

Competitiveness and Price Setting in Dealer Markets

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THE NATIONAL ASSOCIATION OF SECURITIES DEALERS AUTOMATED QUOTATIONS (NASDAQ) SYSTEM IS AN ELECTRONIC MARKET FOR OVER-THE-COUNTER (OTC) STOCKS. IT IS THE SECOND-LARGEST SECURITIES MARKET IN THE UNITED STATES. ALLEGATIONS THAT DEALERS COLLUDE TO WIDEN BID-ASK SPREADS HAVE LED TO SWEEPING CHANGES IN THE RULES GOVERNING TRADING IN THE NASDAQ STOCK MARKET.

Bid and ask quotes are prices at which dealers or market makers are willing to transact. A market maker is an individual or firm that risks its own capital to provide investors with immediacy of supply and demand. The bid-ask spread represents the cost to investors of transacting with the market maker. Investors prefer a narrow spread because it reduces trading costs and improves liquidity (Amihud and Mendelson 1986). Bid-ask spreads, like other transaction costs, significantly affect the efficiency of capital markets (Bhushan 1994; Kim and Verrechia 1994). In an efficient market, prices quickly reflect new information so that the information cannot be used to derive abnormal trading profit. Stock markets are thought to be more efficient when spreads are narrow because information is disseminated more quickly. Yet, at the same time, dealers must receive adequate compensation for making a market in a security, or the market's liquidity is threatened.

Regulators and investors have asserted that Nasdaq dealers conspire to widen bid-ask spreads in order to increase their profit at investors' expense. Academics have amassed a substantial body of evidence relating to the Nasdaq scandal. Yet there is no consensus concerning whether dealers collude to fix prices and widen bid-ask spreads.¹ Observed spreads may result

from institutional features particular to the Nasdaq market rather than collusion among market makers.

This article explores the Nasdaq pricing controversy in light of economic theory and evidence of alleged collusion, including evidence contained in U.S. Department of Justice and Securities and Exchange Commission reports (1996). The following section examines the important role that securities markets play in promoting a stable economy. Then the discussion reviews specifics of the two organizational structures commonly adopted—auction and dealer markets. These initial sections provide a foundation for understanding the significance of the Nasdaq controversy. Subsequently the article considers the sources and economic consequences of divergence in spreads. Finally, it elaborates on what constitutes collusive behavior and summarizes the case against Nasdaq.

Functions of Securities Markets

Regulation of securities markets in the United States changed dramatically following documented abuses and market irregularities in the 1920s and early 1930s. At that time there was little confidence in the stability of the U.S. market. The stock market crash of 1929 and poor economic conditions brought the role of

stock market to the forefront of the policy debate. New federal laws resulted, and a powerful federal agency, the Securities and Exchange Commission (SEC), was established to enforce those laws. According to the Securities Exchange Act of 1934, a national securities exchange must provide a “free and open market” that “protect(s) investors and the public interest” (15 U.S.C. 78f[b] [5] and 78o-3[b] [6]).

It is clear that well-functioning financial markets are vital in a thriving economy. A primary function of these markets is the allocation of capital and financial resources. Financial markets move capital from savers to those with productive uses for the capital (that is, those with good investment opportunities). In so doing, a well-functioning securities market maintains continuous and active trading, which allows investors to enter and exit when necessary. Market participants want to receive the best price with speedy execution at low cost. Investors have greater confidence in a market that is fair, open, and orderly and offers low transaction costs. At the same time, an effective securities market facilitates price discovery so that prices quickly reflect information and reveal this news to the market’s observers and participants. Financial markets also permit individuals to transfer consumption across time. Well-being improves when individuals are permitted to smooth consumption over their life cycle. Designing a securities market that meets these objectives involves trade-offs because these goals typically conflict (Ganley and others 1998).

