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## Should ECNs be SOES-able?

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### **Abstract:**

This paper documents the significant role of ECNs in forming the inside market in NASDAQ securities. We argue that the ECNs need to be exposed to market orders through the SOES system.

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## **I. Introduction**

On the New York Stock Exchange (NYSE) nearly all trading volume is handled by a specialist on the floor of the exchange. Order routing during market hours is not a primary concern for those trading in listed securities. In contrast, the National Association of Security Dealers Automated Quote (NASDAQ) system is a computerized trading network with a variety of routes for marketable orders. Broker dealers making markets and retail investors alike must make use of all these routes to fill orders efficiently.

This paper examines the role of electronic communication networks<sup>1</sup> (ECNs) which match bids and offers automatically. They play an increasingly important role in NASDAQ trading activity, handling about 30% of the total volume. We argue that their role may be even more important because they so frequently make the inside market in a wide range of securities.

With ECNs contributing such a large amount of liquidity, we try to build a case for making these networks as accessible as possible to the retail investor. Under the present system, ECNs cannot be reached through the small order execution system (SOES). Market orders and marketable limit orders placed into the SOES system may go unfilled

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<sup>1</sup> ECNs are defined by SEC Rule 11Ac1-1(a)(8) as “any electronic system that widely disseminates to third parties orders entered by an exchange market maker or OTC (over-the-counter) market maker, and permits such orders to be executed against in whole or in part...”

for three minutes before automatically timing out. Our detailed investigation of the trade and quote data from the NASDAQ indicates that this can occur more than 50% of the time even in the largest capitalization securities.

Section II of this paper provides a more detailed analysis of the SEC regulation and trade routing options. Section III describes our empirical methodology. Section IV presents our results and provides some analysis and an affirmative answer to the question in the title. We then discuss the possible impact of the revisions proposed for the SOES system by the National Association of Security Dealers (NASD) in Section V. Section VI presents some brief conclusions.

## **II. A Brief History of SEC Regulation and the SOES System**

There are three principal routes for making trades in the NASDAQ system. They include the SOES system, the SelectNet system, and direct ECN access. SelectNet is an automated order routing and execution system that allows a member to direct buy or sell orders in NASDAQ securities to a single market maker (*preferenced* orders) or *broadcast* orders to all market makers in the security. While ECNs can be accessed by SelectNet, the majority of trades are conducted using direct access to the computers of the ECNs. We will then defer any further discussion about SelectNet until we discuss the proposed reforms to the SOES system in Section V.

The SOES system was created in response to the limited access of retail investors during the October 1987 stock market crash. NASDAQ market makers (MMs) could not be reached by those anxious to sell. The October crash in NASDAQ was actually spread

out over two days as a result, falling 11.34% on October 19 and another 8.99% on October 20.

The NASD instituted the SOES system in June 1988. In most large capitalization stocks, MMs were required to execute orders of up to 1,000 shares. This system led to the first wave of “day trading” in NASDAQ stocks with “SOES bandits” making quick entry and exit as short term trends emerged. Harris and Schultz (1998) found these strategies to be profitable.

The next major wave of reform followed the research of Christie and Schultz (1994). They found that NASDAQ dealers avoided odd-eighth quotes in 70 of the 100 largest NASDAQ stocks in 1991. Federal and private antitrust litigation followed. In July 1996, the Department of Justice (DOJ) began a civil antitrust suit against 24 leading NASDAQ market makers. Later that year, the DOJ concluded a consent decree with the market makers that prohibited this conduct but imposed no penalty. In November 1998, a federal judge approved a \$1.03 billion class-action settlement between 37 brokerages and investors who alleged they were cheated by the firms in a price-fixing conspiracy involving NASDAQ-listed stocks. The deal was the largest civil antitrust settlement in history.

