shares, 20,000 shares offered at 20 3/8. A broker represents buy and sell orders for 5,000 shares and desires to cross them at 20 1/8. The broker must first announce to the trading crowd a bid of 20 1/8 for 5,000 shares and an offer of 5,000 shares at 20 1/4.¹⁰⁴ Before the broker can consummate the cross, other brokers may break it up, either by selling up to 5,000 shares at 20 1/8 (to the buy side of the cross) or buying up to 5,000 at 20 1/4 (from the sell side of the cross). If the announced bid and offer attract no interest, the crossing broker proceeds with the cross by hitting his or her own 20 1/8 bid.

A broker wanting to cross stock at the published bid or offer -- in a minimum variation market, for example -- must observe the auction market principles of bid and offer priority, parity and precedence.¹⁰⁵

Example XYZ is quoted 20 bid for 2,000 shares, 3,000 shares offered at 20 1/8. Both bid and offer consist of public limit orders in the book. A broker

¹⁰³ NYSE (1992a) ¶ 2076, Rule 76 "Crossing" Orders.

¹⁰⁴ Alternatively, the crossing broker may announce a bid of 20 and an offer at 20 1/8.

¹⁰⁵ NYSE (1992a) ¶ 2072 Rule 72 Priority and Precedence of Bids and Offers.

wants to cross 5,000 shares at 20 1/8, so he or she must bid 20 for 5,000 shares and offer 5,000 shares at 20 1/8. The 2,000 shares at the bid and the 3,000 shares at the offer have time priority over the crossing broker's bid and offer. In order to bring the bid and offer to parity with the pre-existing orders at the quote, the crossing broker may buy (on behalf of the buy side of the cross) 100 shares from the 3,000 shares offered at 20 1/8. This trade effectively places the broker's offer at 20 1/8 and all other offers at 20 1/8 on parity. The broker may now proceed and cross the remaining 4,900 shares claiming precedence based on size ("sizing out" smaller orders at the quote) and taking his or her 4,900-share offer at 20 1/8.

NYSE Rule 76 ensures that the opportunity to price improve is available to one or the other side of the cross. Crosses are, however, often broken up. While small-order crosses inside the prevailing quote are unlikely to be broken, a broker trying to cross large orders must realistically expect that some other floor broker will bid higher or offer lower thereby breaking up at least part of the cross.

The Exchange recently amended Rule 72 to provide large "clean" agency crosses the opportunity to receive price improvement while ensuring they will not be broken up at the proposed cross price, once exposed to the trading crowd.¹⁰⁶ The amendments provide priority to *agency* crosses of 25,000 shares or more, at or within the prevailing quotation, where neither side of the cross contains orders for the account of a member. A broker crossing such agency orders has priority at the proposed cross price, regardless of pre-existing bids or offers at such price, and such crosses cannot be broken up at the proposed cross price. The broker effecting the cross must still expose both sides of the cross to the crowd for price improvement by offering at a price one minimum variation higher than his or her bid. Other brokers may break up the cross, trading with the side of the cross at which price improvement may be provided.¹⁰⁷ The amendment thus maintains the auction market principle of price improvement.

¹⁰⁶ NYSE Market Surveillance Information Memos 92-28 (October 23, 1992) and 92-29 (October 27, 1992). The SEC approved the "Clean Cross" Amendments to Rule 72 effective October 26, 1992.

¹⁰⁷ When a broker intends to break up a cross by providing a better price, he or she must first trade with all other market interest having priority at that price before trading with any part of the cross.

Example XYZ is quoted 20 bid for 30,000 shares, 20,000 shares offered at 20 3/8. A broker holds buy and sell agency orders for 25,000 shares and wants to effect a clean agency cross at 20 1/4. The broker will announce that he or she represents a "clean cross" and state the intended cross price of 20 1/4. The broker will then inquire whether any other member could provide price improvement to either side of the cross.

Case I. Floor broker A indicates a desire to sell at 20 1/8. The crossing broker will then make a bid of 20 1/8 and an offer of 20 1/4, thereby allowing broker A to provide price improvement to the buy side of the cross by trading with the 20 1/8 bid.

Case II. Floor broker B indicates a desire to buy at 20 3/8. The crossing broker will then make a bid of 20 1/4 and an offer of 20 3/8, thereby allowing broker B to provide price improvement to the sell side of the cross by trading with the 20 3/8 offer.¹⁰⁸

The proposed cross can be broken at 20 1/8 (the buy side of the cross gets a better price) or at 20 3/8 (the sell side of the cross gets a better price). Unlike the earlier example, however, the proposed clean agency cross cannot be broken at 20 1/4.

Crossing blocks outside the prevailing quote

The crossing of blocks outside the prevailing quotes is governed by New York Stock Exchange Rule 127.¹⁰⁹ For the purposes of this rule, the New York Stock Exchange formally defines a block as a trade of at least 10,000 shares or \$200,000, whichever is less.¹¹⁰

According to Rule 127, a member receiving a block order which may not be readily absorbed by the market should first explore crowd interest, including ("unless professional judgment dictates otherwise") the specialist's own interest. If asked, the specialist may recommend a clean-up price for the block. A member wanting to cross a block of stock at a specific price outside the quote must announce a clean-up price to the crowd and then may follow one of two procedures.

¹⁰⁸ In the latter case, the broker providing price improvement must first trade with the 20,000 shares being offered at 20 3/8.

¹⁰⁹ In the Consolidated Trade (CT) files, crosses executed at a clean-up price outside the prevailing quote pursuant to Rule 127 include a value of 100 in the G127 field.

¹¹⁰ NYSE (1992a) ¶ 2127.10 "Definition of a Block."

In the first procedure, the member must fill--at the announced clean-up price--all orders in the book and in the crowd as well as all better-priced displayed ITS quotes. The member must also fill at the clean-up price the "reasonable needs" of the specialist.

