

HOW MUCH INFORMATION IS ENOUGH: SECURITIES MARKET INFORMATION AND THE QUEST FOR A MORE EFFICIENT MARKET

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Imagine driving down the road on an empty tank of gas and seeing several open gas stations, none with posted gas prices. You pull into the first station, ask the attendant the price, and she gives you a quote. You pull into the next station, ask for a quote, but instead of providing a competing quote, the station attendant tells you that he will match the first station's price. At the third station, the attendant offers you the same price as the second station minus one cent per gallon. Now imagine that instead of buying gas, you are an investor trying to buy 100 shares of Intel.

Unlike the gasoline hypothetical, an investor shopping for Intel stock can learn the "best" price that anyone in the market is publicly willing to sell 100 shares of Intel at a given time. Federal regulations require that brokers and dealers provide this information to the markets where they trade securities.² The markets, in turn, provide this information to securities information processors ("SIPs"), who collect and consolidate the information. The SIPs determine the best offered price (referred to as the National Best Bid or Offer or "NBBO") and then, for a fee, the proceeds of which go back to the markets, distribute this information to vendors and brokers. The vendors and brokers, in turn, sell or give this information to investors to use in making their investment decisions.

This system for collecting, consolidating, and disseminating market information has worked relatively well over the past two decades. However, advances in technology, changing market structures, and market participants' desires to reduce transaction costs have led some in the industry to call for fundamental changes to the market information pricing and dissemination system. Many critics of the current system note that the best price displayed to the public is not always the

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² See e.g., Securities Exchange Act of 1934, and Rule 11Ac1-2(c)(1)-(2)(A) under the Act, 17 C.F.R. § 240.11Ac1-2 (c)(1)-(2)(i)(A) (2001); see also *infra* notes 24-25 and accompanying text.

best price available. Indeed, the “best” price in the market is just a benchmark for determining the *real* best price. For example, a common market practice for brokers is to offer price and size guarantees to their best customers. Under one such type of guarantee, a broker might guarantee that his best customers, usually large institutions or high net worth individuals, receive a penny better than the NBBO, at a size twice that of the quoted size of any market participant. In other words, the *special* customer pays a price less than the currently displayed NBBO price. Moreover, at least one market permits its participants to enter a kind of two-tiered order; one tier of which is displayed at a certain price, while the second tier remains undisplayed at a better price.³ In addition, reserved size functions (*e.g.*, a market maker displays 100 shares of Intel at \$20 per share but will execute up to 500 shares at that price if it receives a larger order) are also common in markets today.⁴ While such practices are attractive to many market participants, some can serve to “bury” prices or hide or isolate trading interest from the rest of the market, a process referred to as “fragmentation.”⁵

With the recent move in the equities markets to decimal trading increments, many argue that the NBBO is even less indicative of the real best price than before. This is because, when trading increments were in fractions rather than decimals of greater size, more shares of a particular security tended to gravitate toward these fewer price points (*i.e.*, 16 increments per dollar when trading was in sixteenths). Now that stocks on the major markets are priced in decimal increments there tends to be less size quoted at the NBBO.⁶ As a result, price point might now only show where to find 500 or fewer shares, whereas before decimals, the NBBO might identify where to find 1,000 or 1,500 shares of a stock at the best price.⁷ The

³ See *PCX Rulemaking*, Exchange Act Release No. 44,983, 66 Fed. Reg. 55,225, at nn. 28-29 and accompanying text (Oct. 25, 2001) (SEC order approving SR-PCX-00-25, establishing Archipelago as a facility of the Pacific Exchange, including the ability of participants to enter so-called “discretionary orders”) [hereinafter “PCX Release”].

⁴ See *e.g.*, *infra* note 47 and accompanying text.

⁵ For a discussion of market fragmentation see *Commission Request*, Exchange Act Release No. 42,450, 65 Fed. Reg. 10,577, (Feb. 23, 2000) (soliciting public comment on File No. SR-NYSE-99-48).

⁶ See, *e.g.*, THE NASDAQ STOCK MARKET, INC., THE IMPACT OF DECIMALIZATION ON THE NASDAQ STOCK MARKET; FINAL REPORT TO THE SEC PREPARED BY NASDAQ ECONOMIC RESEARCH at 33-34 (June 11, 2001) [hereinafter “NASDAQ Decimal Study”].

⁷ Not surprisingly, over the past two years the extreme drop in share prices of many companies has somewhat tempered the trend toward fewer shares being displayed at the NBBO. For example, on

remaining size will now be found below the NBBO (and therefore below the price level federal regulations mandate to be displayed to the public), thereby rendering the NBBO a less meaningful indicator of the true value of a stock at any given time.⁸ In response to this change, many in the industry argue that the Securities and Exchange Commission (“SEC”), the entity with the primary authority to determine what price level, if any, must be made available to the public, should require that more price information be made available. For example, instead of only requiring the display of the single best price point, as is currently the case, some market participants support a federally mandated display of the top three to five price points, and their aggregated size.