The Securities and Exchange Commission (SEC) also instituted some sweeping regulatory changes. Primary among these was the Display Rule adopted on August 28, 1996. The rule requires the display of customer limit orders priced better than a market maker or specialist's quote. A NASDAQ market maker who receives a customer limit order meeting these parameters must immediately: (1) change its quote and the size associated with its quote to reflect the limit order; execute the limit order; (2) deliver the

limit order to an exchange- or association-sponsored system that complies with the requirements of the rule; (3) send the limit order to another market maker or specialist who complies with the requirements of the rule; (4) deliver a limit order to an ECN limit;

These new order handling rules permit the public to compete directly with NASDAQ dealers by submitting binding limit orders. In addition, superior quotes placed by NASDAQ dealers in proprietary trading venues (for example, SelectNet and ECNs) begin to be displayed in the NASDAQ market. The display of limit orders and the reduced fragmentation of trading between NASDAQ and proprietary venues impart auction market characteristics to a market that was traditionally quote-driven.

The public also gained access to superior prices posted by market makers in ECNs. Prior to the SEC rule changes, the presence of an alternative pricing system permitted dealers to quote one set of prices for retail customers on NASDAQ, while offering more favorable prices to other market makers or institutions. Under the new SEC rules, if a dealer places a limit order either as agent or principal into an ECN, the price and quantity are incorporated in the ECN quote displayed in NASDAQ.

Also parties who are not market makers but trade via ECNs have the option of displaying their orders on NASDAQ through the ECN quote.<sup>2</sup> The rule eliminates the fragmentation of price discovery across trading venues and increases competition

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<sup>2</sup> SelectNet, which permits brokers and dealers to submit orders to exclusive execution by market makers, is not recognized as an ECN. Thus, dealers are required to reflect their SelectNet quotes directly on NASDAQ.

In early 1997, several changes were made to the SOES system. First, the limit size for automatic executions was change to 100 shares. NASDAQ modified the SOES system to return orders to the entering firm when an ECN or Unlisted Trading Privileges (UTP) participant was alone on the inside market. Previous to this SOES orders were filled against the MMs at the next tier of quotes but at the ECN price. The combination of these two changes dramatically limited the SOES exposure of NASDAQ market makers. This had the effect of moving most "day trading" activity to ECNs.

To avoid the problem of resequencing SOES orders due to cancellations, the NASD created a 90 second queue for executable SOES orders in February 1998. This "hold time" will give the market three options: (1) allow the ECN to move away, creating a new inside; (2) give the Market Makers time to adjust their quotes to create a new inside; or (3) allow the Market Maker to join the ECN at their price. If one of these events happens prior to the end of the ninety seconds, the order will either execute or be rejected if it is no longer executable. If none of these conditions occur, however, the order will time out at the end of the 90 seconds and be returned to the entering firm.

The NASD stated in its filing<sup>3</sup> that it would not subject ECNs to SOES executions because the ECN would be exposed to the risk of double executions and the consequent need to take a principal position, which is inconsistent with the ECN's role of acting solely as agent on behalf of its customers. The NASD stated that the risk of double executions arises because, with electronic order entry capabilities, once an order is displayed in multiple execution systems, such as SOES and an ECN's own system, the

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<sup>3</sup> Release No. 34-38156; File No. SR-NASD-96-43 January 10, 1997

same order can be accessed nearly simultaneously by different counterparties. The NASD's explanations is a bit puzzling given that most ECNs are accessible by both SelectNet and direct access to their trading computers.

In the next section, we begin our investigation into whether the lack of SOES access to ECNs is a potentially serious problem.

### **III. Data and Empirical Methodology**

The data are obtained from NASDAQ Trade and Quote Data CD-ROMs issued by NASDAQ. Table 1 shows the contents of the data. Although trade data consist of volume and prices, the identity of the dealer/ECN is unknown. Individual dealer/ECN quote data start at 9:30 a.m., and end at 4:00 p.m. Trade data and inside quote data are around the clock. Quotes and trades are time-stamped to the second. We use the first four months of 1999 as our sample period.

We pick three groups of stocks out of NASDAQ 100. The first group consists of 7 stocks that have the largest capitalization in NASDAQ. The next group of 7 stocks that are the most active ones, apart from those already in the first group. By most active, we mean stocks whose quotes are most frequently revised, which can be correspondingly reflected by the sizes of their individual dealer/ECN quote data files. All the stocks in the first group are very active during the sample period, with high trading volumes. But large capitalization is not necessary to make a stock active. AMZN, YHOO and EBAY are not among the highest capitalization stocks, and they do not have as many market makers as the big 7 (shown in Table 2), but they are at the center of attention during the sample



period, with high trading volumes and extremely frequent quote revisions. Similarly we pick the 7 least active stocks in the Nasdaq 100<sup>4</sup> as the third group. Table 2 shows names of sample stocks and numbers of market makers (including ECNs).