Example The prevailing offer for XYZ is 5,000 shares at 20 1/4 (A), 2,000 shares more are offered at 20 3/8 (B) and 1,000 shares more at 20 1/2 (C). A broker announces a block cross of 30,000 shares at a clean-up price of 20 1/2. The specialist wants to sell 2,000 shares from his or her inventory at this price and there is no other crowd or ITS interest. Under the first procedure, the broker must buy 5,000 shares from A, 2,000 shares from B, 1,000 shares from C and 2,000 shares from the specialist, all at 20 1/2. Orders A and B get the benefit of the clean-up price even though they were offers to sell at a lower price and the block positioner only crosses the amount of stock for which there was no other floor interest.

In general under this procedure, all limit orders on the book receive the benefit of the block price. There is, however, one exception. If the clean-up price is only 1/8th point outside the prevailing quote and the cross consists exclusively of agency orders, the broker may trade with the displayed bid or offer. In this case, the broker will fill part of the block at the prevailing quote and the remainder at the clean-up price.

Example The prevailing offer for XYZ is 5,000 shares at 20 1/4 (A) and 2,000 shares more are offered at 20 3/8 (B). A broker announces an agency block cross of 30,000 shares at a clean-up price of 20 3/8. Assume the specialist wants to sell 1,000 shares from his or her inventory at this price. Since the clean-up price is only 1/8 point outside the quote, the broker can buy the 5,000 shares from A at 20 1/4. To complete the cross, the broker will also buy 2,000 shares from B and 1,000 shares from the specialist at 20 3/8. The block positioner obtained off the floor the remaining 22,000 shares needed to complete the 30,000-share cross. In contrast to the previous example, in this case order A does not get the benefit of the clean-up price.

If the broker feels that under the first procedure he or she will give away an excessive portion of the cross, an alternative procedure can be followed. Under this second procedure, the broker informs the crowd that he or she will not give them stock at the clean-up price. The broker then

makes a public bid and offer on behalf of both sides of the cross (offering at a price one minimum variation higher than his bid) and allows a reasonable time for the crowd and the specialist to trade. After the crowd and the specialist trade, the crossing broker can cross the orders for the remaining shares at the clean-up price.

There are two restrictions to this second procedure. First, if any portion of the block increases (or establishes) the block positioner's position, the block positioner must fill--at the clean-up price--all public orders limited at the clean-up price before retaining any stock for his or her own account. Second, if both sides of the block are exclusively for customers' accounts (clean agency cross), the block positioner must fill public orders limited to the clean-up price in the specialist's book up to a minimum of 1,000 shares or 5 percent of the cross size, whichever is greater.¹¹¹

Only a small fraction of orders is crossed outside the quote subject to Rule 127. For example, on January 12, 1993 less than half of one percent of NYSE share volume traded under Rule 127.

¹¹¹ The volume given to the book is distributed equally to all customers on the book--not according to who has priority.

12. Block Trades and the Upstairs Market

These days, a block of 10,000 shares is not a particularly large trade. For liquid stocks, an order of this size will almost certainly be brought directly to the post by a floor broker. In the case of orders which are large relative to a stock's usual market size, however, member firms will usually explore interest "upstairs" before bringing the orders to the floor for crossing subject to the Exchange's crossing and block positioning procedures.

Many researchers and market observers make the mistake of assuming that all block trades (trades of 10,000 shares or more) are upstairs-facilitated. In fact, only a small fraction of block trades are upstairs-facilitated. On January 12, 1993, for example, block trades accounted for 53 percent of NYSE share volume but only 27 percent of this block volume--*14 percent of total volume*--was upstairs-facilitated.¹¹²

Table 5 provides more details. The percentage of upstairs-facilitated block volume increases with block size from 10 percent for blocks with fewer than 25,000 shares to 57 percent for blocks of 100,000 shares or more. The percentage of upstairs-facilitated block volume ranges from 43 percent for the least actively traded stocks to 26 percent for the most actively traded stocks. The average size of an upstairs-facilitated block trade was 43,000 shares.

¹¹² Identifying upstairs-facilitated trades is difficult and can only be done by matching buyer and seller badge numbers in the audit trail data. For details see Shell (1993).

13. Odd-Lot Orders

Stocks are typically traded in "round lot" units of 100 shares.¹¹³ Odd-lots comprise orders smaller than a round lot (pure odd-lots, e.g. 60 shares) and the non-round-lot portion of larger orders (partial round lots, e.g., the 60-share portion of a 560-share order).¹¹⁴ Odd-lot orders are executed automatically against the specialist's inventory. Pure odd-lot market orders are executed automatically upon receipt at the best ITS quote. Odd-lot market orders entered prior to the opening receive the opening price. Pure odd-lot limit orders are executed at the limit price or better immediately following a round-lot NYSE trade at that price. Odd-lot portions of partial round-lot orders are executed immediately following the execution of the round-lot portion of the order at its execution price. Odd-lot transactions are not disseminated to the Tape.

The specialist learns of odd-lot transactions via an odd-lot advisory (OLA). A single OLA will generally cover multiple transactions. The threshold for notification (usually 300 to 1200 shares in either direction) is set by the specialist. When this point is reached, the specialist is notified and can trade out of the position.¹¹⁵ At the end of the day, the specialist is notified of the prices at which the individual odd-lot transactions occurred.

Member firms are not allowed to combine the odd-lot orders given by *several different customers* into round-lot orders without prior customer approval.¹¹⁶ At the same time, to limit the possibility of abuse of the automated odd-lot trading system, a broker-dealer entering multiple odd-lot orders *for the same account* in the same stock is required to "aggregate the orders into

¹¹³ NYSE (1992a) ¶ 2055 Rule 55 Unit of Trading - Stocks and Bonds. In some issues, a round lot unit consists of 10 shares: on December 1, 1992, of 2,657 NYSE-listed stocks, preferred stocks, warrants and rights, 197 (mostly preferred stocks) traded in 10-share lots. The round-lot size of NYSE-listed issues can be ascertained by examining the UOT (unit of trading) field in the MAST data file available on the TAQ and TORQ databases.