Dealer versus Auction Markets

The rules governing securities trading vary across organizational structures. Economists debate the merits of two commonly adopted organizational forms: auction and dealer market structures. In an auction market an investor buys or sells at a price set by another investor’s limit order. A limit buy order specifies the maximum price that an investor is willing to pay, whereas a limit sell order specifies the minimum price that an investor is willing to receive. By comparison, in dealer markets investors trade with market makers who simultaneously quote prices at which they are willing to buy (the “bid” price) and sell (the “ask” price) a particular security. The best bid (highest) and ask (lowest) prices determine the inside spread.

The New York Stock Exchange (NYSE) is an auction market that maintains a specialist system, wherein one dealer maintains a market in a particular stock. The specialist enters offers to buy at bid prices and sell at ask prices in order to provide liquidity and continuous trading. Investors place market orders to sell or buy at prevailing market prices, and the specialist fills the orders at

the inside (best) bid and ask prices. The specialist also maintains a record or limit order book of investors’ unexecuted limit orders. Although a specialist in a sense has a monopoly franchise in a particular stock, the presence of one market maker does not necessarily lead to excessive bid-ask spreads because the limit order book provides competition for order flow. Execution costs are expected to be low because the inside spread is often determined by customers’ limit orders and investors can trade directly with each other. Investors get the best available prices, whether the prices are from the specialist or from other investors’ limit orders.

In contrast to the NYSE, the Nasdaq is a multiple-dealer market, where several dealers maintain a market in a particular stock. Other important dealer markets include most bond and foreign currency

markets, as well as the Chicago Board Options Exchange and the London Stock Exchange. Traders in the Nasdaq market do not gather in one location as in an organized exchange but rather are connected electronically through a computer system. To make a market, dealers simultaneously quote prices at which they are willing to buy and sell a particular stock. Because each Nasdaq stock has at least two market makers, a dealer’s spread is not necessarily the inside spread. However, investors’ market orders get the “best execution” in that orders to sell or buy at the current market price are filled at the inside bid or ask price, whether or not the dealer receiving the order issued that particular price quote. Prior to the recent Nasdaq rule changes (discussed below), limit orders were not revealed to all market participants and were filled by a dealer when the dealer’s quote reached the limit price. The presence of multiple market makers is designed to produce narrow bid-ask spreads through competition for order flow among individual dealers. In addition, dealer markets are more flexible and can handle different types of orders from different types of customers.

Why Might Spreads Differ?

A large body of literature examines the determinants of bid-ask spreads and the effects of institutional structure on pricing in securities markets (Benston and Hagerman 1974; Stoll and Whaley 1990;

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1. *There is not even agreement on whether Nasdaq spreads are wider than those of stocks listed on other U.S. exchanges. See, for example, Kleidon and Willig (1995) and Woodward (1997).*

Neal 1992). The width of the spread reflects the costs of inventory, order processing, and trading with informed agents (Glosten and Milgrom 1985; Stoll 1985; Amihud and Mendelson 1986). By standing ready to buy or sell, the market maker provides a useful service. However, while providing immediacy to investors the market maker is exposed to the risk of a market movement that results in a decrease in the value of inventory held. Additional risk arises because some investors' trades are motivated by private information, and the dealer may trade (unknowingly) with an investor who has superior knowledge about a stock. A market maker will quote a wider spread if the chance of trading with an informed investor is greater. Thus, market makers can pass the cost of trading with informed traders on to uninformed traders through the bid-ask spread.

The average bid-ask spread appears to be smaller in specialist markets like the NYSE than in dealer markets such as Nasdaq. Huang and Stoll (1996) found that in 1991 the average quoted spread for a sample of 175 Nasdaq stocks was \$0.50 whereas a carefully matched sample of 175 NYSE stocks had an average spread of only \$0.26. The difference in spreads does not appear to be generated by differences in inventory, order processing, or asymmetric information costs across the two markets. However, these stock markets have different institutional features that can affect the bid-ask spread, in addition to having divergent pricing systems. Disentangling the effects of various factors is difficult, if not impossible, so the competitiveness of the Nasdaq market continues to be debated.

