

A Tale of Two Trading Venues: Electronically Delivered Orders vs. Floor Brokered Orders on the American Stock Exchange

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Abstract

At the American Stock Exchange (Amex), electronically-routed orders (referred to as "system orders") from "upstairs" traders interact on the Amex trading floor with each other and with orders "worked" by brokers. In addition, we see that brokers receive orders from clients and other traders who have chosen to involve a floor broker as an intermediary in the trading process. The quality of the trading outcomes for system orders, compared to brokered orders, differs considerably, and these results have important implications for market structure design.

1. Introduction

At the American Stock Exchange (Amex), we see electronically-routed orders (referred to as "system orders") from "upstairs" traders interacting on the Amex trading floor with each other and with orders "worked" by brokers.¹ In addition, we see

that brokers receive orders from clients and other traders who have chosen to involve them as intermediaries in the trading process. The quality of the trading outcomes for system orders compared to brokered orders differs considerably, and these results have important implications for market structure design.

There is also evidence of differential price improvement across the two venues. The empirical findings are that price improvement on the Amex is not simply a matter of chance or bargaining ability, but that it is an important part of the underlying price discovery process.² Specifically, buy orders are more apt to be price improved than sell orders when the tendency of price is to fall, and that sell orders are more apt to be price improved than buy orders when the tendency of price is to rise. The evidence indicates that it is specialists and other floor brokers who, by handling orders with finesse, accomplish this result and contribute to the accuracy of price discovery.

¹ To appear: **Proceedings**, HICSS-32 Conference, January 1999. For a more complete discussion of the issues addressed here and the empirical findings, see "The Economic Value of the Amex Trading Floor," by Punnet Handa, Robert A. Schwartz and Ashish Tiwari, working paper, 1998.

² When a floor trader steps ahead of the book to execute against an in-coming contra-side market order, the market order trader receives price improvement. For further discussion, see Handa, Puneet, Robert Schwartz, and Ashish Tiwari, 1998b. Price discovery and price improvement on a primary market: evidence from the

The current trend in equity market structure around the globe is toward floorless electronic trading.³ But the trading floor still characterizes the U.S. stock exchanges, except for the Cincinnati Stock Exchange. The Nasd's acquisition in 1998 of the American Stock Exchange may bring into question the continuing existence of the Amex trading floor. At this stage, it is important to ask if the floor has economic value. Curiously, micro-structure economists have paid scant attention to the issue until recently.

In assessing the value of a trading floor, there is need to pay particular attention to the information aggregation procedure. Specifically, this procedure encompasses order matching, a process that translates individual customer orders into trades and trade prices. The procedure is not trivial; it depends on the market architecture, rules, and protocols that define a trading system. At the Amex, there are two order-handling mechanisms: (i) the working of floor orders by human intermediaries (floor brokers) and (ii) the electronic delivery of system orders by the Amex's electronic Post Execution Reporting (PER) system.

American Stock Exchange, *Journal of Portfolio Management*, 1999, forthcoming.

³ The Toronto Stock Exchange closed its trading floor in May, 1997. The London Stock Exchange, which has been floor-less since Big Bang in 1996, introduced an electronic limit order book into its quote driven market in 1997. Nasdaq is currently planning to do the same. Floorless, electronic continuous trading now characterizes the equity markets of Toronto, Paris, Tokyo, Stockholm, Sidney, Switzerland, Madrid, Frankfurt and elsewhere. In the U.S., new alternative trading systems (commonly referred to as ATSS) and Electronic Communications Networks (ECNs) are also electronic, order driven systems.

One might be tempted to view such a study as a contrast of electronic trading with trading by human intermediaries. This would not be correct. First, clear alternatives exist in electronic trading, and the Amex's PER is only one system. Secondly, PER is primarily an order routing and order management system, and *not* an electronic trade execution system. Nevertheless, the contrast does point out the value of handling orders with finesse, which is what floor brokers do, and it would be appropriate to interpret our results in another way. Namely, they indicate that, if electronic trading is to be an improvement over floor based trading, the electronic system must enable buy-side traders to enter their orders with a sensitivity to current market conditions that is equivalent to or better than that offered by human intermediaries.

An understanding that floor brokers enter orders "with finesse" can be viewed in a second way. The brokers wait until liquidity conditions are favorable before entering their orders. Specifically, floor buy orders are more apt to trigger executions when the bid size of the book is large relative to the offer side, and floor sell orders are more apt to trigger executions when the offer side of the book is large relative to the bid side. From the buy side perspective, this can be the case because (i) more limit orders have been entered on the buy side than on the sell side of the book and/or (ii) more orders to buy than to sell "at market" have removed limit orders predominantly on the sell side of the book. The view from the sellers' side is symmetrical.