¹¹⁴ NYSE (1992a) ¶ 2124 Rule 124, Odd-Lot Orders.

¹¹⁵ NYSE (1992a) ¶ 2104 Rule 104.10 Functions of Specialists (6)(i)(C).

¹¹⁶ NYSE (1992a) ¶ 2411 Rule 411 (b)(1) "Bunching" odd-lot orders.

round-lots, where possible, for execution in the round-lot auction market."¹¹⁷

¹¹⁷ NYSE Market Surveillance Information Memo 92-25, September 28, 1992. The aggregation requirement also applies to broker-dealers making a single investment decision over multiple odd-lot orders for accounts over which they have investment discretion. In this case, odd-lot orders totalling less than 300 shares need not be aggregated. This exception may be used only once per trading day in the same security.

14. Market-on-Close Orders

The Exchange defines a market-on-close (or at-the-close) order as "a market order which is to be executed in its entirety at the closing price, on the Exchange, of the stock named in the order, and if not so executed, is to be treated as cancelled."¹¹⁸ A market-on-close (MOC) order is guaranteed execution at the closing price according to prescribed pricing and order-entry procedures. MOC orders may not be executed (and will be cancelled) only when there is a trading halt or when there are special conditions to the order (such as "buy minus" or "sell plus") that cannot be met.¹¹⁹

Pricing Procedures¹²⁰

When there is an imbalance of MOC orders, the imbalance is executed against the prevailing bid or offer on the Exchange at the close of trading, thus setting the closing price.¹²¹ An excess of buy orders is executed against the offer and an excess of sell orders is executed against the bid. The remaining buy and sell MOC orders are then paired off at the price at which the imbalance was executed. When the aggregate size of the buy MOC orders equals the aggregate size of the sell MOC orders, the buy and sell orders are paired off at the price of the previous NYSE trade.

The result of these pricing procedures is that all executed MOC orders receive the same closing price. Executable limit orders on the book may be left unfilled because the paired MOC orders are crossed rather than executed against the orders on the book.¹²²

¹¹⁸ NYSE (1992a) ¶ 2013, Rule 13 Definitions of Orders.

¹¹⁹ NYSE Market Surveillance Information Memo 90-34, August 1, 1990.

¹²⁰ NYSE (1992a) ¶ 2116, Rule 116.40 and NYSE Market Surveillance Information Memo 90-34 op. cit.

¹²¹ The MOC pricing procedures *do not* supersede the ITS requirement to satisfy better-priced ITS bids or offers at the close (see Information Memo 90-34, op. cit.)

¹²² These pricing procedures have been in effect since September 1986 on monthly expirations for MOC orders in about fifty pilot stocks (see page 42). These same pricing procedures have been in effect for trading days other than monthly expirations since August 3, 1990 when the SEC initially approved them on a one-year pilot basis. The SEC approved these procedures on a permanent basis effective November 27, 1991. Prior to the introduction of these new pricing procedures, MOC orders were, in fact, executed against the book, rather than being paired off.

Paired MOC transactions are usually reported to CTS as "stopped stock."¹²³ This reporting procedure may result in essentially two same-price closing trade reports: first, the MOC imbalance executing against the book and then the paired-off MOC orders designated as stopped.

Example At 3:59 p.m. the last trade in XYZ was at 30 1/8 and XYZ is quoted 30 bid 30 1/4 ask, 800 shares by 600 shares. MOC orders represent 1,000 to buy and 1,500 to sell. The 500-share sell imbalance is executed against the 30 bid price and reported to the Tape. The remaining 1,000 by 1,000 MOC shares are paired off also at 30 and *separately* reported to the Tape as "stopped stock."

Example As in the previous example, at 3:59 p.m. the last trade in XYZ was at 30 1/8 and XYZ is quoted 30 bid 30 1/4 ask, 800 shares by 600 shares. MOC orders represent 1,000 to buy and 1,000 to sell. The MOC shares are paired off at 30 1/8, the last trade price. This paired-off transaction is reported to the Tape as "stopped stock."

Order-Entry and Cancellation Procedures

Every third Friday of each month, the stock market experiences large surges in MOC orders associated with the expiration -- using closing prices -- of several index derivative products.¹²⁴ In order to facilitate the pricing of the large volume of expiration-related MOC orders, the NYSE introduced special order-entry and cancellation procedures. On monthly expirations, no MOC orders (in *any* stock) can be cancelled or reduced in size after 3:45 p.m. except in cases of legitimate error. Moreover, on monthly expirations, MOC orders (in *any* stock) *relating to any strategy involving any index derivative product* must be entered by 3:00 p.m.¹²⁵

¹²³ In the CT file these trades include a value of 200 in the G127 field.

¹²⁴ For detailed examinations of these expirations, see Sofianos (1992) and Stoll and Whaley (1990).

¹²⁵ **Non derivative-related** orders to establish positions in non-pilot stocks and to offset a published imbalance in pilot stocks may be entered until 4:00 p.m. (pilot stocks are defined below). See NYSE Market Surveillance Information Memo 92-40, December 11, 1992. These cancellation and order-entry procedures were approved by the SEC on an experimental pilot basis effective with the April 16, 1992 expiration; the SEC approval was subsequently **made permanent May 8, 1992**. Before the April 1992 expiration, the 3:00 p.m. order-entry deadline applied only to the fifty pilot stocks. The 3:45 p.m. cancellation deadline was first introduced in April 1992.