An institutional factor that must be considered when comparing spreads across markets is the handling of commissions. On the NYSE all traders are charged explicit commissions whereas on Nasdaq commissions are frequently included in the stock's price, lowering the bid price and raising the ask price. For this reason alone, one should expect to find wider spreads on Nasdaq. However, commissions cannot fully explain the difference in spreads across markets because small traders usually pay explicit commissions on Nasdaq as well as on the NYSE (Huang and Stoll 1996).

Another factor that clearly affects how orders are processed, and in turn the bid-ask spread, is the handling of limit orders. As discussed above, on the NYSE limit orders narrow the spread because limit prices can determine the inside spread. Hence, the best prices are available to investors, whether these prices come from the specialist or from other investors through limit orders. On Nasdaq, prices are set by market makers. Prior to the rule changes made effective last year, limit orders were recorded by individual dealers and did not determine the inside spread. Because of this procedural difference, the measured spread on the two exchanges came from different sources. The reservation prices of market makers

and investors also differ, leading to further differences in quoted prices and spreads. Dealers derive earnings by recycling stock rather than through long-run speculation. Dealers' earnings come from buying stock and reselling it at higher prices. Investors, on the other hand, generally trade for the long run and buy or sell based on anticipated increases or decreases in a security's value. Despite a recognition that the treatment of limit orders affects the spread, it appears to provide only a partial explanation for wider Nasdaq spreads (Demsetz 1997).

Other institutional arrangements that affect pricing in securities markets are agreements between brokers and dealers to direct order flow, either internally or externally (Godek 1996; Kandel and Marx 1997). When an order is internalized, a dealer trades with a customer at the inside price quote for the dealer's own account, even if the dealer did not issue the best price quote. When an order is preferenced, a dealer forwards the order to another market maker, who fills the order at the best price quote. The dealer who receives a preferenced order is not necessarily the market maker who issued the best price quote. Internalization and preferencing lead to interdependencies across dealers and limit their incentives to narrow spreads because they do not compete over incoming orders through their price quotes.² Experimental economics methods have been used to provide insight into the effect of order preferencing on quoted spreads in dealer markets (Ackert and Church 1998; Bloomfield and O'Hara 1998).³ These studies conclude that preferencing has striking effects on pricing behavior, even if dealers are not permitted to communicate overtly.

Besides recognizing that the ability to direct customer order flow has important effects on quoted spreads, Dutta and Madhavan (1997) argue that dealers compete for orders along dimensions other than price. Nonprice competition for order flow can take the form of research services or agreements with brokers in which dealers pay brokers for order flow.⁴ Because these other inducements reduce the per share value of order flow to the dealer, conclusions about the competitiveness of markets are complex and cannot be based simply on price.⁵ Empirical evidence suggests that dealers will compete for order flow using methods other than price (Ackert and Church 1998).

Finally, spreads in dealer markets may be wider than in other market structures if market makers conspire to fix prices. Proponents of dealer markets argue that competition among dealers will produce narrow spreads. With a large number of competitive dealers, cooperative agreements may be difficult to design and enforce. However, Dutta and Madhavan (1997) argue that even dealers who behave noncooperatively can set spreads that exceed the competitive level. They show that self-interested dealers can accrue abnormal profit despite acting noncooperatively. Institutional arrangements, like preferencing, result in abnormal profit levels because these arrange-

ments reduce dealers' incentives to compete for order flow using price. From a public policy standpoint this result is important because dealers are not explicitly cooperating to fix prices; that is, excess spreads can arise without explicit collusion.

Collusion in Securities Markets

In the Nasdaq market, more than thirty dealers are involved in the pricing of an actively traded issue, so it is likely that competitive pressures will come to bear. Collusion may be difficult because of the absence of explicit barriers to entry (Grossman and others 1997). In addition, the "product" or service provided is not necessarily homogeneous because market makers may offer cash payments for order flow and other noncash services. However, it is difficult to ignore the words of the dealers themselves (see Box 1). Their testimony, from depositions taken during the Department of Justice investigation, and audiotaped conversations suggest that Nasdaq market makers followed an industrywide practice or quoting convention that fixed transaction prices. The practice of violating the industry's quoting convention, referred to by traders as making a Chinese market, was actually viewed within the industry as unethical and unprofessional conduct.