While some argue that regulators should require greater price information than that provided in the NBBO, others argue that even the NBBO data stream, for which brokers and vendors must pay a fee, provides more information than investors need to make an investment decision. Thus, such a system imposes an unnecessary cost on the brokers and vendors. Still others argue that the current system, which has been in place for more than two decades, is not broken and the cost of replacing it would far outweigh the anticipated benefits.⁹

Recent changes to the market make a prompt resolution of the market information conflict all the more important. For example, the number of online brokerage accounts, although leveling off during the recent bear market, generally has ballooned over the past few years.¹⁰ To trade online, these investors must have access to real-time market information. This increased demand by investors in turn raises the demand by vendors and online brokers for real-time market information. Moreover, the move of market centers to for-profit status is also changing the way

July 1, 2002, NASDAQ share volume surpassed 3 billion shares for the first and only time in 2002, due largely to trading in the stock of WorldCom, which fell below \$1 per share.

⁸ This is particularly true for institutional investors, such as pension funds and mutual funds, which tend to trade in larger blocks of stock.

⁹ For a detailed discussion of the market information debate, *see* Part II below.

¹⁰ One securities industry publication notes:

[d]espite the fact that the number of online accounts and assets contained in those accounts differ from source to source, it is generally agreed that they doubled in 1999 and nearly doubled again in early 2000, before account growth turned negative along with the direction of major market indexes late in that year.

2001 SECURITIES INDUSTRY FACTBOOK 7 (George Monahan & Grace Toto eds., 2001).

the industry views the pricing of market information. As markets become publicly held, for-profit entities, they will be under pressure from investors to maximize profitability.¹¹ Given that market data fees are an important source of revenues for many such markets, there is concern that the for-profit motive could result in unreasonably high fees for data from these markets.

In 1999, in an effort to determine whether an industry consensus could be reached on the more pressing issues in the market data debate, the SEC issued a concept release soliciting public comment on a number of the most difficult issues.¹² Far from forming a consensus, the concept release evoked comments on more fundamental concerns with the current system for disseminating market information. Acknowledging the difficulty of resolving the many thorny issues raised in the debate, then-SEC Chairman Arthur Levitt formed an advisory committee chaired by Washington University Law School Dean, Joel Seligman (the “Seligman Committee”). The Seligman Committee was comprised of representatives from the industry, including the markets, brokerage firms, data vendors, academia, and the institutional investor community.

On September 14, 2001, the Seligman Committee issued a report to the SEC making several findings and recommendations regarding the most fundamental issues in the market information debate.¹³ Although the committee was sharply divided over whether the federal government should continue to mandate the dissemination of a certain level of market information (one of many issues addressed in the report), a majority favored retaining the current mandate. The current mandate requires the markets and vendors to make available to the public only the NBBO and information regarding the last sale (i.e., the price, the number of shares, and the market on which the most recent trade in a stock took place). The committee recommended that the SEC retain the current mandate despite recent changes in market structures, and the move to decimal pricing that arguably make the NBBO less useful than it was in the past. While the SEC has not yet acted on

¹¹ The NASDAQ Stock Market is already publicly traded, as is the Chicago Mercantile Exchange. Other United States markets have also expressed an interest in selling shares to the public.

¹² Exchange Act Release No. 42,208, 64 Fed. Reg. 70,613, 70,613-14 (Dec. 17, 1999) [hereinafter “Concept Release”].

¹³ ADVISORY COMM. ON MKT. INFO., REPORT OF THE ADVISORY COMMITTEE ON MARKET INFORMATION: A BLUEPRINT FOR RESPONSIBLE CHANGE (Sept. 14, 2001) [hereinafter “Seligman Report”], available at <http://www.sec.gov/divisions/marketreg/marketinfo/finalreport.htm>.

the Seligman Committee's recommendations, the SEC recently identified these issues as some of the more important ones facing the current Commission.¹⁴

Although it is unclear if the SEC or Congress will act in response to the market information debate, it is fair to assume that lawmakers will eventually seek to discern which action might be the most likely to enhance the efficiency of the markets. One means of determining the potential impact of a policy decision on market information is to examine the change in the context of the Efficient Market Hypothesis ("EMH").

This article examines certain aspects of the market information debate in the context of the EMH. Part I of this article discusses the EMH as it applies to securities research, of which market information is an important subset. Part I also examines the theory in the context of recent changes in the securities markets. Part II discusses the market information debate as it relates to the amount of market information that must be made available to the public in the context of the principles of the EMH. Part III argues that in assessing means to enhance market efficiency, lawmakers should consider policies that tend to expand the amount of price and size information available to the public. Part III concludes that the market is currently in an inefficient disequilibrium as a result of recent market structure changes that have increased the amount of relevant information about the value of a security that is hidden from the general public.

Part I: Securities Information and the Quest for Efficiency

The EMH contends that the market has available to it all relevant information which it will digest immediately.¹⁵ Under this theory, arbitrage

¹⁴ Testimony Concerning Market Structure Issues by William H. Donaldson, Chairman, SEC, before the House Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises (Oct. 30, 2003) available at <http://www.sec.gov/news/testimony/ts103003whd.htm>; SEC Press Release, SEC Release No. 2002-148, *Commission Sets Dates for Market Structure Hearings* (Oct. 15, 2002) available at <http://www.sec.gov/news/press/2002-148.htm>. [hereinafter "SEC Press Release"].