Imbalance Publication Procedures

To further facilitate the orderly representation of MOC orders, on monthly expirations the NYSE announces MOC order imbalances of 50,000 shares or more for a group of "pilot" stocks. The pilot stocks consist of the 50 NYSE S&P 500 stocks with the highest market capitalizations plus any other component stocks of the Major Market Index.¹²⁶ The imbalance announcements are disseminated (via the Tape) as soon as possible after 3:00 p.m, 3:30 p.m. and again after 3:45 p.m. Once an imbalance announcement has been made, only MOC orders on the opposite side of the published imbalance are accepted. For pilot stocks with MOC order imbalances of less than 50,000 shares a "No Imbalance" notice is published and thereafter *no* MOC orders are accepted.¹²⁷

Finally, to increase the flow of information on non-expiration trading days, the NYSE disseminates--on every trading day--pilot-stock MOC order imbalances of 50,000 shares or more as soon as practicable after 3:45 p.m. In addition, the Exchange makes an MOC order-imbalance announcement of 50,000 shares or more for any stock that is to be added to or dropped from either the S&P 500, S&P 100 or Major Market Index after the close of trading on that day. These announcements are also made as soon as possible after 3:45 p.m.¹²⁸

¹²⁶ The pilot stocks are chosen to include stocks likely to attract a lot of MOC orders. The list of pilot stocks is adjusted every month based on market capitalization at the Wednesday close prior to the first Friday of each month. The Exchange publishes the list in a monthly information memo circulated to member firms on the first Friday of each month.

¹²⁷ See NYSE Market Surveillance Information Memo 92-27, October 16, 1992. The Exchange first implemented a variation of these procedures for quarterly expirations only, starting with the September 1986 triple-expiration (initially, only the 30 "Dow" stocks were covered). Subsequently, since the November 1988 double-expiration, the Exchange has used them for monthly expirations as well. The 3:45 p.m. imbalance announcement was first introduced with the April 1992 expiration.

¹²⁸ NYSE Market Surveillance Information Memo 92-35, November 13, 1992. The NYSE has been making non-expiration day imbalance announcements in the pilot stocks since August 1, 1990. The NYSE first implemented the 3:45 p.m. imbalance announcement for non-pilot stocks for the five stocks that were being added to and dropped from the S&P 500 Index on July 2, 1992. The non-expiration day imbalance announcements were permanently approved by the SEC effective October 6, 1992.

15. Unusual Market Conditions

Non-Firm Quotes

When the level of trading activity in a security is such that the Exchange cannot collect, process and disseminate quotes accurately reflecting market conditions, the specialist, with Floor Official approval, may switch to "non-firm mode" for 30 minutes.¹²⁹ When in the non-firm mode, it may not be possible for transactions to be effected at the disseminated quotes. Specialists may extend the non-firm mode beyond 30 minutes following a review by Floor Officials.

Opening Delays and Stock-Specific Trading Halts

In unusual market situations, a specialist, with Floor Official approval, may delay the opening of a stock or temporarily halt trading. There are three primary reasons for opening delays and trading halts: large order imbalances, news pending and news dissemination.¹³⁰ Trading may be temporarily suspended to allow time to attract contra side interest and evaluate news. In each case an administrative message is disseminated to the Tape.¹³¹

"News pending" refers to cases where listed companies are about to make announcements that may have substantial market impact. When a company plans to make such announcements, the Exchange recommends that the company notify the Exchange at least ten minutes prior to the announcement.¹³² Listed companies may also expressly request that trading be halted in their stock. Such a request, however, does not guarantee that a halt will occur. The Exchange will

¹²⁹ NYSE (1992a) ¶ 2060 Rule 60 (c)(2). Non-firm quotes are disseminated to CQS with the character "N" in the condition field and in the Consolidated Quotes (CQ) data file (available in the TORQ and TAQ databases), they are identified by the value "9" in the MODE field.

¹³⁰ Generally, when trading in the common stock of a company is halted, trading in any preferred, rights, warrants, etc. of the same company is also halted. Finally, a trading halt, designated as "Equipment Changeover," may take place when trading in a particular security is temporarily inhibited due to a systems, equipment or communications facility problem or for other technical reasons. As with any other halt, an "Equipment Changeover" trading halt requires Floor Official approval.

¹³¹ The message indicates a trading halt (TRD.HLT) or an opening delay (OPN.DLY) and identifies the reason (ODR.IMB for order imbalance, DIS.OF.NEWS for news dissemination, or NEWS.PEND for news pending).

¹³² NYSE Listed Company Manual (1992c) ¶ 202.06 Procedure for Public Release of Information (B) Telephone Alert to Exchange.

inform a Floor Official of the impending news and/or trading halt request, and the Floor Official will decide whether trading should be halted (or an opening delayed). "News dissemination" refers to cases where news is reported about a company or its stock. For example, if it is announced that an investor acquired a sizeable percentage of the company's stock or if the company announces unexpected earnings figures, a Floor Official may decide to halt trading temporarily.

Trading halts due to order imbalances are considered "non-regulatory," meaning that regional exchanges may continue to trade and that all trade information is disseminated to the Tape. "News pending" and "news dissemination" trading halts are considered "regulatory" and the regional exchanges will generally follow the NYSE's lead and also halt trading.¹³³

During opening delays and trading halts, quote indications will usually be disseminated to the Tape.¹³⁴ Quote indications attempt to signal market conditions and the likely reopening price in order to attract counter-balancing interest. No trading can take place at these indications. The dissemination of an indication is *mandatory* for any opening which will result in a price significantly different from the previous NYSE close.¹³⁵ An indication should also be published immediately when trading is halted for a non-regulatory order imbalance and prior to the opening or reopening of a stock following an opening delay or a trading halt. Any stock that is not opened with a trade or reasonable quotation within 30 minutes after the opening of business is considered a delayed opening and requires Floor Official supervision, as well as an indication.¹³⁶

¹³³ If the regional exchanges or NASD continue trading while the NYSE has declared a halt, their trade reports will go into the system but will not appear on the Tape until 4:07 p.m.