In understanding recent U.S. securities market experience, it is important to consider what sorts of behavior are deemed anticompetitive. Collusion to raise prices is certainly not a practice or a concern of recent origin. According to Adam Smith, "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices" ([1776] 1994, 148). The dictionary defines collusion as a "secret agreement or cooperation for an illegal or deceitful purpose." American law on overt price fixing is clear. Such behavior is illegal per se. However, in many cases there is no explicit agreement to fix prices. Under the Sherman Act, the U.S. courts developed the conscious parallelism doctrine. The Supreme Court explained the doctrine as follows: "No formal agreement is necessary to constitute an unlawful con-

spiracy. Often crimes are a matter of inference deduced from the acts of the person accused and done in pursuance of a criminal purpose. . . . The essential combination or conspiracy in violation of the Sherman Act may be found in a course of dealings or other circumstances as well as in an exchange of words. . . . Where the circumstances are such as to warrant a jury in finding that the conspirators had a unity of purpose or a common design or understanding, or a meeting of minds in an unlawful agreement, the conclusion that a conspiracy is established is justified" (American Tobacco Co. et al. v. the U.S. 328 U.S. 781 [1946]).

The Case against Nasdaq

Serious questions about the competitiveness of the Nasdaq market surfaced in two widely publicized studies by Christie and Schultz (1994) and Christie, Harris, and Schultz (1994). The allegations led to investigations by the Department of Justice and the SEC, as well as numerous on-going civil lawsuits (see Box 2). Christie and Schultz report that odd-eighth price quotes are nearly nonexistent for many Nasdaq stocks and suggest that market makers implicitly collude to widen spreads by avoiding odd-eighth price quotes.⁶ According to the Justice Department, this pricing convention existed for at least three decades. However, following the publicity of the first study, Christie, Harris, and Schultz report a sudden decline in the spreads for several actively traded issues and a concomitant increase in the use of odd-eighth price quotes for those stocks. In fact, the inside spreads for Amgen Inc., Cisco Systems, and Microsoft Corporation fell by almost 50 percent immediately after newspapers reported the results of the first Christie and Schultz study. Average spreads for these stocks fell from between \$0.25 and \$0.45 to between \$0.151 and \$0.175.

The United States brought a civil action under the Sherman Act with the claim for relief justified as follows: "Beginning at least as early as 1989, and continuing to the date of this Complaint, a common understanding arose among the defendants and other Nasdaq market makers concerning, among other things, the manner in which

2. Although orders are preferenced and internalized on the NYSE, the arrangement is more prevalent on Nasdaq (Huang and Stoll 1996).
3. Experimental economics methods allow the researcher to conduct investigations that cannot be conducted in naturally occurring markets and complement studies using traditional archival data. In the laboratory the experimental researcher can control factors that are extraneous to the investigation. For example, Ackert and Church (1998) are able to directly examine how dealers' spreads are affected by order preferencing while controlling the overt communication among dealers.
4. Competition for order flow from brokers may result in order flow payments to the brokers that reduce market makers' profits and can be viewed as a way for dealers to share their profits with brokers. The extent to which brokers, in turn, pass these earnings on to individual investors is unclear.
5. Another complication when using price quotes to assess competitiveness arises because many transactions are negotiated and occur between the best bid and ask price (Bessembinder 1997).
6. In June 1997 the NYSE followed the AMEX and Nasdaq and permitted trading in increments of one-sixteenth. Historically, most stocks listed on large U.S. exchanges were quoted in increments of one-eighth, though moving to decimalization is debated. See, for example, Angel (1997).