¹⁵ Jeffrey N. Gordon & Lewis A. Kornhauser, *Efficient Markets, Costly Information, and Securities Research*, 60 N.Y.U. L. REV. 761, 786 (1985). There are three forms of the theory based on the amount of "relevant information" that is presumed to be reflected in the price of a given security: the weak, the semi-strong, and the strong form. The weak form uses past prices. The semi-strong form uses all publicly available information. The strong form uses all information, including private and inside information. See *id.* at 771 n.19. From a practical perspective, relevant information that is incorporated into the price of a security might vary from security to security as could the efficiency of

opportunities are negligible because the price of a stock reflects all relevant information about its value.¹⁶ If markets are efficient, the theory holds, it makes no rational sense to spend scarce resources on securities research.¹⁷ Such expenditures would only be justified if there were a meaningful probability that the acquisition of such information would yield a higher return (net of the information acquisition costs) than could be earned by buying a diverse, unmanaged portfolio of securities.¹⁸ While it is widely accepted that markets do not achieve perfect efficiency,¹⁹ the quest toward a more efficient securities market has long been a vaunted policy goal. As a result, in assessing whether to change the amount of relevant information concerning stocks that is available to investors, lawmakers often look to the EMH for guidance

the incorporation of that information. For example, a security of a company with a “chatty” management will leak more non-public information than one with a taciturn crew. The amount of chattiness in a corporation’s executive suite could be impacted by the nature of the company. For example, a defense contractor that deals in classified military information might tend to leak less about the company than would, say, a non-defense firm that is in the entertainment industry. Likewise, a security that is covered by numerous analysts, broadly owned by numerous “informed” investors, and traded on a national market such as the New York Stock Exchange or NASDAQ would seem more likely to incorporate relevant information into the price of the security more promptly and more efficiently than would a thinly traded security of a company that has no analyst coverage and that is traded through the Pink Sheets. This article focuses on the former type of security, which, unlike the latter, is covered by the Vendor Display Rule. See 17 C.F.R. § 240.11Ac1-2(a)(20) and (b)(2) (2001) (rule applies only to a “reported security”).

¹⁶ Donald C. Langevoort, *Theories, Assumptions, and Securities Regulation: Market Efficiency Revisited*, 140 U. PA. L. REV. 851, 852 n.6 (1992).

¹⁷ Defining the term efficiency with respect to information is somewhat controversial, but Gordon & Kornhauser, *supra* note 14 at n.19, provide a couple of definitions that are sufficient for our purposes. A widely-accepted definition is Beaver’s: “the market is efficient with respect to an information set if revealing that information to all investors (while they keep the information they have) would not change prices.” Beaver, *Market Efficiency*, 56 ACCT. REV. 23 (1981). Latham proposes a new definition: “efficiency with re[s]pect [sic] to an information set means that revealing that information to all investors would not change prices, or *change investors’ portfolios*.” Latham, *Informational Efficiency and Information Subsets*, 41 J. FIN. 39, 41, 50-51 (1986).

¹⁸ See Gordon & Kornhauser, *supra* note 14, at 764.

¹⁹ See Langevoort, *supra* note 15, at 852, n. 6, noting that markets offer positive returns to participants to justify their continued presence and citing Sanford J. Grossman & Joseph E. Stiglitz, *On the Impossibility of Informationally Efficient Markets*, 70 AM. ECON. REV. 393, 405 (1980), for the premise that “because information is costly, prices cannot perfectly reflect the information which is available, since if it did, those who spent resources to obtain it would receive no compensation.

and support.²⁰ While the EMH has acquired detractors over the last several years,²¹ the theory provides a valuable framework for determining whether potential changes to securities laws are likely to promote an efficient market, a relevant consideration with respect to some of the changes being considered in the market information debate.

SEC Vendor Display Rule Reflects Regulatory Judgment of Relevant Security Information

In the market information debate, lawmakers and market participants are currently examining the regulatory framework that governs the collection, consolidation, and dissemination of market information. At the center of this examination is the SEC's Vendor Display Rule,²² which the SEC adopted under Section 11A of the Securities Exchange Act of 1934.²³ While little academic attention is paid to the importance of the Vendor Display Rule,²⁴ it is one of the more important rules impacting the information displayed to the public regarding the value of a security.

Many efficient market theorists assume that securities' price information will be displayed to the public, and thus focus their analysis on determining whether all relevant information about the value of a security is reflected in that displayed price.

²⁰ For example, academic literature has paid a fair amount of attention to the SEC's stated reliance on the EMH to support deregulatory changes to the corporate disclosure requirements. *See* Securities Act Release No. 6,235, 45 Fed. Reg. 63,693, 63,698 (Sept. 25, 1980) (SEC order approving abbreviated disclosure requirements and "shelf registrations" for companies with large market capitalizations, reasoning that "investors are protected by the market's analysis of information about certain companies which is widely available . . . and that such analysis is reflected in the price of the securities offered") [hereinafter "Release No. 6235"]. For an analysis of the SEC's possible motives in relying on the EMH, *see* Langevoort, *supra* note 15, at 873-90. Recent allegations of analyst malfeasance could suggest that a reassessment of this rationale is warranted. *See* Apr. 28, 2003 SEC Press Release announcing settlement of enforcement action against ten of nation's top investment firms, *available at* <http://www.sec.gov/news/press/2003-54.htm>.

