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SECURITIES MARKETS

Preliminary Observations on the Use of Subpenny Pricing

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Financial Markets and Community Investment

July 22, 2004

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Preliminary Observations on Subpenny Pricing

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Highlights

Highlights of GAO-04-968T, a report to Committee on Banking, Housing, and Urban Affairs

Why GAO Did This Study

In 2001, U.S. stock and options markets, which had previously quoted prices in fractions, began quoting in decimals. Since then, various positive and negative effects have been attributed to the transition to decimal pricing. As part of this transition, the major stock markets chose one penny ($.01) as the minimum price variation for quoting prices for orders to buy or sell. However, some electronic trading systems allowed their customers to quote in increments of less than a penny (such as $.001). The use of subpenny prices for securities trades has proved controversial and the Securities and Exchange Commission (SEC) has proposed a ban against subpenny quoting for stocks priced above one dollar across all U.S. markets.

As part of ongoing work that examines a range of issues relating to decimal pricing, GAO reviewed (1) how widely subpenny prices are used and by whom, (2) the advantages and disadvantages of subpenny pricing cited by market participants, and (3) market participants' reactions to SEC's proposed ban.

www.gao.gov/cgi-bin/getrpt?GAO-04-968T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Davi D'Agostino at (202) 512-8678 or dagostinod@gao.gov.

What GAO Found

Data on the extent to which market participants are quoting in subpenny increments across all U.S. equity markets are not routinely reported or readily available. However, studies of limited scope conducted by regulators and one market found that subpenny prices were not widely used. For example, a study done by the Nasdaq Stock Market in 2001 of Nasdaq stocks found that subpenny increments were used in less than 15 percent of the orders that specified a price (limit orders). Currently, the major markets do not allow subpenny quoting but a few electronic trading systems that match customer orders do.

On electronic trading systems, professional traders (such as those employed by hedge funds) use subpenny quotes to gain a competitive price advantage over other orders. However, many market participants GAO interviewed cited numerous disadvantages to the use of subpenny quoting. They argued that subpenny quotes primarily benefit the professional traders who subscribe to market data systems displaying subpenny prices and who use fast systems to transmit their orders to take advantage of such prices. As a result, most investors do not benefit from subpenny quotes because they do not use these systems and because many broker-dealers do not accept orders from their customers in subpenny increments. In addition, participants said that subpenny quotes allow some traders to step ahead of others' orders for an economically insignificant amount. They said this discourages other traders from submitting limit orders and reduces overall transparency and liquidity in the markets.

Based on the work GAO has conducted to date, including a limited review of comments on SEC's proposal to ban subpenny quoting, most market participants support SEC's proposed action. However, some organizations opposed to the ban said that it could reduce the ability of traders to offer better prices and stifle technological innovation and reduce market participants' incentive to invest in better systems. Although some electronic trading systems supported the ban, others indicated that the decision to use subpenny quotes should be left to market participants who, as technology advances, may increasingly find subpenny quotes more useful than they do today.

In addition to reviewing subpenny pricing, GAO continues to review the broader impacts of decimal pricing on markets, securities firms, and investors. As part of this work, we plan to conduct original analysis using a comprehensive database of trades and quotes from U.S. markets to identify trends in quoted spreads, clustering of quotes and trades across certain prices, and other potential changes since decimal pricing was introduced.

Mr. Chairman and Members of the Committee:

It is a pleasure to be here today to participate in this important hearing on market structure issues. As you requested, my statement today will focus on the use of subpenny quotes in the securities markets. I also will describe the work we are conducting for this Committee's Subcommittee on Securities and Investment as part of our ongoing broader study of the impact of decimal pricing on the securities markets, firms, and investors.