Floor brokers waiting for favorable conditions can be viewed as an *intertemporal search for liquidity*. The fact that participants search intertemporally for liquidity suggests that markets should be structured to better provide participants with those conditions that they are in fact waiting

for. One important market structure proposal for doing so is to introduce electronic call market trading. Specifically, holding calls with reasonable frequency (perhaps as often as one per hour) would facilitate order entry and reduce participants' need to work their orders with finesse.⁴

2. Order handling and price formation in a continuous trading environment

Trading is a two step process in a continuous, order driven market. First, some participant enters a limit order. Second, another participant responds to the posted limit order by entering a market order and completing the trade. The two step process is clear in a completely electronic continuous market. A limit order already placed on the book that has price and time priority executes when a contra-side market order arrives, and the limit order generally executes at the price at which it has been placed.⁵

With human intervention, the two-step process is less clear. The contra-side order may be price improved,⁶ and two contra-side floor traders may meet and negotiate a trade with neither being

⁴ For further discussion, see *Building A Better Stock Market: The Call Auction Alternative*, Robert A. Schwartz, Editor, Kluwer Academic Publishers, 1999, forthcoming.

⁵ With block rather than walk-the-book pricing, a buy (sell) limit order may execute at a lower (higher) price than it has been placed at if a block trade is negotiated at a lower (higher) price.

⁶ Price improvement occurs when a market buy order executes at a price lower than the lowest posted offer or a market sell order executes at a price higher than the highest posted bid.

identifiable as the revealer of the price or the initiator of the trade. The very subtlety of the trade initiation, price disclosure process in floor trading distinguishes floor trading from electronic trading.

Floor brokers commonly work "not-held" orders,⁷ revealing little or nothing about an order to the market while awaiting the arrival of contra-side orders. On the Amex, the contra-side order could be:

- (i) a market order that would otherwise execute against the book or other interest in the crowd reflected in the market quotation
- (ii) a not-held order being handled by another floor broker
- (iii) from the specialist's own account, or
- (iv) from a regional exchange or third market maker delivered via the Intermarket Trading System (ITS).⁸

Fearing that disclosing a large order can cause an adverse price change for the customer, the floor broker generally reveals the not-held order only in response to the arrival of a contra-side order that he or she actually wants to trade against. Even though the broker's presence in the crowd might signal a desire to buy or sell, no one knows the size of the

⁷ A floor broker executes a not-held order at his or her own discretion attempting to get the customer a better price than the posted bid or offer, while "not being held" to the price existing at the time of the order's arrival if he or she eventually fills the order at a worse price.

⁸ Orders can also be entered into electronic trading systems but not be publicly revealed. In systems such as Paris's CAC market, these are referred to as hidden orders. An Amex floor trader, however, has more flexibility in revealing a not-held order to the market than is the case with hidden orders on the CAC market.

order being held, the price at which it will be traded, or the extent to which the order may be broken into smaller pieces for execution over an extended period of time.

By responding to market events as they occur, a floor broker can better control two polar opposite trading costs: (i) the liquidity impact cost of trading a large order too aggressively and (ii) the opportunity cost of trading too patiently. Further, if some orders are not revealed on a publicly displayed limit order book, a physical presence on the trading floor might enable a broker to obtain a more complete picture of the market for a stock at any given moment of time. Benefits are also conveyed to the broader market in the form of improved price efficiency if the liquidity impact of aggressively handled orders is contained and if patient trading results in a smoother incorporation of information into prices.

With order book trading, a participant cannot receive an execution from an arriving contra-side customer without having first placed an order on the book. An order sitting on the book reflects conditions that existed when the order was placed, and stale limit orders can result in transaction prices that are imperfectly adjusted to current market conditions.⁹ With human intervention, on the other hand, a floor trader can await the arrival of a contra-side order and step ahead of the book by offering an improved price, or two contra-side floor traders can step forward and trade with each other within the spread. This ability to adjust order prices at the time of the trade may enable transaction

prices to be better attuned to current market conditions.

3. Empirical findings

In a recent study, Handa, Schwartz and Tiwari (1998) provide empirical evidence on the order handling procedures. Their study is based on October 1996 non-block trade and quote data for 838 Amex stocks. For each stock (ticker symbol), for each day, they have:

- (i) the quote file (for each posted quote, the time of the posting, the posting exchange, the bid price posted, the size of the bid, the ask price posted, and the size of the ask)
- (ii) the trade file for floor (non-system) orders (for each trade, the time the trade was reported executed, identification code for the buy account, the quantity purchased, identification code for the sell account and the quantity sold), and
- (iii) the trade file for non-floor (system) orders (for each trade, an indicator showing whether the order was buyer or seller initiated, the time of order entry, the time the order was reported executed, the size of the order, the quantity of the order executed, the quantity remaining unexecuted, an indicator showing whether the order executed against the specialist's principal account and, if the order was guaranteed, the time and price of the guarantee).¹⁰

⁹ In the current electronic environment, limit orders are commonly kept on the book for only brief periods of time (e.g., a few minutes or less).

¹⁰ When an order is guaranteed (stopped), the customer is assured of transacting at the best price existing when the order is received, and also has the opportunity to get an execution at a better price (price improvement).

After arranging all trades for a stock by the time of execution, they merge the floor and non-floor trade files. The merged file contains trades arranged in chronological order and identified as either buyer or seller initiated, and also identified by the source of the initiating order – floor versus non-floor.