²¹ For a discussion of the arguments against the theory, *see generally* Langevoort, *supra* note 15.

²² 17 C.F.R. § 240.11Ac1-2 (2001).

²³ 15 U.S.C. § 78k-1 (1999).

²⁴ A recent LEXIS search of law reviews yielded only three references to the Vendor Display Rule, none of which discussed the rule in the context of the EMH.

Much of the study discerning relevant information to the value of a stock focuses on the mandatory disclosures issuing companies are required to make to the SEC and to the public.²⁵ This information is certainly relevant in determining the value of a security. As the EMH holds, however, mandatory corporate disclosures are quickly digested and reflected in a stock's price. In the periods between corporate disclosures and relevant news about a company or its industry, often the only relevant, real-time information available about a company's stock is the price that someone in the open market is willing to buy or sell it for and for how many shares, and the price and size of the last transaction. The purpose of the Vendor Display Rule is to mandate publication of this information. While many efficient market scholars take this kind of price disclosure for granted, doing so ignores the policy choices that determine what real-time and near real-time information is publicly available.

Most of the impetus behind the initial display of price information in the first instance (and an underlying determination of what information is and is not relevant) arose from a consensual agreement of a need for such information between Congress, the SEC, and the industry. As the SEC noted in its 1999 Concept Release regarding regulation of market information fees and revenues:

All participants in the U.S. markets have access to a consolidated, real-time stream of market information for any of the thousands of equity securities and options that are actively traded. The information for each security is "consolidated" in that it is continually collected from the various market centers that trade the security and then disseminated in a single stream of information. It is "real-time" in that there is very little delay between the time that a quotation is made or a transaction is effected and the time that this information is made available to investors and any others who use the information. This consolidated, real-time stream of market information has been an essential element in the success of the U.S. securities markets. It is the principal tool for enhancing the transparency of the buying and selling interest in a security, for addressing the fragmentation of buying and selling interest among different market centers, and for facilitating the best execution of customers' orders by their broker-dealers.²⁶

²⁵ See, e.g., Langevoort, *supra* note 15, at nn. 100-25.

²⁶ SEC Concept Release No. 42,208, 3 (Dec. 3, 1999).

As the SEC correctly notes, however, “[b]road public access to consolidated market information was not the fortuitous result of private market forces, but of planning and concerted effort by the Congress, the Commission, the [self-regulatory organizations], and the securities industry as a whole.”²⁷ Given the importance of this information in determining the value of a security, it is worthwhile to examine the history of the current system for disseminating market information.

Prior to the 1970s, the market acted independently in determining who would receive market information and at what price.²⁸ In the early 1970s, the SEC took preliminary steps toward facilitating the development of a central or national market system. Congress furthered these efforts by adopting the Securities Acts Amendments of 1975. A key component of the 1975 Amendments was the enactment of Section 11A of the Securities Exchange Act of 1934.²⁹ In Section 11A, Congress recognized the importance of emerging technological advancements in enhancing the efficiency and effectiveness of the U.S. securities markets, and the importance of making quotation and transaction information available to brokers and investors. Congress also recognized the importance of promoting a national market system, and granted the SEC broad authority to facilitate establishment of a national market system for securities.³⁰

Market data dissemination was a central focus of the 1975 Amendments.³¹ While Congress intended to rely on competition where possible to develop the national market system, it acknowledged the necessity of providing, in certain areas, the SEC with the authority to ensure that brokers and investors had access to a

²⁷ *Id.*

²⁸ *Id.*

²⁹ 15 U.S.C. § 78k-1 (1999).

³⁰ 15 U.S.C. § 78k-1(a)(2) (1999).

³¹ *See, e.g.*, 15 U.S.C. § 78k-1(a)(1)(C)(iii) wherein Congress noted that “[i]t is in the public interest and appropriate for the protection of investors and the maintenance of fair and orderly markets to assure, among other things, the availability to brokers, dealers, and investors of information with respect to quotations for and transactions in securities.”

central source of consolidated market information.³² Congress anticipated that competition alone might not be sufficient to develop a composite quotation system or a consolidated transaction reporting system and, therefore, Congress empowered the SEC to ensure the institution of a process for developing integrated markets.³³

From an information dissemination perspective, one of the more important rules the SEC adopted under that grant of authority was the Vendor Display Rule.³⁴ The Vendor Display Rule provides that if a market information vendor provides quote information for any stock that is traded on a market, it must also provide either the NBBO for the stock, including the associated size for those quotes, or a quote montage from all markets that report quote information for that security.³⁵ In other words, if a vendor provides any price information, it must either provide the best price available regardless of the market that posts it, or provide the best prices from all of the markets. Moreover, under the rule, if a vendor provides transaction reports or last sale data for a stock, it must also provide the price and volume of the most recent transaction in that security from any market that reports trades in that stock and indicate the market where that last trade occurred.³⁶ This rule is designed to help ensure that investors are not provided with a misleadingly narrow or “representative” view of the trading interest in a particular security, such as the price on only one market.³⁷ At the time the Vendor Display Rule was adopted in 1980, the

³² See Seligman Report, *supra* note 12, at 29, available at <http://www.sec.gov/divisions/marketinfo/finalreport.htm>. See also, H.R. Rep. No. 94-229, 94th Cong., 1st Sess. 92-93 (1975).