¹³⁴ All Tape indications require Floor Official approval. On the Tape, indications are identified in the condition field by characters I, P or D for order imbalance, news pending and news dissemination. In the Consolidated Quote (CQ) file (available in the TORQ and TAQ databases), quote indications are identified by the value of the MODE field: 4 denotes news dissemination, 7 denotes order imbalance, 11 denotes news pending etc.

¹³⁵ An indication must be disseminated for an opening which will result in a price which will exceed the lesser of 10 percent or three points (five points if the previous close is \$100 or higher) from the prior NYSE close. No indication is necessary if the price change is less than one point.

¹³⁶ On highly volatile days, Floor Directors may extend the 30-minute period, usually until 10:15 a.m.

A minimum of 15 minutes must elapse between the first indication and a stock's re-opening.¹³⁷

Market-Wide Circuit Breakers

In addition to stock-specific opening delays and trading halts, the Exchange also has several market-wide "circuit breakers." These circuit breakers are rules and procedures designed to slow down or halt various market processes during significant market breaks. Their objective is to reduce market volatility and promote investor confidence.¹³⁸ Table 6 summarizes NYSE Rule 80A and Rule 80B that constitute the Exchange's circuit breakers.¹³⁹ Table 7 summarizes the current circuit breakers on the New York Futures Exchange.

When the Rule 80A tick restriction is in effect, *all* orders related to index arbitrage--including MOC orders--must contain the appropriate instructions ("buy minus" or "sell plus"). If the MOC orders were entered prior to Rule 80A's being put into effect, then the orders must be cancelled and replaced with MOC orders containing the appropriate instructions. However, on Expiration Fridays, index arbitrage MOC orders to liquidate a previously established stock position against expiring derivative products are exempt from the tick provisions of Rule 80A.¹⁴⁰

¹³⁷ When more than one indication is disseminated, a stock may open five minutes after the last indication when it overlaps the prior indication. When the last indication does not overlap the prior indication, a minimum of 10 minutes must elapse, provided that at least 15 minutes have elapsed since the first indication.

¹³⁸ For an extensive discussion of circuit breakers see NYSE (1990).

¹³⁹ NYSE (1992a), ¶ 2080A, Rule 80A, Limitations on Trading During Significant Market Declines and ¶ 2080B, Rule 80B, Trading Halts Due to Extraordinary Market Volatility. Rule 80A is discussed further in NYSE (1991d).

¹⁴⁰ The tick provisions of Rule 80A were implemented by the Exchange in August 1990.

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Tables

Table 1
Audit trail information on a single NYSE trade

The example shows only some of the information in the audit trail. Additional information includes firm clearing numbers, ITS and comparison information. "Compared trade size" is the adjusted size following the comparison of CTS and clearance data, which do not always match perfectly. Character mnemonics in the badge field indicate SuperDot orders and numeric mnemonics indicate crowd orders. However, specialist badge mnemonics (for both proprietary and agency trades) can either be numeric or the character mnemonic SPEC.

Symbol - AA
Trade date - January 12, 1993
Trade time - 9:42:59
Trade price - 70.875
Compared trade size - 2,600
CTS trade size - 2,600
Condition - Regular way

	Quantity		Badge		Account*		Source	
	Buy	Sell	Buyer	Seller	Buyer	Seller	Buyer	Seller
1	2,000	2,600	KP	0717	I	P	SuperDot Limit	Crowd
2	500		KP		I		SuperDot Market	
3	100		SPEC		S		Crowd	

* I = Non-program trading, non-member, individual investor
P = Non-program trading, member proprietary
S = Specialist proprietary

Table 2
Maximum SuperDot order size in shares
March 1, 1976 through December 31, 1992

The size limitations do not necessarily reflect technical system limitations but policy choices. Currently, for example, the system's byte-size technical limit is 99,999.

Date	Market Orders		Limit Orders	
	Pre-opening*	Post-opening	Pre-opening*	Post-opening
1976 (March)	199	199	100	100
1977 (Feb.)	299	299	500	500
1981 (Sep.)	1,099	399	500	500
1981 (Nov.)	1,099	499	500	500
1982 (Feb.)	5,099	599	500	500
1984	5,099	1,099	30,099	30,099
1985	5,099	2,099	30,099	30,099
1986	5,099	2,099	99,999	99,999
1988	20,099	2,099	99,999	99,999
1989 (Sept.) - present	30,099	30,099	99,999	99,999

* Opening Automated Report Service (OARS) introduced March 1980.

Table 3
SuperDot market order turnaround times
1992

SuperDot turnaround time is the time interval from when the specialist receives an order to the time the specialist sends out the execution report. Market-on-close and opening orders are excluded. Stopped orders are included and turnaround is based on time received to time stopped.

Time in seconds	Number of Orders	Percent of Orders
0-15	6,467,572	46
16-30	3,889,119	28
31-60	2,390,524	17
61-120	917,506	7
121 +	263,981	2

Table 4
Average daily number of ITS commitments
December 1992

Originating Market		Executing Market		
		NYSE	Other	Totals
NYSE	Commitments	0	3,172	3,172
	Executed	0	2,765	2,765
	Expired	0	62	62
	Cancelled	0	345	345
Other	Commitments	5,514	2,280	7,794
	Executed	5,034	1,812	6,846
	Expired	83	34	117
	Cancelled	397	435	832
Totals	Commitments	5,514	5,452	10,966
	Executed	5,034	4,577	9,611
	Expired	83	96	179
	Cancelled	397	780	1177

Table 5
Proportion of Upstairs-Facilitated Block Trades

The data are from the NYSE audit trail file for January 12, 1993. Stocks were arranged into quintiles according to their consolidated December 1992 share volume. Each cell represents the percentage of upstairs-facilitated volume in each category. Upstairs-facilitated block trades may include book and crowd participation. Upstairs-facilitated share volume includes the whole trade, not just the crossed portion. Similarly, trades are classified according to their total size, not just the crossed portion. For example, a 110,000-share print with 20,000-share floor participation contributes 110,000 shares to upstairs-facilitated share volume and is classified in the 100,000 plus category. The average size of upstairs-facilitated blocks is 43,000 shares. For full details of the estimation procedures see Shell (1993).