Many changes have occurred since the U.S. markets transitioned from pricing stocks and options in fractions of a dollar to using decimal prices. Many participants cite decimal pricing as providing benefits to small investors, but others argue that it has contributed to lower liquidity and reduced the willingness and ability of securities firms to execute their customers' orders. As part of the transition to decimal prices, the major stock markets chose one penny as the minimum price variation (MPV), which is the minimum increment in which the prices of stocks on these markets are allowed to be quoted. However, some electronic trading systems allow their customers to quote in increments of less than a penny. The use of subpenny prices for stock trades has proven controversial, and the Securities and Exchange Commission (SEC) has proposed a ban against subpenny quoting for stocks priced above one dollar across all U.S. markets.[1]

Today, I will discuss the preliminary results of our review of subpenny pricing issues, including:

- how widely subpenny pricing is used and who uses it,
- the advantages and disadvantages of subpenny pricing, as reported by market participants, and
- the reactions of market participants to SEC's proposed ban on subpenny quoting.

To address these issues, we interviewed a variety of market participants, including regulators, markets, electronic trading systems, broker-dealers, industry associations, trade analysis firms, and institutional investors. We

[1]Securities Exchange Act Release No. 49325 (February 26, 2004), 69 FR 11126 (March 9, 2004).

also reviewed relevant studies, testimonies, and comment letters on SEC's regulatory proposal. Our work is ongoing, and we expect to report on the broader range of decimal pricing issues later this year.

In summary:

Although data on the extent to which market participants are quoting in subpenny increments are not routinely reported or readily available, the use of subpenny quotes in U.S. equity markets appears to be limited. Currently, the major markets do not allow subpenny quoting but a few electronic trading systems that match customer orders do. Professional traders using those electronic trading systems have used subpenny quotes to gain a competitive price advantage over other orders. The general investing public does not use such systems and can usually see prices only in penny increments.

Although some market participants saw benefits to subpenny pricing, most cited various disadvantages to the use of subpenny quotes. The advantages market participants cited included gaining order priority, price improvement, and more competitive and efficient markets. However, other market participants cited disadvantages. For example, subpenny quotes primarily benefit professional traders who subscribe to market data systems displaying subpenny prices and who use fast order routing systems to access prices. These prices are usually not available to the general investing public. In addition, market participants noted subpenny quotes allow some traders to step ahead of others' orders for an economically insignificant amount. Finally, they argued that this stepping ahead discourages other traders from submitting limit orders, which reduces overall transparency and liquidity in the markets.[2]

Based on the work we have conducted to date and a limited review of some of the comments on SEC's proposal to ban subpenny quoting, most market participants appear to support SEC's proposed action. However, some organizations opposed to the ban said that it could reduce the ability of traders to offer better prices and stifle technological innovation and reduce market participants' incentive to invest in better systems. Although some electronic trading systems supported the ban, other

[2]A limit order is a request to buy or sell stock at a specific price. In contrast, a market order does not set a specific price but is executed at the best price quoted at the time the order is received by the executing market.

electronic trading systems indicated that the decision to use subpenny quotes should be left to market participants who, as technology advances, may increasingly find subpenny quotes more useful than they do today. We are also continuing to review the broader impacts of decimal pricing on markets, securities firms, and investors. As part of this work, we also plan to conduct original analysis using a database of trades and quotes occurring on U.S. markets to identify trends in quoted spreads, clustering of quotes and trades across certain prices, and other potential changes since decimal pricing was introduced.

Background

In 2000, in response to calls from Congress, SEC directed U.S. stock and options markets to change from quoting equity securities and options in fractions of a dollar, such as 1/16th, to quoting in decimals. Proponents of this change believed decimal pricing would make stock prices easier for investors to understand, align U.S. markets with other major stock markets of the world, and lower investors' trading costs by narrowing spreads to as little as one penny.[3] At the time of SEC's order, U.S. markets were the only major securities markets in the world still trading in fractions. After a phase-in period of several months, the major exchanges and Nasdaq began using decimal pricing for all quotes on equity securities and options on April 9, 2001. The national securities markets, including the New York Stock Exchange (NYSE) and Nasdaq, chose to allow quoting on their markets with an MPV, or tick size, of one penny. The MPV is the minimum increment in which stock prices on these markets are allowed to be quoted.[4] However, even before the transition to decimal pricing, some stocks were trading in increments of less than the MPV, such as 1/256th of a dollar.