³³ *Id.* at 38-39.

³⁴ 17 C.F.R. § 240.11Ac1-2 (2001).

³⁵ 17 C.F.R. § 240.11Ac1-2(c)(1)-(2)(2001).

³⁶ *Id.*

³⁷ See, e.g., 17 C.F.R. § 240.11Ac1-2(c)(2)(vi) (2001) (prohibiting vendors from providing a representative quote). Although the Vendor Display Rule is crucial in determining the level and quality of price information that is made available to the public, several other SEC rules adopted under Exchange Act Section 11A, are essential in facilitating the quality and timeliness of market information. In particular, Exchange Act Rule 11Aa3-1(b)(2), referred to as the Transaction Reporting Rule, requires each self-regulatory organization (“SRO”) (including the registered securities markets) to file with the SEC a transaction reporting plan for securities meeting certain criteria that are traded in that market. This rule also requires that an SRO’s members provide the market information required by the plan to the SRO. Rule 11Ac1-1, called the Quote Rule, requires SROs to establish procedures for making available its members’ bids, offers, and quotation sizes to information

vendors. The rule also requires SROs' member brokers and dealers to transmit to the SRO the quotation information as set forth by the procedures. In addition, this rule requires brokers to execute any order presented to it at a price that is no worse than the broker's published bid or offer up to the displayed size. Finally, Rule 11Aa3-2(b)(1) authorizes SROs to act jointly to file national market system plans (or amendments to those plans) with the SEC. National market system plans are joint efforts by two or more SROs to develop and implement procedures for complying with requirements of Section 11A of the Act and the rules adopted under that section, including Rule 11Aa3-1, discussed above.

Under this regulatory structure, the SROs upon which equity securities are traded have acted jointly to develop three SEC-approved national market system plans that govern the collection and distribution of market information for equity securities. The three plans are the CTA Plan (which governs the collection and distribution of transaction information for NYSE-listed and AMEX-listed securities or regional exchanges that meet AMEX's listing criteria), the CQ Plan (which governs the collection and distribution of quotation information in NYSE-listed and AMEX-listed securities or regional exchanges that meet AMEX's listing criteria) and the NASDAQ/UTP Plan (which, in combination with NASD rules, governs the collection, consolidation and dissemination of quotation and transaction information for NASDAQ-listed securities). See Seligman Report, *supra* note 12, at 18. A fourth Plan, called the OPRA Plan, governs options market information. *Id.* at 20-21.

The plans require all participating SROs to transmit market information to a central processor, which then consolidates the information into a single stream which is then disseminated to vendors and brokers. The vendors in turn disseminate the market information to the public. Among other things, the plans govern the fees that data recipients will pay for the data stream as well as how plan revenues are divided among participating SROs. The plans also govern such non-fee related issues as reporting obligations and trading halt procedures. Pursuant to the plans, member SROs have developed networks that disseminate market information for different categories of securities. Seligman Report, *supra* note 12, at 18.

In particular, Network A disseminates market information for NYSE-listed securities. *Id.* at 19. Network B disseminates market information for AMEX-listed securities. The central processor for Network A and Network B is the Securities Industry Automation Corporation ("SIAC"). *Id.* The NYSE currently owns two-thirds and AMEX owns one-third of the equity in SIAC, which is registered with the SEC as a securities information processor ("SIP"). Seligman Report, *supra* note 12, at n.43 and accompanying text. Each of the Plan Participants for which SIAC is the SIP electronically provides SIAC with its last sale and quote information. From this information SIAC calculates aggregate volume and an NBBO that identifies which market or markets have the best price at that time. SIAC then distributes the data to approved recipients. There are about 86 such recipients, which include exchanges, the press, broker-dealers, and vendors. *Id.* at 24. Most of the vendors (as well as some brokers) then offer this information to others. About 1,500 other users of this information, including broker-dealers and institutions, receive data feeds indirectly through a data feed provider and often redistribute it to their retail customers and employees. *Id.* at 24.

Market information for NASDAQ-listed securities is collected and disseminated by NASDAQ, which is registered with the SEC as a SIP. *Id.* at 20. NASDAQ and the other markets that trade NASDAQ securities recently agreed to replace NASDAQ as the SIP with a new SIP that is independent of any of those markets. Arrangements for this transition are ongoing. See Exchange Act Release No. 46,139, (June 28, 2002), 67 Fed. Reg. 44,888, (July 5, 2002) ("[n]otice of filing and partial summary effectiveness of Amendment No. 13 to the Reporting Plan for NASDAQ-listed securities").