	All Blocks (10,000 +)	Block Size (shares)		
		10,000 to 25,000	25,000 to 100,000	100,000 +
All Stocks	27 %	10 %	32 %	57 %
Least Active Stocks (bottom quintile)	43 %	16 %	54 %	100 %
Active Stocks (middle quintile)	30 %	14 %	40 %	42 %
Most Active Stocks (top quintile)	26 %	10 %	30 %	61 %

Table 6
NYSE Circuit Breakers
March 31, 1993

At current levels, eight points on the Dow Jones Industrial Average are equivalent to approximately one point on the S&P 500 Index.

Event	Rule
The Dow Jones Industrial Average moves 50 points up or down from the previous day's close. (Approximately 6 S&P 500 points.)	In an up market, index arbitrage program buys in S&P 500 stocks must be executed on a minus or a zero-minus tick. In a down market, index arbitrage program sells (including short sales) in S&P 500 stocks must be executed on a plus or zero-plus tick. Applies for the remainder of the day, unless the DJIA moves back to within 25 points of the previous day's close. (Since 8/1/90, now has permanent approval) On expiration Fridays market-on-close orders to liquidate previously established stock positions against expiring derivative products are exempt from the index arbitrage restrictions. (Since 10/18/90)
The primary S&P 500 futures contract declines 12 points from the previous day's close. (Approximately 100 DJIA points.)	5-minute sidecar.* New stop and stop limit orders in all stocks are banned for the rest of the day, except for those orders from individuals for 2,099 shares or less. Does not apply in the last 35 minutes of trading. (Since 10/19/88.)
The Dow Jones Industrial Average declines by 250 points from the previous day's close. (Approximately 30 S&P 500 points.)	Trading in all stocks is halted for one hour. (Since 10/19/88.)
The Dow Jones Industrial Average declines by 400 points from the previous day's close. (Approximately 50 S&P 500 points.)	Trading in all stocks is halted for two hours. (Since 10/19/88.)

* In the sidecar procedure, all program trading market orders entered in SuperDot for NYSE-listed component stocks of the S&P 500 are diverted to a separate blind file. After the sidecar period ends, buy and sell orders are paired off and become eligible for execution. If there is an order imbalance, the specialist may make up the difference and/or adjust the price and resume trading. Alternatively, if the imbalance is large, the specialist with Floor Official permission may halt trading and publicly disseminate the imbalance information. If the imbalance is greater than 50,000 shares and if the stock is a "pilot" stock, then the imbalance information is publicly disseminated immediately after the sidecar period ends even if orderly trading has resumed. The pilot stocks consist of the 50 NYSE S&P 500 stocks with the highest market capitalizations plus any other component stocks of the Major Market Index.

Table 7
NYFE Circuit Breakers
NYSE Composite Index Futures Contract
March 31, 1993

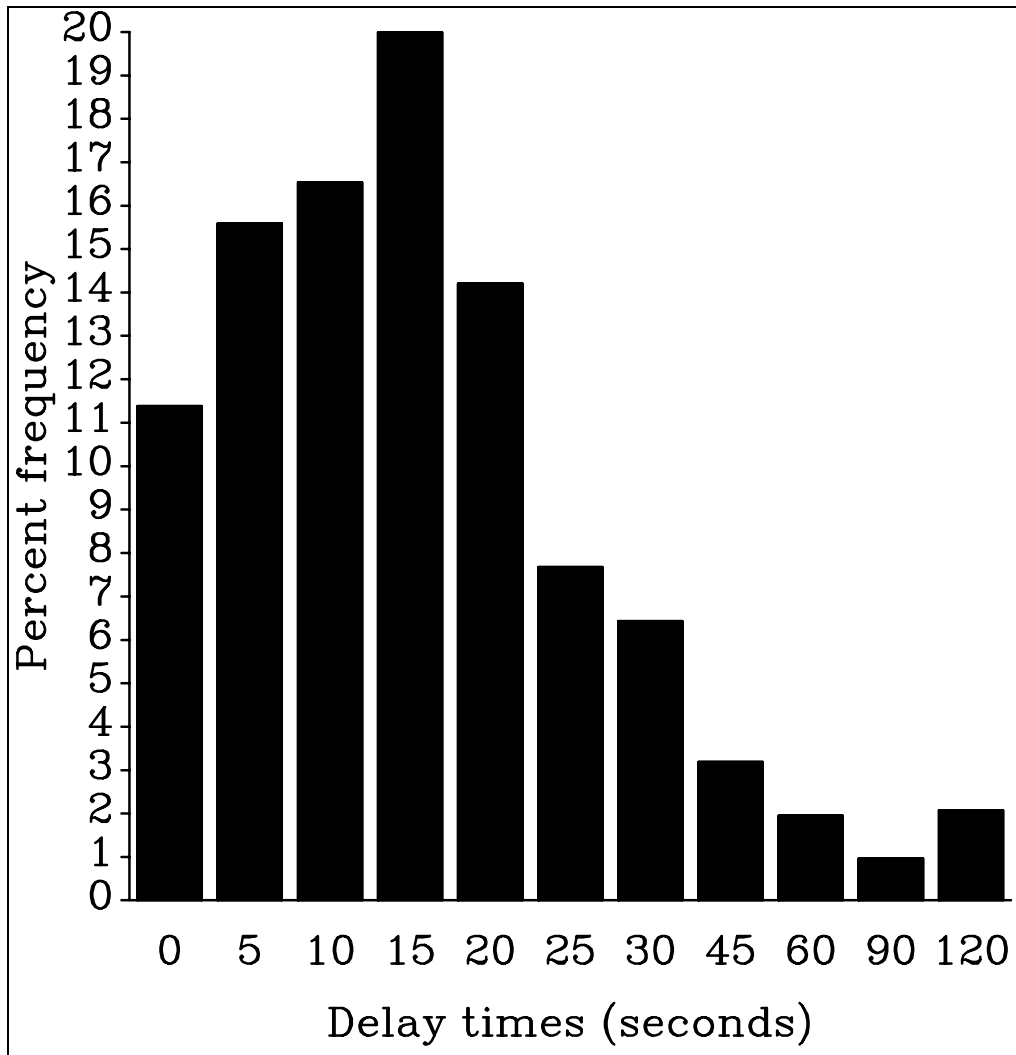
At current levels, 14 points of the Dow Jones Industrial Average are equivalent to approximately one point on the NYSE Composite Index.