Currently there are 11 ECNs registered in the NASDAQ system. They are Attain (ATTN), Archipelago (ARCA), Brass Utility BRUT, Bloomberg Tradebook (BTRD), Instinet (INCA), Island (ISLD), Chicago Stock Exchange<sup>5</sup> (MWSE), PIM Global Equities (NTRD), Spear, Leeds and Kellogg (REDI), Strike Technologies (STRK) and Terra Nova Trading (TNTO). Among them Island, which caters primarily to day traders, and Instinet, which handles mostly institutional volume, are the most active ones.

## **IV. Results**

ECN-BID gives us the time ECNs can be found at the inside bid. For example, for Cisco Systems (CSCO) in Table 3, 78.8% of time ECNs are at the inside bid. MM-BID indicates that a market maker is at the inside bid. For example, for Dell Computer

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<sup>4</sup> The Nasdaq 100 index is a subjective index that consists primarily of the largest market capitalization stocks on the index. A list of the current stocks in the index can be found at <http://www.nasdaqtrader.com/asp/nasdaq100ndx.asp>

<sup>5</sup> The Chicago Stock Exchange is actually what is known as a UTP - Unlisted Trading Privileges participant. Through UTP, other exchanges and markets are able to compete with, and attract order flow from the listing market. MWSE is the only fully registered UTP participant.

(DELL), 84.8% of the time there is a market maker at the inside. We can determine the amount of time only ECNs are at the inside bid from this latter percentage. For DELL, ECNs are alone at the inside just 15.2% of the time. ECN-ASK and MM-ASK are the corresponding percentages for the ask prices.

For the NASDAQ's seven largest capitalization stocks, ECNs can be found at the inside bid an average of 77.7% of the time and 79.7% of the time at the ask. These range from a low of 73.8% for SUNW to a high of 79.3% for ORCL. Market makers appear only slightly less frequently, an average of 76.8% of the time on the bid and 73.2% of the time on the offer. For bid prices, the range is 68.7% for SUNW at the low and 87.3% at the high for ORCL. The range for the offer prices is 63.5% for SUNW and 84.6% for ORCL.

Market makers are clearly quite active in these stocks, but many retail investors would be surprised to learn that more than 25% of the time their market buy orders may be queued in 4 of 7 of these stocks (CSCO, INTC, MSFT, and SUNW). The first 3 are the largest capitalization stocks on the entire NASDAQ market.

We next turn to a similar set of results for stocks where we knew ECNs were especially active in Table 4. By active, we do not mean that ECNs are more often at the inside market. On the contrary, ECNs are on the inside bid only 75.0% of the time in this second group. The big difference between the first group and the second is the large decline in market maker activity at the inside. On the bid, market makers are on the inside only 57.0% of the time and only 56.1% of the time on the offer. These differences are highly statistically significant.

The ECN presence on the bid ranges from 64.8% at the low for Xilinx (XLNX) to 80.9% for 3-COM (COMS). The ask range is 64.8% for Ebay (EBAY) to 83.1% for COMS. Market makers are at the inside as much as 50% less often in this group of stocks. For example, market makers are at the inside bid for Yahoo (YHOO) only 39.6% of the time, which is the low end of the range. This compares to an ECN presence of 78.6%. The only stock for which the market maker presence is higher is COMS: 87.9% of the time on the bid and 84.3% on the offer. Both are the high end of the ranges for this group.

Market orders for this group may be quite hazardous. They face potential queuing more than 50% of the time for 3 stocks (YHOO, AMZN, and CMGI) and more than 25% of the time for all seven in this group except for COMS.

Before beginning this investigation, we expected that the ECNs would not be very active in the less active<sup>6</sup> group listed in Table 5. These stocks generally have trading volumes well under one million shares and do not trade in ranges that make them appealing to day traders. Our priors were confirmed by a statistically significantly lower ECN inside presence of 53.0% on the bid and 56.0% on the ask. These are more than 20% lower than the corresponding ECN active group from Table 3.