Making a Chinese Market

As reported in the Department of Justice's *Competitive Impact Statement*, the traders' testimony provides insight into the degree of interdependence in the Nasdaq market and the entrenchment of the pricing convention. According to the market makers, those who attempted to "break the spread" by violating the pricing convention created a "Chinese market." For example, the following trader's testimony suggests that creating a Chinese market was not only considered unprofessional but traders were actually trained to conform to the convention:

Q: And through the period December '93 through December of '94, do you observe the market makers entered very—relatively few odd-eighths. And by that I mean, with perhaps one or two exceptions *under 10 percent of their quotes were odd eighths* in McCormick.

A: Yes, ma'am.

Q: And again, is that, in your professional opinion, because those market makers had three-quarter point dealer spreads and did not want to enter what were termed "unprofessional markets"?

A: Yes, ma'am.

Q: How is it that all of the market makers knew that entering an odd eighth quote could be unprofessional?

A: *Young traders were trained over the years not to put in unprofessional markets, "Chinese markets." . . . This was part of the—of the traditional and ethical on-the-job training that all of us got, and it encompasses not only that you don't put in unprofessional-looking "Chinese markets," it . . . grew out of a self-imposed industry standard of ethics and conduct.* So that's my answer as to why everybody seems to be doing this, because most of the people were trained the same way. (1996, 21; italics in original)

In fact, the widely held belief that making a Chinese market was unethical was reflected in the Security Traders Association of New York's (STANY) newsletter in 1989. The Security Traders Association is the largest national trade organization for security traders. In reporting on a speech

given at an "Ethics Conference" the newsletter misreported a speaker's comments. The correction was as follows:

In the recently issued STANY NEWSLETTER, *we are certain that you will realize that **** was grossly misquoted* when a portion of his speech was extracted for publication. A corrected copy is featured below.

*As *** and you are all aware, it is clearly UNETHICAL to make a Chinese Market or to run ahead of an order.* (22–23; italics in original)

Most of the communication between Nasdaq traders is on the telephone. Phone calls were used to ensure compliance with the pricing convention as the following audiotape excerpt suggests:

Trader 1: *Who trades CMCAF in your place without yelling it out?*

Trader 2: . . . Sammy

Trader 1: Sammy who?

Trader 2: It may be the foreign department . . .

Trader 1: What?

Trader 2: The foreign didn't realize they had to trade it.

Trader 1: Well, he's trading it in an eighth and he's embarrassing . . .

Trader 2: . . . foreign department

Trader 1: *He's trading it in eighths and he's embarrassing your firm.*

Trader 2: *I understand.*

Trader 1: You know. *I would tell him to straighten up his [expletive deleted] act and stop being a moron.* (24; italics in original)

Additional testimony and taped conversations revealed that when firms continued to violate the pricing convention they were punished in other ways, including the refusal of other market makers to execute deals. The Department of Justice's investigation uncovered other anticompetitive conduct such as "moves on request." A move on request is made when one market maker agrees to change a price quote when requested to do so by another, the purpose being to influence the market in a stock.

bids and asks would be displayed on Nasdaq (the 'quoting convention'). Under the quoting convention, stocks with a dealer spread of $\frac{3}{4}$ point or greater are quoted in even-eighths (quarters). Under the quoting convention, market makers used odd-eighth fractions in their bid and ask prices only if they first narrow their dealer spread in the stock in question to less than $\frac{3}{4}$ of a point."

The quoting convention has two aspects. Under the first part, stocks with spreads that exceed three-quarters could not be quoted on odd-eighths. This practice ensures that the inside spread of the stock is at least one-quarter because off-eighth quotes are eliminated from the set of possible price quotes. Hence only quarter points (for example, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$) remain and the inside spread, which is the difference between two prices at quarter points, could not be less than a quarter point. Under the second part of the convention, dealers could only use odd-eighth quotes if they narrow their spread to less than \$0.75. Market makers are reluctant to narrow their spreads to less than three-quarters of a point because at narrower spreads they are exposed to greater trading risk. In general, at any point in time, a dealer has greater interest in either buying or selling so that a single market maker's quotes do not normally constitute both sides of the spread. Together the two parts of the pricing convention allowed dealers to increase their earnings.