Event	Rule
The NYSE Composite Index futures moves 3 points up or down at the opening. (Opening Limit)	The move is limited to 3 points and will remain in effect for the first ten minutes of trading. If at the end of the ten minute period the Chicago Mercantile Exchange declares a trading halt in S&P 500 Futures, the limit will remain in effect for another two minutes.
The NYSE Composite Index futures moves down 7 points. (Intermediate Limit)	When the 7 point decline is reached the limit will remain in effect for 30 minutes or until 3:30 p.m.
The NYSE Composite Index futures moves down 12 points. (Circuit Breaker Limit)	When the 12 point decline is reached the limit will remain in effect for 60 minutes or if the 12 pt. limit is reached on or after 2:30 p.m., this limit will remain in effect until the close of trading.
The NYSE Composite Index futures moves up or down 18 points. (Maximum Limit)	When the 18 pt. limit is reached: The limit will remain in effect until the close of trading. If a 250 point decline in the DJIA occurs, and the NYSE halts trading, a one hour trading halt will begin. At the end of the one hour trading halt, futures can resume only if at least 50% of the NYSE Composite Index (by capitalization) has re-opened. If a one hour trading halt occurs when the NYSE Composite Index Futures contract is at a 7 pt. Intermediate Limit and trading resumes after the halt, the 18 pt. Maximum Limit will go into effect.
A one hour trading halt on the NYSE	If a one hour trading halt occurs within 30 minutes of the normal close of trading that day, the NYSE Composite Index futures shall not re-open that day. If a one hour trading halt occurs more than 30 minutes but less than one hour before the normal close of trading that day, the NYSE, in its discretion, shall determine whether an abbreviated re-opening of the NYSE Composite Index futures contract shall be allowed in order to settle the futures contracts to market forces. In the event of such re-opening, there shall be no trading at a price more than 18 Index points above or below the previous day's settlement price.
A two hour trading halt on the NYSE	If a two hour trading halt occurs within 60 minutes of the normal close of trading that day, the NYSE Composite Index futures contract shall not re-open that day. If a two hour trading halt occurs more than 60 minutes but less than two hours before the normal close of trading that day, the NYFE, in its discretion, shall determine whether an abbreviated re-opening of the NYSE Composite Index futures contract shall be allowed in order to settle the futures contracts to market forces. In the event of such a re-opening, there shall be no trading at a price of more than 18 Index points above or below the previous day's settlement price.

*If futures limit is in effect, options trading is suspended. When futures limit is removed, options trading resumes.