SEC was attempting to address what it perceived to be deficiencies in the then-existing system for disseminating market information. In particular, the SEC noted that vendors of such information made it easier to access market information from the primary markets than from other markets.³⁸ Moreover, with respect to securities traded over the counter, the SEC noted that the market information disseminated to the public did not represent the “best” price, but rather was merely a “representative” price or the median of all prices quoted at that time by market makers in the securities.³⁹

Examination of the Vendor Display Rule under the Efficient Market Hypothesis

Under the EMH, all relevant information about the value of a stock is purportedly incorporated into the stock price. Stated another way, according to the EMH, one inquiring about the value of a stock needs to look no further than its price in the open market. From a practical standpoint, however, the Vendor Display Rule illustrates that, although the price is an important element in determining the value of a stock at a given time, it is only one piece of relevant information. Size is

Until recently, NASDAQ offered two market information services directly to vendors and other subscribers: the Level 1 service, and the NASDAQ Quotation Dissemination Service (“NQDS”). Level 1 included the NBBO, last sale reports, and volume information for NASDAQ-listed securities. NQDS (also called Level 2) included all Level 1 information as well as NASDAQ market maker quotes and trading interest from electronic communications networks and exchanges that trade NASDAQ-listed securities. Seligman Report *supra* note 12, at 25. With the introduction of NASDAQ’s new trading system, SuperMontage, NASDAQ has introduced a number of new data products, which are discussed at note 52 below.

There are about 133 direct data recipients and about 1,200 indirect recipients of NASDAQ data products. After being disseminated to the direct recipients, these data feeds are then redistributed to professional and non-professional subscribers. Seligman Report, *supra* note 12, at 28.

Users of market information are charged a fee for the data, which depends on the type of user as well as on the amount of information they receive. The fees charged by each of the Networks are pooled together and, after expenses are subtracted, are distributed as net income to the SROs that participated in the Plan, based on each SRO’s proportional share of transaction volume that it executed through the Network. *Id.* at 36. In 2000, net income for Network A totaled nearly \$165 million, net income for Network B was nearly \$121 million, and net income for NASDAQ-listed securities was \$187 million. Seligman Report, *supra* note 12, at Appendix C.

³⁸ Exchange Act Release No. 16,590 (Feb. 19, 1980).

³⁹ *Id.* at nn. 21-25.

an equally important element, as illustrated by the following example.⁴⁰ Assume that market professionals on three markets, the NASDAQ, the Chicago Stock Exchange (“CHX”) and the Pacific Exchange (“PCX”), are offering to sell Intel at \$20 per share. Based on that information alone, an investor could only conclude that each market placed the same value on Intel at that time. That conclusion is not necessarily true. Assume further that NASDAQ market professionals are willing to buy 1,000 shares of Intel at \$20 per share, whereas those on CHX and PCX are only willing to buy 100 shares each at that price. Now, the investor has substantially more information about the value of Intel on each of the markets. Whereas CHX and PCX are indicating that they are only willing to buy a minimum share amount at \$20 per share, NASDAQ, which represents the bid of one or more market professionals in that security, is indicating that it is willing to buy ten times the minimum amount it is required to display.⁴¹ This information could suggest that a NASDAQ market maker is holding a customer limit order for 1,000 shares, that it is trying to move a position of its own, or a combination of both. Whichever the case, by placing size into the equation, based on this hypothetical, one might reasonably assume that NASDAQ places a higher value on Intel despite the fact that all markets quoted the same price for it at a given time.⁴²

Markets Shift to Decimal Pricing

From an efficient market theory perspective, it might be more accurate to state that all relevant information about a security is embedded into the price and size offered for that security at a given time. In light of the markets’ recent move to

⁴⁰ In adopting the Vendor Display Rule, the SEC acknowledged the importance of size in determining the value of a particular quote. See Exchange Act Release No. 16,590, at nn. 125-26 and accompanying text.

⁴¹ Many, but not all markets require the professionals who trade there to maintain a minimum bid and offer quote of 100 shares in each of the stocks that they trade on that market.

⁴² For brokers, the market where a broker is likely to find the greatest number of shares at a given price is, of course, a matter of practical importance. Brokers have a duty to find for their customers’ orders the best terms reasonably available. Brokers that repeatedly route their customers’ orders to a market with insufficient size to obtain executions at a favorable price could be exposing themselves to regulatory and civil liability for failing to meet this “best execution” obligation. Equally important, brokers that regularly fail to obtain favorable execution terms for their customers’ orders risk losing those customers.

decimal pricing,⁴³ however, even this amendment might be an overstatement, as demonstrated by the following example. Prior to the move to decimals, most established securities markets in the United States quoted in minimum increments of 1/16th or 6.25 cents. Assume in a pre-decimals environment that there were ten market makers in Intel. All have different views of what the true value of Intel is, but one-half of the market makers are somewhat more bullish on the stock compared to the other half. However, all want to be at or near the inside or best publicly displayed price. If the prevailing market to buy is around \$20 per share, then the market makers could make a choice of whether to be at the inside price or one trading increment away. As a result, five market makers would each post a 100-share quote to buy at \$20 1/16th per share and the other five would each post a 100-share quote to buy at \$20 per share. Thus, 500 of the 1,000 shares offered by the ten market makers would be available at \$20 1/16th per share and 500 would be available at \$20 per share. As required by the Vendor Display Rule, an investor that bought the minimum amount of price information required to be made available would see 500 shares of Intel at \$20 1/16th per share. The other 500 shares would be invisible to that investor.