The Department of Justice and twenty-four major dealers reached a settlement on July 17, 1996. The Department of Justice did not assert that dealers had an explicit agreement to collude. However, there was a "conscious commitment to a common scheme," and such agreement is condemned by the Sherman Act. The department's order, which was designed to prevent and detect adherence to the pricing convention, required the firms to tape traders' telephone conversations.

The SEC conducted a concurrent investigation of the Nasdaq market and concluded that the NASD failed to properly oversee trading in the Nasdaq market and enforce compliance with its own rules (1996). The SEC's goal is to promote price competition, and the recommendations in its proposal reflect this goal. Prices should be determined by supply and demand forces and customer order interaction. The proposal included requirements for order handling and execution designed to enhance price competition. Specifically, the SEC ordered Nasdaq dealers to publicly display investor limit orders that are at least 100 shares but not more than 10,000 shares. Dealers were also directed to notify the public of the best available prices.

Despite its conclusion that Nasdaq market makers engaged in abusive practices that suppressed competi-

tion, the SEC recognized that various institutional features also could affect the width of spreads. Its report acknowledged the importance of preferencing, internalization, and payment for order flow, concluding that these practices lead to price interdependencies and reduce price competition. Because market makers have a stake in each other's quotes, nonprice forms of competition for order flow provide economic incentives to engage in price fixing. Although direction of and payment for order flow were not prohibited, dealers were strongly chastised for improper behavior, including price fixing and intimidation of rival dealers.⁷ The SEC summarized its position as follows: "Vigorous price competition is a hallmark of a free and open market and is critically important to the efficient functioning and regulation of a dispersed dealer market. Because Nasdaq market makers trade securities which are otherwise fungible, price should be a principal means of competition in the Nasdaq market. Any significant hindrance to price competition impedes the free and open market prescribed by the Exchange Act. The investigation found that certain activities of Nasdaq market makers have both directly and indirectly impeded price competition in the Nasdaq market" (1996, 13).

Conclusion

The behavior of security dealers has been closely scrutinized in the 1990s. Recent investigations of the NASD and the Nasdaq market by the Justice Department and SEC suggest that prior to 1996 market makers colluded to fix prices and widen bid-ask spreads. At a minimum, market makers appeared to have adopted a quoting convention that can be viewed as anticompetitive behavior. The purpose of this practice was to increase dealers' profits at investors' expense.

The results of recent academic studies also shed insight into dealer markets and pricing behavior. Important findings suggest that spreads may be large on Nasdaq because dealers had little incentive to compete using price and to narrow the spread. In addition to collusion, institutional features such as preferencing may limit competition for order flow, the effect of which is to produce spreads that are wider than observed in a purely competitive setting.

Through the bid-ask spread market makers are compensated for providing immediacy and liquidity to investors. These dealers also provide other services to their customers such as research. Because they compete along nonprice dimensions, a judgment regarding the competitiveness of the Nasdaq market based solely on the width of the bid-ask spread is problematic. However, the Department of Justice and SEC clearly state that competition on

7. Other evidence of price fixing is reported by the Justice Department and the SEC. For example, price quotes on Instinet, a private electronic market, differed from Nasdaq quotes for the same stocks. Instinet is a proprietary system accessible to the institutional investors and dealers who are subscribers. Price quotes on Instinet may not be directly comparable to those on Nasdaq for several reasons (Woodward 1997). For instance, Instinet prices do not generally include commissions whereas Nasdaq prices do.

The Nasdaq Investigation: A Chronology

May 24, 1994: Approximately 100 security traders meet in New York at the offices of Bear Stearns & Company and are urged to narrow spreads.

May 26–27, 1994: Newspapers report the results of an academic study of the behavior of Nasdaq dealers by Professors William G. Christie and Paul H. Schultz. Christie and Schultz report that market makers attempt to widen spreads by avoiding odd-eighth price quotes. They conclude that the most plausible explanation for this behavior is implicit collusion. The results of the study were released to the press on May 24.