[3]The spread is the difference between the lowest price at which an investor is willing to sell stock and the highest price another investor will pay for it. This spread represents a trading cost to investors, since in a hypothetical round-trip trade in which an investor buys the stock and then immediately sells it, the price paid exceeds the price received. Narrowing the spread can lower purchase prices and raise sale prices, reducing trading costs.

[4]Securities Exchange Act Release No. 46280 (July 29, 2002), 67 FR 50739 (August 5, 2002).

Professional Traders on Electronic Markets Are the Primary Users of Subpenny Quotations

Since U.S. markets converted to decimal pricing, professional traders trading outside the national securities markets have been the primary users of subpenny prices. Although the national securities markets set their MPVs at one penny, several electronic trading systems—known as electronic communication networks (ECNs)—display quotes and execute orders entered by their customers in subpennies and allow traders to quote prices and trade in subpenny increments.[5] When quotes from these proprietary systems are displayed to traders outside the proprietary systems, the quotes are rounded to the nearest full penny increment—specifically, down for buy orders and up for sell orders—to comply with the required one-penny MPV of the national securities markets. In such instances, orders executed against these quotes receive the subpenny price. According to SEC staff and others, although several ECNs initially allowed quoting in subpennies, some have curtailed the use of such quotes. At the time we prepared this statement, we were aware of only two ECNs that allowed quoting in subpennies—Instinet's INET and Brut ECN—for a few selected stocks.

The extent to which stocks are quoted in subpenny increments appears to be limited. According to SEC staff, data on the extent to which subpenny increments are used to quote securities across all U.S. equity markets are not routinely reported or readily available. However, a 2001 Nasdaq report to SEC that reviewed trading in stocks listed on its market showed that less than 15 percent of limit orders were submitted in subpennies after decimals were introduced.[6] A vast majority of the subpenny limit orders cited in the 2001 Nasdaq report were handled by a single ECN. SEC staff also conducted a study of the use of subpennies in trading that took place between April 21 and 25, 2003, and found that subpenny trades accounted for about 13 percent of trades in Nasdaq stocks, 10 percent of trades in American Stock Exchange stocks, and 1 percent of the trades in NYSE stocks. These trade execution data, however, do not directly demonstrate the extent of subpenny quoting, because trades may be executed using the subpenny increment for other reasons. For example, some institutional investors may ask their broker-dealers to execute orders at the weighted

[5]ECNs are a type of alternative trading system that use electronic systems to match their customers' orders to buy or sell securities at specified prices. ECNs register with SEC as broker-dealers.

[6]The Nasdaq Stock Market, Inc., *Final Report to the SEC, The Impact of Decimalization on the Nasdaq Stock Market* (New York, New York: June 11, 2001).

average price at which a stock traded on a particular day. This weighted average price can be carried out to several decimal places.

Representatives of one ECN told us that it allowed traders to quote certain stocks in subpennies because its customers wanted to be able to quote in these increments. They also said that this use of subpenny quotes was a way to differentiate their business from that of their competitors. In addition, these ECN representatives said that subpenny quoting enhanced the efficiency of trading in certain actively traded securities, such as the Nasdaq 100 Index Tracking Stock (QQQ). According to SEC staff and market participants with whom we spoke, subpenny quotes are used primarily by professional traders, such as day traders or traders for hedge funds, to gain a competitive price advantage over other traders.[7] However, some ECNs that were allowing their customers to use subpenny quoting more widely have significantly curtailed the number of stocks that could be quoted in subpennies. According to a representative at one ECN, its share of the total trading volumes of these stocks increased rather than declined after it stopped quoting in subpennies.

Market Participants Cited Advantages and Disadvantages to Subpenny Pricing

Although some market participants saw benefits to subpenny pricing, most cited various disadvantages to the use of subpenny quotes. Some market participants said subpenny quoting allowed traders to raise the priority of their orders. For example, a representative of one ECN told us that when a large number of traders were all quoting the same full penny price, one trader could increase the chances of executing a trade by improving the price by a subpenny increment. This representative also said that the customers on the other side of the trade also benefited from the subpenny increment, as their orders were executed at slightly better prices. ECNs we contacted also told us that subpenny pricing allowed for more efficient and competitive markets. For example, a one-cent MPV could act as an artificial constraint on pricing for stocks that trade actively. According to representatives of one ECN, allowing such actively traded stocks to trade in increments of less than a penny allows buyers and sellers to discover a stock's true market price.