Now, assume that in a post-decimals environment the same group of market makers is considering the price at which they will post a quote for Intel. Instead of two choices, at or near the inside, the market makers can now quote at a price that more closely reflects what each believes to be the true value of Intel. Under this hypothetical, assume that each of the ten quotes for 100 shares, two market makers quote at \$20.05 per share, two quote at \$20.04 per share, two at \$20.03 per share, two at \$20.02 per share, and the last two at \$20.01 per share. Given that the Vendor Display Rule requires only that the best price be displayed, an investor will see where 200 shares are traded, but the other 800 shares are buried. As a result, the move to decimal pricing, while not directly changing the minimum amount of information that must be displayed, would in theory, make the market less efficient by reducing the amount of information required to be made available to the public. The reduction in information that must be displayed would result in a greater value being placed on investment research, especially research that analyzes a greater depth of trading information. As shown in the example, economic research conducted after

⁴³ In 2001, the United States equity markets completed the transition to quoting in decimal prices from fraction pricing. Although the SEC order mandating such a move did not mandate which quoting increment the markets were to use, the registered exchanges and NASDAQ quickly permitted quoting in single penny increments. Alternative trading systems have permitted quoting in subpenny increments. See SEC Concept Release No. 44,568, *Request for Comment on the Effects of Decimal Trading in Subpennies* (July 18, 2001).

the industry moved to decimal pricing tends to support the theory of a less efficient market in this respect.⁴⁴

The move to decimal pricing, and in particular the pricing of securities in single cent or subpenny increments, would also seemingly weaken the EMH. This is so because in a decimal environment, the publicly displayed price embeds less relevant information about the value of that security at a given time. For example, if the best bid in Microsoft stock is at \$40.01 per share for 100 shares by Market Maker 1 (“MM1”) the public, in effect, sees the financial “vote” of only one market participant for the value of that security. There may be other “votes” hidden below that best vote (MM2-MM5 may vote that 1,000 shares of Microsoft is worth \$40.00 per share), but because they are not the best votes at the time, they are not required to be displayed to the public. The fewer votes embedded into that single best price point, the less likely it is that that best price represents the true value of that security.

SEC Limit Order Display Rule

Another important set of rules that should be examined in the context of the EMH involves market structure changes. In 1996, the SEC adopted the Limit Order Display Rule to address what it perceived as deficiencies in the manner in which market professionals, and in particular NASDAQ market makers, handled customer limit orders.⁴⁵ The rule requires market makers who receive customer limit orders that better the market maker’s quote or add to its size either to: (1) execute the order immediately; (2) display the order in the market maker’s quote; or (3) send the order to another broker or electronic communications network (“ECN”) that will display or execute the order.⁴⁶

The Limit Order Display Rule addressed a perceived inefficiency in the market (i.e., hidden limit orders), thus enabling the price of a security to better reflect

⁴⁴ See NASDAQ Decimal Study, *supra* note 5, at 33 (finding that the quote size at the best or “inside” price declined substantially following decimalization. According to the report, on average, quoted size at the inside price for the most active NASDAQ stocks declined by 70 percent). See also DECIMALIZATION OF TRADING ON THE NEW YORK STOCK EXCHANGE: A REPORT TO THE SECURITIES AND EXCHANGE COMMISSION, at 14 (Sept. 7, 2001) (“displayed liquidity declined markedly after decimal pricing”).

⁴⁵ 17 C.F.R. § 240.11Ac1-4 (2001); *Display of Customer Limit Orders*, Exchange Act Release No.37,619A, 61 Fed. Reg. 48,331 (Sept. 12, 1996), as amended in 65 Fed. Reg. 75,462 (Dec. 1, 2000).

⁴⁶ 17 C.F.R. 240.11Ac1-1(c)(1-5) (2001).

all relevant information more efficiently. The Limit Order Display Rule also had other, less direct, impacts on the prices of securities and on market information generally. By permitting brokers to display limit orders in ECNs, rather than in the market maker's quote, the rule helped to integrate ECNs, which up to that point were private markets for brokers and institutional investors, into the National Market System. As a result, the Limit Order Display Rule increased the importance of ECNs and the information that they contribute to the stock price that they trade.⁴⁷ ECN quotes are now accessible through NASDAQ and other markets, and provide a significant source of liquidity in those markets. By forcing market makers to execute, display, or route an order to an ECN that would display that customer's limit order, the Limit Order Display Rule tends to make the securities markets more efficient and strengthen the EMH. This is so because the Limit Order Display Rule helps to ensure that the markets have access to information about public limit orders, thereby enabling incorporation of such information into the price of a stock.