Market makers are also less active in these stocks at least as compared to the large capitalization group. On average, MMs form the inside bid 70.8% of the time and 66.1% of the time on the offer. They range from a high of 84.7% for Herman Miller (MHLR) on

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<sup>6</sup> These are small only relative to their counterparts in the NASDAQ 100 index.

the bid and to 60.9% at the low for Molex Inc. (MOLX). The range for the ask prices is 78.3% for Sigma-Aldrich (SIAL) to 55.0% for Panamsat Corp (SPOT)..

Market orders would fare much better in this group than the ECN active stocks, but for 5 of 7 stocks (ADLAC, DLTR, MOLX, PCAR and SPOT) SOES executions would be ineffective almost 30% of the time.

We think this set of results provides some compelling evidence for exposing ECNs to SOES executions. In the next section, we explore whether some recently proposed NASDAQ regulations may accomplish this.

## **V. SuperSOES**

On January 14, 2000, the SEC approved rule changes that establish a new platform for the trading of NASDAQ National Market (NNM) securities and amended the rules governing SelectNet. The effective date was set to be March 15<sup>th</sup>, 2000, but it was postponed to June 5<sup>th</sup>, then July 10<sup>th</sup>. Now it has been delayed again to the fourth quarter of 2000.

Nasdaq will establish a NASDAQ National Market Execution System (NNMS), commonly known as SuperSOES, as the primary trading platform for NNM securities. NNMS will be based on the architecture of SOES, but will be enhanced in several ways. Under the rule changes, SelectNet will be used to deliver negotiable non-liability orders to Market Makers and Electronic Communication Networks (ECNs) that participate in NNMS.

The reason of rule changes, according to NASD<sup>7</sup>, was to avoid “dual liability” created by two separate execution systems (SOES and SelectNet) operating independently and simultaneously for market makers. Multiple access pointing to a market maker's quote can subject MMs to unintended double liability for orders that reach their quote at or near the same time through separate and asynchronous systems. This reduces Market Maker incentives to commit capital and display larger quote sizes, thereby depriving the Nasdaq market of liquidity.

Under the new rules, SelectNet will be restructured to be a non-liability, order delivery and negotiation system for NNM securities. On the other hand, SOES will be enhanced substantially. Among other changes, the one that is most relevant to the topic of this paper is that the new system will allow ECNs to choose to be Order-Entry ECNs or Full-Participant ECNs. Order-Entry ECNs (OE ECNs) will participate in Nasdaq in substantially the same manner as ECNs do today. That is, market participants would be able to access OE ECN quotes via the SelectNet linkage. Full-Participant ECNs (FP ECNS), however, will agree to provide automatic execution against their quotes for orders, similar to Market Makers. That is, FP ECNs are SOES-able.

While the rule changes<sup>8</sup> are still several months off and subject to further changes, we feel that making all ECNs SOES-able would be an advisable amendment to the proposed rule changes.

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<sup>7</sup> NASD Notice to Members 00-30.

<sup>8</sup> Some other changes are worth mentioning too. Under the new rules, “No Decrementation” will be eliminated. “NO DEC” currently allows continuous executions

## VI. Conclusion

The SEC has clearly enhanced the efficiency of the NASDAQ trading system with the reforms it began in the late 1990s. Bid ask spreads have narrowed substantially. Barclay, Christie, Harris, Kandel, and Schultz (1999) found that quoted and effective spreads narrowed by approximately 30 percent, with the largest benefit accruing to investors in stocks with relatively wide spreads prior to the implementation of the new SEC rules.

We feel that offering market makers protection from SOES exposure was a step backward though. The frequent ECN presence at the inside market provides an option to NASDAQ market makers that is potentially harmful to retail investors. We would strengthen the proposed NASDAQ regulations to make *all* ECNs SOES-able.

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against a MM's quote at the same time. Similarly, Nasdaq is also eliminating the existing SOES preferencing feature. These changes, can be viewed as protective arrangements for MMs, once ECNs start to be SOES-able.