[7]Day traders use a trading strategy that involves making multiple purchases and sales of the same securities throughout the day in an attempt to profit from short-term price movements via direct access to securities markets. Although there is no statutory definition of hedge funds, it is the term commonly used to describe private investment vehicles that often engage in active trading of various types of securities and commodities.

However, most of the market participants we contacted mainly cited disadvantages to subpenny quoting. First, many participants told us that the benefits of subpenny pricing accrue to professional traders but not to the general investing public. Representatives of one firm with whom we spoke told us that quotes in subpenny increments were available to professional traders who pay to access proprietary trading systems the ECNs operate. Through these proprietary systems, professional traders can use fast order routing systems to obtain the subpenny prices, which may be better than those that are publicly displayed on other markets that use one-cent MPVs. According to market participants, many broker-dealers do not accept orders from their customers in subpenny increments, and so the average investor generally cannot access the subpenny quotes. A representative of a large broker-dealer stated at an April 2004 SEC hearing that his firm had stopped allowing clients to submit orders priced in subpenny increments for this reason. Further, representatives at one securities market argued that the integrity of the securities markets was reduced when some traders have advantages over others.

Many of the market participants we contacted told us that quoting in subpenny increments also resulted in more instances of traders "stepping ahead" of large limit orders. According to some market participants, reduced MPVs that accompanied decimal pricing have negatively affected traders displaying large orders at one price. These traders find that their orders go unexecuted or have to be resubmitted when other traders step ahead of them by quoting a better price in increasingly small amounts. These participants argued that at higher MPVs, which were previously $1/8^{th}$ or $1/16^{th}$ of a dollar per share, traders stepping ahead of other orders were taking a greater financial risk if their orders were executed and prices then moved against them. However, market participants with whom we spoke said subpenny increments were generally an economically insignificant amount and that traders using them faced much lower financial risk. Recent SEC and Nasdaq studies of subpenny trading found that most trades executed in subpenny increments clustered at prices $1/10^{th}$ of a cent above and below the next full penny increment, suggesting that subpenny quotes were primarily being used to gain priority over other orders and were not otherwise the result of natural trading activities. Market participants also told us that the more likely it is that a trader can step ahead of other orders—as they can by using subpenny quotes—the less likely traders are to enter their limit orders, which are an important source of liquidity. This reduced incentive to enter limit orders also reduces the number of shares displayed for sale and potentially affects liquidity and market efficiency.

Furthermore, some market participants also saw subpenny quoting as reducing market transparency for retail investors and depth for institutional investors. When the MPV decreases, for example to subpennies, the number of potential prices at which shares can be quoted—called price points—increases, because displayed liquidity is spread over more price points. For example, subpenny quotes using 1/10th of a penny ($.001) increase the number of price points to 1,000 per dollar. This affects retail investors, because fewer shares are generally quoted at the only prices visible to them—the current best prices for purchase or sale. This affects institutional investors, because the more price points that must be considered, the more difficult it becomes to determine whether sufficient shares are available to fill larger orders. Market participants said that quotes in a subpenny pricing environment change more rapidly (a phenomenon known as quote flickering) and make determining the actual prices at which shares are available more difficult. Quote flickering reduces broker-dealers' ability to determine whether the trades they have conducted satisfy their regulatory responsibility to obtain the best execution price for their clients. Finally, some market participants told us that subpenny pricing has the potential to greatly increase the processing and transmission capacity requirements for the market data systems that transmit price and trade information, causing firms to expend resources to redesign electronic systems.