May 31, 1994: Within one week after the release of Christie and Schultz's results, dealer spreads on four prominent Nasdaq stocks narrowed and market makers began entering odd-eighth prices quotes in those stocks. Christie, Harris, and Schultz later reported the change in behavior.

July 1994: Civil lawsuits are filed against thirty-three major dealers alleging collusion.

October 1994: The Justice Department begins an investigation of antitrust law violations.

November 1994: The Securities and Exchange Commission launches an investigation into the NASD's self-regulatory activities.

September 15, 1995: The Rudman Committee submits its report to the NASD. The NASD Board of Governors appointed the committee in November 1994 to review NASD governance and oversight structure. The committee made several recommendations intended to separate the regulatory and

oversight functions of the NASD. These recommendations were later implemented.

July 17, 1996: The United States files a complaint alleging that twenty-four major dealers fixed prices, in violation of federal antitrust acts. The same day, the Justice Department settles with the dealers who agree to random taping of trading-desk telephone calls but neither admit nor deny wrong-doing.

August 7, 1996: The SEC concludes that the NASD violated the Exchange Act of 1934, citing deficiencies in market oversight and failure to enforce NASD and federal securities laws. In its settlement with the SEC, NASD agrees to spend \$100 million over five years on additional market surveillance.

January 20, 1997: The SEC's new order-handling rules for the Nasdaq market take effect. Market makers are required for the first time to show investors the size and prices for certain orders. The SEC also directs the market to open previously exclusive electronic systems, including Instinet and SelectNet.

December 24, 1997: Thirty securities firms settle a class-action suit alleging price-fixing for \$910 million. The agreement is believed to be the largest civil antitrust settlement in U.S. history. Six other firms had previously settled individually for a total of \$98.9 million.

Currently: The SEC continues to investigate individual traders in connection with price fixing, and additional civil suits remain unsettled.

price is essential for protecting the public interest. Policymakers can, and in the Nasdaq case did, encourage price competition by removing institutional obstacles.

New rules approved by the SEC and recently implemented in the Nasdaq market, including an open book of limit orders, should enhance price competitiveness. If orders are exposed to the entire market, dealers have greater incentive to improve inside price quotes. However,

as dealers focus on price, they may compete less on non-price dimensions and offer fewer services to their clients. Finally, stern warnings and scrutiny from regulators and investors are likely to dampen dealers' incentives to engage in collusive arrangements, whether explicit or implicit. Recent changes in the Nasdaq market will lead to narrower spreads and, in turn, improved market efficiency.