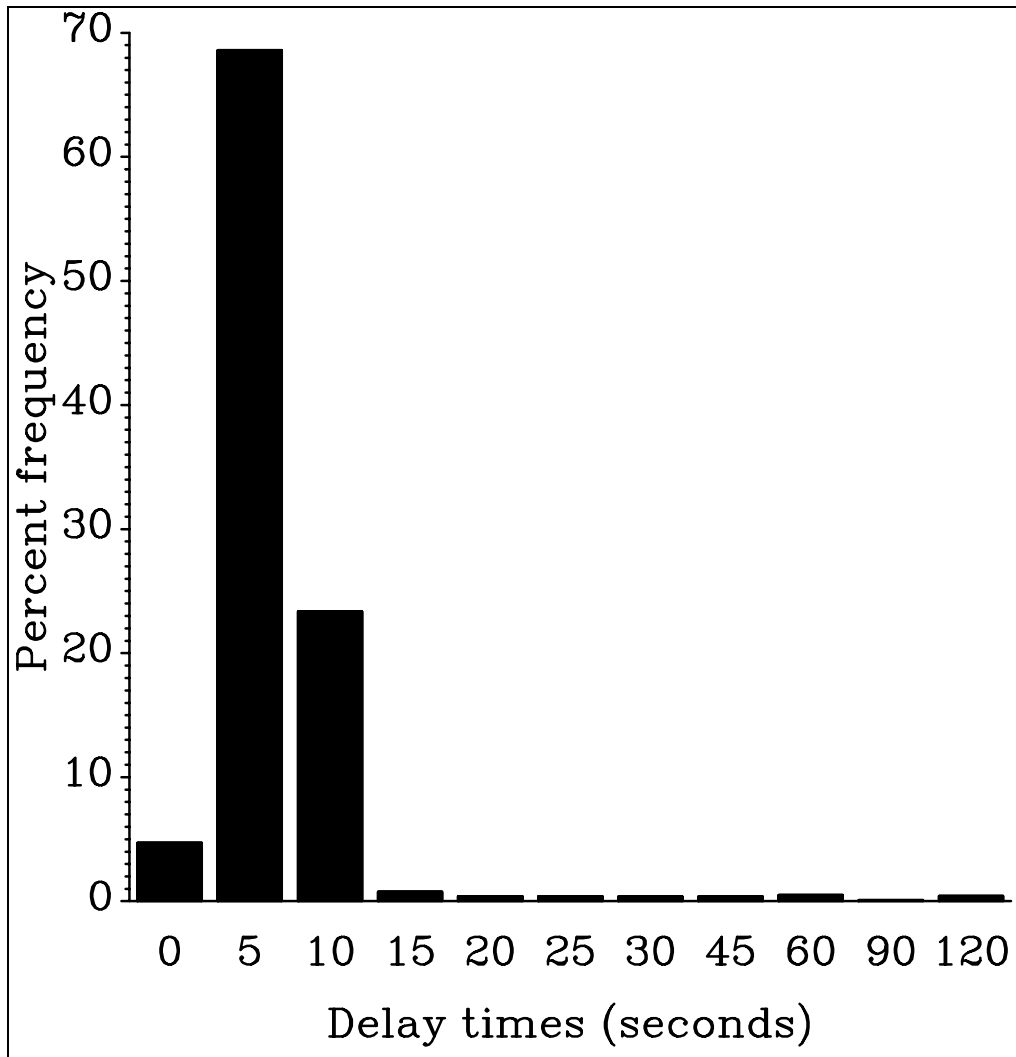
Charts

Chart 1
Reporting Lags in NYSE System Trades; All Reporting Methods
November 1 through 7, 1990



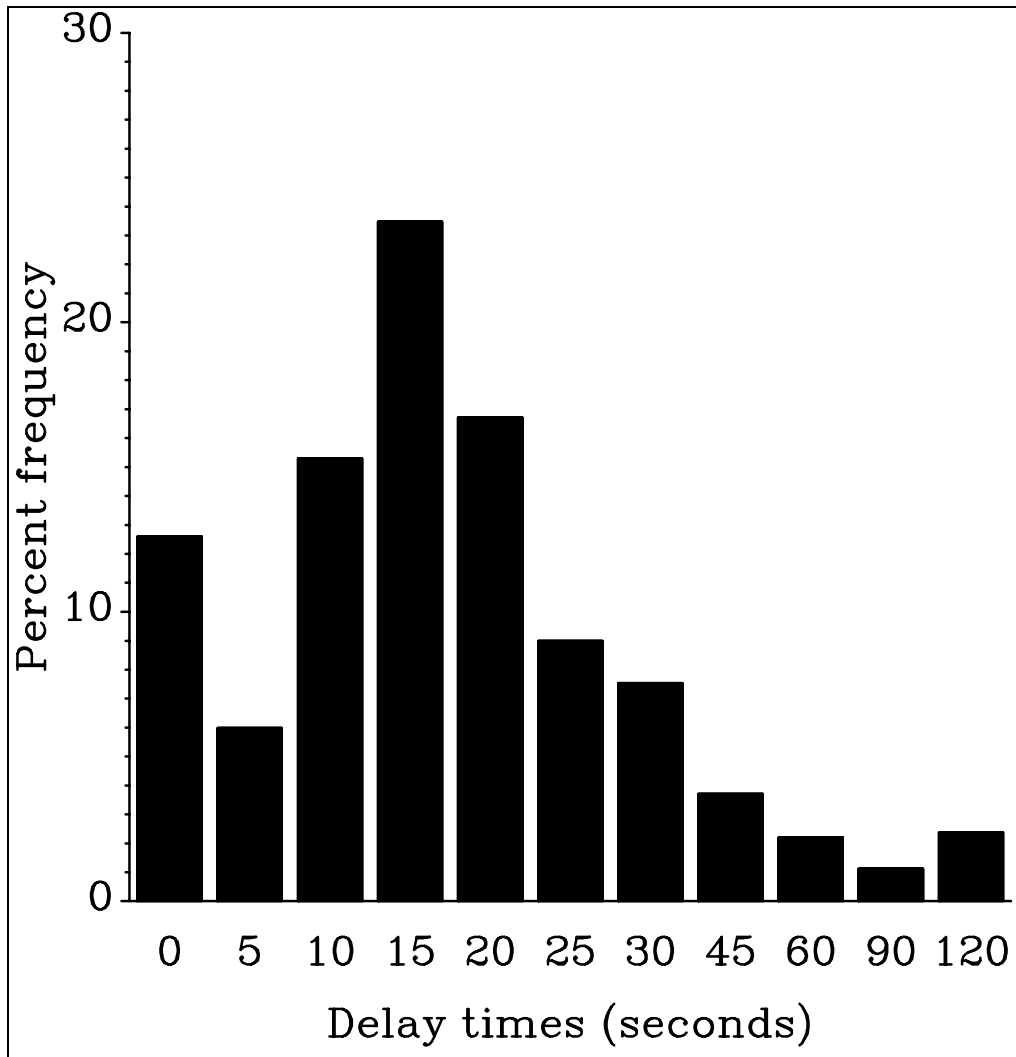
Notes: The chart depicts the distribution of $\text{Min}(0, (\text{Transaction Print Time}) - (\text{Report Time}))$, where the transaction print time is the CTS time stamp and the report time is the SuperDot execution report time to one of the trade participants. The sample consists of the 144 stocks in the TORQ database and includes 28,584 trades for which at least one participant was on the SuperDot system. The sample reflects both Display-Book and floor-reporter transaction reports.

Chart 2
Reporting Lags in NYSE System Trades; Display Book Reporting
November 1 through 7, 1990



Notes: The chart depicts the distribution of $\text{Min}(0, (\text{Transaction Print Time}) - (\text{Report Time}))$, where the transaction print time is the CTS time stamp and the report time is the SuperDot execution report time to one of the trade participants. The sample consists of the 144 stocks in the TORQ database and includes 4,384 trades for which at least one participant was on the SuperDot system and the trade was reported via the Display Book.

Chart 3
Reporting Lags in NYSE System Trades; Floor Reporting
November 1 through 7, 1990



Notes: The chart depicts the distribution of $\text{Min}(0, (\text{Transaction Print Time}) - (\text{Report Time}))$, where the transaction print time is the CTS time stamp and the report time is the SuperDot execution report time to one of the trade participants. The sample consists of the 144 stocks in the TORQ database and includes 24,200 trades for which at least one participant was on the SuperDot system and the trade was recorded by a floor reporter.