SEC's Proposal to Ban Subpenny Quoting Appears to Have Widespread Support

SEC's proposed rule to prohibit market participants from pricing stocks in increments of less than one penny appears to be widely supported. As part of its proposed rule changes to Regulation NMS, SEC has proposed establishing a uniform pricing standard for stocks that trade in all market centers, which SEC defines as exchanges, over-the-counter market makers, specialists, and ECNs. Specifically, SEC proposes to prohibit market participants from accepting, ranking, or displaying orders, quotes, or indications of interest in a pricing increment finer than a penny in any stock, unless the stock has a share price of less than one dollar. The proposed rule would not prohibit executing trades in increments of less than one penny, which most markets currently permit, because there are instances when subpenny trading is appropriate—for example, when the trade's price is based on some averaging mechanism. According to SEC staff, this change would address differences in pricing that exist across markets and that benefit some investors at the expense of the general investing public. According to the staff, banning subpenny pricing should also reduce the extent to which limit orders lose priority because of subpenny pricing, thereby preserving incentives to display limit orders, which are an important source of liquidity for the markets.

Most market participants we have contacted to date and most commenting on SEC's proposal appear to support a ban on subpenny pricing for stocks priced at more than one dollar. Of the over 500 comment letters available on SEC's Web site as of July 16, 2004, we determined that about 50 provided comments on the proposed ban. Of these, 86 percent of the commenters supported banning subpenny quoting. According to NYSE and Nasdaq representatives with whom we spoke, the current existence of quotes that not all investors can access is a significant reason for their support of SEC's proposed subpenny prohibition. Nasdaq's support for banning subpenny quoting comes despite filing for a proposed rule change with SEC in 2003 that would permit Nasdaq to adopt an MPV of $1/10^{th}$ of one cent for its listed securities. According to the Nasdaq representatives, if SEC does not prohibit subpenny quoting, Nasdaq would want SEC approval to begin quoting in subpennies in order to compete with ECNs. Nasdaq subsequently withdrew its propsed rule change, presumably because SEC is proposing to ban subpennies in its proposed changes to Regulation NMS. Representatives at several institutional investors and broker-dealer firms also agreed that quoting in subpenny increments should be prohibited. In its June 30, 2004, comment letter to SEC, the Investment Company Institute (which represents the interests of the $7 trillion mutual fund industry) stated that quoting in subpennies eliminates many of the benefits brought by decimal pricing and exacerbates many of the unintended consequences that have arisen in the securities markets since its implementation that have proven harmful to mutual funds and their shareholders.

However, other market participants and other commenters opposed SEC's proposal to ban subpenny quoting. Several of the organizations that opposed a ban said that subpenny quotes allow traders more ability to improve the prices they offer to others. A group of 10 academic researchers that commented to SEC argued that the impacts of subpenny quoting on market transparency could be resolved with technology. For example, data vendors can choose to update quotes only when there are meaningful changes. A letter from a university regulatory research center noted that banning subpenny quoting could stifle innovation in the way that quotes are displayed to investors. For example, graphical displays could replace flickering quotes with fluid motion and use patterns and shapes to help investors recognize changes. A ban could also reduce incentives for other market participants to invest in innovative technologies.

Opinions among some ECNs were mixed, with roughly an equal number supporting and opposing SEC's proposal to ban subpenny quoting.

Representatives of two ECNs indicated that SEC should not enact a ban, arguing that tick size is best determined by demand in the marketplace. Furthermore, representatives of two ECNs noted that stocks that trade at a spread of a penny benefit from the increased efficiency afforded by subpenny increments; one representative noted that a penny MPV artificially constrains price discovery for these stocks. In addition, this representative said that stocks with low share prices should be quoted in subpenny increments because subpennies become economically significant when the share price is a few dollars or less. Finally, these representatives said that as more traders and firms upgrade their trading technology, they may find more advantages from quoting in subpennies and that a regulatory ban enacted now might become an unpopular constraint in the future. One of the ECNs is supporting SEC's proposal to ban subpenny quoting because its customers preferred not to have subpennies used on that ECN's system. At the time we prepared this statement, we had not yet talked to entities that are reported to be key users of subpenny quotes and who may be opposed to SEC's proposal, such as day traders, hedge funds, or entities whose sole business is computer-enabled trading.