The study assesses the economic value of the trading floor by comparing the average liquidity price impact of floor trades to the average liquidity price impact of non-floor trades. The liquidity price impact of a trade measures the liquidity provided by a market (a liquid market has the ability to absorb large trading volumes with minimal price movements). To measure the price impact of a trade, the *permanent* and *temporary* components of the price change before and after the trade, are calculated.

- The *permanent* component of the price change represents the long-run information-based revision in the market's valuation of a stock following the advent of news; it is measured by the *permanent price impact* of trade t for stock i over an interval spanning fifteen trades before trade t to fifteen trades after trade t .^{11,12}

¹¹ Such a test design constrains examination of the sixteenth through the sixteenth-to-last trade of the day for each stock.

¹² Specifically, the permanent price impact of trade t for stock i is defined as the logarithmic return from the mid-quote of the fifteenth trade prior to the transaction (denoted by M_{-15}) to the mid-quote of the fifteenth trade after the transaction (denoted by M_{+15}), multiplied by an indicator variable D_{it} that equals 1 for buyer initiated trades and -1 for seller initiated trades. The indicator

- The *temporary* component of the price change reflects the transitory price change associated with the market absorbing the trade impact. In markets that are not perfectly liquid, one would expect that buyer-initiated trades are followed by transitory price declines while seller-initiated trades are followed by transitory price increases. These price *reversals* from the trade price to the post-trade value of the stock, may be viewed as the compensation required by the suppliers of liquidity to consummate the trade. The study uses the mid-quote of the fifteenth trade *after* the transaction as a measure of the post-trade value of the stock.

Hence, the *temporary price impact* of trade t for stock i is defined as the negative of the logarithmic return from the transaction to the mid-quote of the fifteenth trade *after* the transaction, multiplied by an indicator variable that equals 1 for buyer initiated trades and -1 for seller initiated trades.

The permanent and temporary components of price impact can be documented for four categories of trades: floor-based buy orders, floor-based sell orders, non-floor based buy orders and non-floor based sell orders. For each of these four categories, the permanent and temporary price changes can be assessed with regard to two explanatory variables: *order size*, and *order imbalance*. With regard to order size, orders are divided into four groups: orders less than 500 shares, orders between 500 and 999 shares, orders between 1000 and 1499 shares and orders between 1500 and 9999 shares. Order imbalance for trade t is defined as:

variable D_{it} facilitates the presentation of our findings by allowing aggregation of buyer and seller initiated trades.

Size at same Side/(Size at Same Side+Size at Contra Side)

where size is measured with respect to trade t .

In addition to the order size and order imbalance variables, the study takes account of a stock's average daily trading volume.

For the full sample, Handa, Schwartz and Tiwari find that 58.16% of all trades on the Amex in October 1996 were triggered by floor orders, with floor orders averaging 1480 shares in size and non-floor orders averaging 645 shares. The temporary price impact of a trade averaged 1.45 cents for trades triggered by floor orders and a substantially larger 3.29 cents for trades triggered by non-floor orders. The permanent price impact of a trade averaged 5.90 cents for trades triggered by floor orders and a substantially lower 3.27 cents for trades triggered by non-floor orders.

The heavy use of floor orders, the lower temporary price impact of floor orders, and the larger permanent price impact of floor orders clearly suggest the value of floor broker intermediation in trading. Using the order size and imbalance variables, the study further assesses order handling to gain insight into why the floor environment might be valuable. First it analyzes the probability of a trade being triggered by a floor vs a non-floor order. The finding is that this probability is higher for larger orders, larger values of the imbalance variable, and smaller trading volume for a stock. This clearly suggests that the value of the floor is that it enables participants to better time their orders given the characteristics of an order (i.e., its size), the characteristics of the market at the time of execution (i.e., order imbalance), and the characteristics of the stock being traded (i.e., its average trading volume).

Also analyzed are, for floor and for non-floor orders separately, the temporary price impact's relationship to trade size and order imbalance. For both floor and non-floor orders, as expected, the temporary price impact is less for larger trade size and larger values of the order imbalance variable. However, the relationships are considerably stronger and more significant for floor than for non-floor orders, which further indicates the value of broker intermediation in the Amex environment.

4. Conclusion

In the U.S., the New York Stock Exchange and the American Stock Exchange have retained their trading floors, and recent empirical findings confirm the desirability of their having done so. These studies assess the economic value of the Amex trading floor for handling orders for individual traders and for setting prices for the broad market by contrasting the price changes that precede and follow the execution of floor orders with those that precede and follow the execution of non-floor orders delivered by Amex's electronic PER system.

These findings should not be interpreted as implying that floor traders may, on average, achieve better executions than would occur with electronic trading in general, but only with regard to Amex's PER in particular. But they do demonstrate the importance of the Amex trading floor to that market. The findings are particularly interesting in light of recent developments around the world in electronic trading technology. For an expanding array of equity markets, including Toronto, Paris, Tokyo, Australia, Madrid, Stockholm, Switzerland and Frankfurt, floorless electronic trading systems have been replacing the old trading floors. However, many questions associated with electronic trading remain. No doubt an

understanding of the economic value of human intermediation on a trading floor can yield valuable insights for the development of superior electronic trading systems.