REFERENCES

- ACKERT, LUCY F., AND BRYAN K. CHURCH. 1998. "Bid-Ask Spreads in Multiple Dealer Settings: Some Experimental Evidence." Federal Reserve Bank of Atlanta Working Paper 98-9, June.
- AMIHUD, YAKOV, AND HAIM MENDELSON. 1986. "Asset Pricing and the Bid-Ask Spread." *Journal of Financial Economics* 17:223–49.
- ANGEL, JAMES J. 1997. "Tick Size, Share Prices, and Stock Splits." *Journal of Finance* 52, no. 2:655–81.
- BENSTON, GEORGE J., AND ROBERT L. HAGERMAN. 1974. "Determinants of Bid-Asked Spreads in the Over-the-Counter Market." *Journal of Financial Economics* 1:353–64.
- BESSEMBINDER, HENDRIK. 1997. "The Degree of Price Resolution and Equity Trading Costs." *Journal of Financial Economics* 45:9–34.
- BHUSHAN, RAVI. 1994. "An Informational Efficiency Perspective on the Post-Earnings Announcement Drift." *Journal of Accounting and Economics* 18:45–65.
- BLOOMFIELD, ROBERT, AND MAUREEN O'HARA. 1998. "Does Order Preferencing Matter?" *Journal of Financial Economics*, forthcoming.
- CHRISTIE, WILLIAM G., JEFFREY H. HARRIS, AND PAUL H. SCHULTZ. 1994. "Why Did NASDAQ Market Makers Stop Avoiding Odd-Eighth Quotes?" *Journal of Finance* 49 (December): 1841–60.
- CHRISTIE, WILLIAM G., AND PAUL H. SCHULTZ. 1994. "Why Do NASDAQ Market Makers Avoid Odd-Eighth Quotes?" *Journal of Finance* 49 (December): 1813–40.
- DEMSETZ, HAROLD. 1997. "Limit Orders and the Alleged Nasdaq Collusion." *Journal of Financial Economics* 45:91–95.
- DUTTA, PRAJIT K., AND ANANTH MADHAVAN. 1997. "Competition and Collusion in Dealer Markets." *Journal of Finance* 52 (March): 245–76.
- GANLEY, JOE, ALLISON HOLLAND, VICTORIA SAPORTA, AND ANNE VILA. 1998. "Transparency and the Design of Securities Markets." Bank of England *Financial Stability Review* (Spring): 8–17.
- GLOSTEN, LAWRENCE R., AND PAUL R. MILGROM. 1985. "Bid, Ask, and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders." *Journal of Financial Economics* 14:71–100.
- GODEK, PAUL E. 1996. "Why Nasdaq Market Makers Avoid Odd-Eighth Quotes." *Journal of Financial Economics* 41:465–74.
- GROSSMAN, SANFORD J., MERTON H. MILLER, KENNETH R. CONE, DANIEL R. FISCHEL, AND DAVID J. ROSS. 1997. "Clustering and Competition in Dealer Markets." *Journal of Law and Economics* 40:23–60.
- HUANG, ROGER D., AND HANS R. STOLL. 1996. "Dealer versus Auction Markets: A Paired Comparison of Execution Costs on Nasdaq and the NYSE." *Journal of Financial Economics* 41, no. 3:313–57.
- KANDEL, EUGENE, AND LESLIE M. MARX. 1997. "NASDAQ Market Structure and Spread Patterns." *Journal of Financial Economics* 45, no. 1:61–90.
- KIM, OLIVIER, AND ROBERT E. VERRECHIA. 1994. "Market Liquidity and Volume around Earnings Announcements." *Journal of Accounting and Economics* 12:41–67.
- KLEIDON, ALLAN W., AND ROBERT WILLIG. 1995. "Why Do Christie and Schultz Infer Collusion from Their Data?" Cornerstone Research and Princeton University Working Paper.
- NEAL, ROBERT. 1992. "A Comparison of Transactions Costs between Competitive Market Maker and Specialist Market Structures." *Journal of Business* 65:317–34.
- SMITH, ADAM. [1776] 1994. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Reprint, New York: Modern Library.
- STOLL, HANS R. 1985. *The Stock Exchange Specialist System: An Economic Analysis*. Monograph Series in Finance and Economics, no. 1985-2. New York: Salomon Brothers Center for the Study of Financial Institutions.
- STOLL, HANS R., AND ROBERT E. WHALEY. 1990. "Market Structure and Volatility." *Review of Financial Studies* 3, no. 1:37–71.
- U.S. DEPARTMENT OF JUSTICE. ANTITRUST DIVISION. 1996. *United States v. Alex. Brown & Sons Inc., et al.—Competitive Impact Statement*. Washington, D.C.: U.S. Department of Justice. Available on-line at <<http://www.usdoj.gov/atr/cases/f0700/0739.htm>> [July 16, 1998].
- U.S. SECURITIES AND EXCHANGE COMMISSION. 1996. *Report Pursuant to Section 21(a) of the Securities Exchange Act of 1934 regarding the NASD and the Nasdaq Market*. Washington, D.C.: U.S. Securities and Exchange Commission. Available on-line at <<http://www.sec.gov/news/extra/21a.txt>> [May 7, 1998].
- WOODWARD, SUSAN E. 1997. *Price Fixing at Nasdaq? A Reconsideration of the Evidence*. Report commissioned by the Special Studies Division of the Congressional Budget Office. July.