GAO's Review of the Impacts of Decimal Pricing Is Ongoing

At the request of this Committee's Subcommittee on Securities and Investment, we are conducting additional work to review the impact of decimal pricing on the securities markets, securities firms, and retail and institutional investors. To conduct this work, we are reviewing relevant regulatory, academic, and industry studies that address decimal pricing impacts. We are also interviewing and obtaining information from market participants, including:

- regulators;
- securities markets, including stock and options markets;
- ECNs;
- securities firms, including broker-dealers that conduct large-block trading, market makers, and exchange specialists;
- industry associations, including those representing securities traders, broker-dealers, and mutual funds;
- trade analysis firms;

- institutional investors, including pension and mutual fund investment managers; and
- academic researchers who have studied trading and decimal pricing.

To identify trends and changes since decimal pricing was introduced, we are also attempting to collect and analyze data on the characteristics of markets, firms, and investors and the impact of decimalization on these entities (table 1).

Table 1: Data Being Collected on Decimal Impact Review

Area affected	Examples of data
Markets	• spreads • market liquidity • trading volumes • price volatility
Securities firms	• number of active market makers • number of market makers per stock • firm profitability
Investors	• trading costs

Source: GAO.

In addition, we plan to conduct research and analysis using a comprehensive electronic database of quotes and trades that have occurred on U.S. stock markets. The Trade and Quote (TAQ) database offered by NYSE consolidates all quotes and trades that have occurred on NYSE, Nasdaq, the American Stock Exchange, and the regional exchanges. As part of this research, we plan to expand and extend analysis done for a recently published study on the impact of decimal pricing on trade execution costs and market quality, including volatility and liquidity.[8]

[8]Hendrik Bessembinder, "Trade Execution Costs and Market Quality after Decimalization," *Journal of Financial and Quantitative Analysis*, vol. 38, no. 4 (December 2003), pp. 747-77. This study looks at 300 NYSE and 300 Nasdaq stocks from the second week of January 2001 through August 2001. The TAQ database is a collection of intraday trades and quotes for all securities listed on NYSE, the American Stock Exchange and Nasdaq. TAQ data do not contain information on orders.

Among the types of information we plan to analyze using this database are:

- quoted spreads,
- quotation sizes (i.e., number of shares being quoted),
- the percentage of trades and shares executed at prices less or greater than the best quoted price prevailing at the time of executions, and
- the volatility of returns from investing.

We plan to use this analysis to shed light on how trade execution costs and market quality may have changed in transitioning from a fractional to a decimal pricing environment. In addition to the variables considered in the published study, we plan to gather data on trade size and the numbers of trades and quotes that may provide evidence on changes in trading behavior. We also plan to analyze the TAQ data to identify whether and to what extent clustering occurs when quotes or trade executions occur more frequently than would be expected at particular price points (e.g., multiples of 5 cents and 10 cents) despite the existence of the one-cent tick.

Observations

Because we are continuing to review issues relating to decimal pricing, we do not have definitive conclusions on subpenny pricing at this time. Our work to date has shown that subpenny quoting can provide advantages to some traders but can also create disadvantages to others and potentially impair incentives to display liquidity. A significant majority of market participants appear to support SEC's proposed ban on quoting in subpennies, but little information is available on the impact of using these quotes. On the one hand, given that such quotes are currently used only in a few trading venues and for a limited range of stocks, SEC's proposed ban would probably not result in a significant change for the overall markets or most investors. On the other hand, if SEC did not ban subpenny quotes, it is possible that exchanges and more markets would want to quote in subpennies—a change that could have a significant impact on U.S. equity markets. Still, a ban would take away the ability of individual markets and investors to choose whether to use subpenny quotes if they decide their use would be advantageous. Subsequent changes in market structure, technology, and investor needs could require SEC to reconsider whether the use of subpenny quotes would be appropriate at some future date.

Mr. Chairman, this concludes my prepared statement. I would be happy to respond to any questions that you or Members of the Committee may have.

GAO Contacts and Staff Acknowledgement

For questions concerning this testimony, please contact Cody Goebel at (202) 512-8678 or goebelc@gao.gov. Other key contributors to this statement were Jordan Corey, Emily Chalmers, Joe Hunter, Kathryn Supinski, and Richard Vagnoni.

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