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**Table 1.**

**The contents of the data**

<b>Trade Data</b>	<b>Inside Quote Data</b>	<b>Dealer/ECN Quote Data</b>
Report date	Report date	Report date
Ticker symbol	Ticker symbol	Ticker symbol
Reported trade time	Quote change time	Quote change time
Execution time	Inside bid price	Market Maker/ECN id
Executed size	Inside ask price	Displayed quoted bid price
Execution price	Opening market indicator	Displayed quoted ask price
Late reported trade indicator		Displayed size of bid quote
Source indicator (SOES or SelectNet trade)		Displayed size of ask quote
		Open/close/halt indicator



**Table 2.**

**Sample Stocks and Numbers of Market Makers**

Group 1	CSCO	DELL	INTC	MSFT	ORCL	SUNW	WCOM
# of MMs	75	67	58	59	75	61	73
Group 2	AMAT	CMGI	EBY	YHOO	AMZN	COMS	XLNX
# of MMs	64	36	33	52	51	76	47
Group 3	DLTR	ADLAC	MLHR	PCAR	MOLX	SIAL	SPOT
# of MMs	29	18	28	22	28	30	25

**Table 3.****Large Capitalization Stocks**

	<b>ECN-BID</b>	<b>ECN-ASK</b>	<b>MM-BID</b>	<b>MM-ASK</b>
CSCO	0.788 (0.042)	0.792 (0.100)	0.699 (0.050)	0.671 (0.071)
DELL	0.810 (0.082)	0.817 (0.096)	0.848 (0.089)	0.825 (0.096)
INTC	0.746 (0.090)	0.785 (0.098)	0.778 (0.074)	0.738 (0.082)
MSFT	0.788 (0.073)	0.808 (0.081)	0.700 (0.085)	0.646 (0.088)
ORCL	0.793 (0.063)	0.812 (0.071)	0.873 (0.085)	0.846 (0.082)
SUNW	0.738 (0.084)	0.777 (0.083)	0.687 (0.069)	0.635 (0.076)
WCOM	0.779 (0.050)	0.791 (0.065)	0.791 (0.052)	0.760 (0.065)
AVG.	0.777	0.797	0.768	0.732

**Table 4.****Most Active Stocks**

	<b>ECN-BID</b>	<b>ECN-ASK</b>	<b>MM-BID</b>	<b>MM-ASK</b>
AMAT	0.777 (0.086)	0.813 (0.074)	0.723 (0.070)	0.68 (0.069)
YHOO	0.786 (0.104)	0.796 (0.158)	0.396 (0.100)	0.372 (0.136)
AMZN	0.805 (0.073)	0.826 (0.057)	0.406 (0.082)	0.392 (0.091)
CMGI	0.725 (0.101)	0.746 (0.078)	0.446 (0.107)	0.437 (0.083)
COMS	0.809 (0.113)	0.831 (0.075)	0.879 (0.094)	0.843 (0.091)
EBAY	0.703 (0.085)	0.648 (0.110)	0.470 (0.108)	0.551 (0.106)
XLNX	0.648 (0.098)	0.668 (0.095)	0.670 (0.100)	0.650 (0.069)
AVG.	0.750	0.761	0.570	0.561

**Table 5.****Least Active Nasdaq 100 Stocks**

	<b>ECN-BID</b>	<b>ECN-ASK</b>	<b>MM-BID</b>	<b>MM-ASK</b>
ADLAC	0.445 (0.24)	0.513 (0.205)	0.7 (0.167)	0.625 (0.188)
DLTR	0.504 (0.174)	0.516 (0.173)	0.689 (0.141)	0.67 (0.144)
MLHR	0.546 (0.211)	0.593 (0.213)	0.847 (0.149)	0.773 (0.172)
MOLX	0.683 (0.161)	0.707 (0.161)	0.609 (0.191)	0.565 (0.189)
PCAR	0.47 (0.173)	0.519 (0.150)	0.702 (0.139)	0.666 (0.145)
SIAL	0.547 (0.205)	0.442 (0.184)	0.732 (0.155)	0.781 (0.133)
SPOT	0.512 (0.161)	0.633 (0.149)	0.678 (0.176)	0.55 (0.156)
AVG.	0.530	0.560	0.708	0.661