Reserve Size Features

Other important market structure changes that impact the EMH deal with the trading rules of individual markets. For instance, NASDAQ's "SuperSOES" system (implemented in July 2001 and the precursor to NASDAQ's current trading platform called "SuperMontage") allowed market participants for the first time to use a reserve size feature in NASDAQ.⁴⁸ With this feature, a market participant not wanting to display the full size of its trading interest, but still wanting to protect the priority of that interest against subsequent orders or inferior prices, may display a portion of its quote (say 1,000 shares) and keep the remaining interest (say 5,000 shares) in reserve (i.e., in an undisplayed but electronically accessible state). Under this scenario, if a firm sends a 2,000-share order to this market maker, it would receive an execution for the full size of the order, even though the market maker at

⁴⁷ As a practical matter, most ECNs that are now in operation (including Island and Archipelago), were formed after the adoption of the Limit Order Display Rule (Instinet is a notable exception). Many contend that the rise of ECNs was due less to the liquidity they provide to the market than to the fact that the Limit Order Display Rule permits ECNs to charge an access fee to non-subscribers who access their quotes, whereas, an SEC rule prohibits market makers from charging an access fee. *See* 17 C.F.R. § 240.11Ac1-1(c)(2) (2001) (mandating that a broker execute orders it receives at a price at least as favorable as the broker's quote in an amount equal to its quoted size).

⁴⁸ For a full discussion of SuperSOES, including the reserve size feature, *see* Reserve Size Feature, Exchange Act Release No. 42,344 (Jan. 14, 2000), 65 Fed. Reg. 3,987, 93-95 (Jan. 25, 2000). SuperSOES has since been replaced by a new NASDAQ system called SuperMontage, which also contains a reserved size feature similar to that offered in SuperSOES and is discussed further below.

the time was only displaying 1,000 shares. The 2,000-share order would exhaust the 1,000 shares that are displayed and would execute against 1,000 shares of the market maker's 5,000-share reserve.

Discretionary Orders

Another similar development deals with an order type now permitted by the Pacific/Archipelago Exchange. In October 2001, the SEC approved the PCX's proposal to establish the Archipelago Exchange as an all-electronic market that serves as a facility of PCX.⁴⁹ Market participants that wish to trade on this market are permitted to enter so-called "discretionary" orders. A discretionary order is a two-tiered order with one price and size that are displayed and a second price and size that are undisplayed. For example, a PCX market maker might wish to buy 10,000 shares of Intel but does not want the rest of the market to know how much it is willing to pay for the entire block. Therefore, the market maker might enter a discretionary order to buy that would contain a publicly displayed price of \$20 per share for 1,000 shares of Intel with a portion of the order containing an undisplayed price of \$20.02 per share for the remaining 9,000 shares. An order entry firm could send a 2,000-share order to sell Intel and would receive an execution for 2,000 shares from the market maker, the first 1,000 of which would be for \$20 per share and the second 1,000 would be for \$20.02 per share. In this manner, the order entry firm receives a good price for the stock it is selling and the market maker buys a larger block of stock without alerting the market that it is interested in accumulating more (thereby shielding the market maker from market impact or the risk that its trading will cause the price of the stock to be driven higher before the market maker can purchase the entire block).⁵⁰

⁴⁹ *Order Approving Pacific Exchange*, Exchange Act Release No. 44,983 (Oct. 25, 2001), 66 Fed. Reg. 55,225 (Nov. 1, 2001).

⁵⁰ In the order approving the PCX proposal, the SEC compared discretionary orders to other types of orders or trading interest that have long been fixtures of the United States equities markets: percentage orders and orders that exchange floor brokers "work." *Id.* at note 92. Unlike discretionary orders, which receive price and time priority protection under exchange rules, floor broker orders, which, by definition are not placed on the exchange specialists' limit order books, would not receive such exchange protection. Percentage orders may be closer to discretionary orders. A percentage order is a limited price order to buy (or sell) 50% of the volume of a specified stock after its entry. NYSE R. 13 (2002). According to the SEC, a percentage order:

[i]s essentially a memorandum entry left with a specialist that becomes a 'live' order capable of execution when either: (i) all or part of the order is elected as a limit order on the specialist's book based on trades in the market; or (ii) a specialist holding a percentage order with a conversion instruction converts all or part of the

The advent of reserve size and discretionary orders could enhance market efficiency by increasing the likelihood that a market participant will execute all of its size at a given price. At the same time, reserve size and discretionary orders tend to diminish efficiency by diminishing the amount of relevant information reflected in the stock price (i.e., the fact that someone is willing to buy more stock than the amount displayed or is willing to pay more for it than the best displayed price).

NASDAQ's SuperMontage System

Another important development that should be analyzed with respect to its contribution to market efficiency and in the context of the EMH is the implementation of SuperMontage, NASDAQ's new quoting and trading platform. SuperMontage is NASDAQ's response to competitive pressures from other market participants that trade NASDAQ securities, including ECNs and regional stock markets. Before SuperMontage, NASDAQ permitted market makers to display only their single best quote on both sides of the market, identified by that market maker's unique market identifier ("MPID"). For example, prior to SuperMontage, if Goldman Sachs ("Goldman") wished to display its trading interest in Microsoft, it was required to post its best quote on either side of the market under its MPID, "GSCO." A GSCO quote of 40.00-40.05, 1000X500 would mean that Goldman was willing to buy 1,000 shares of Microsoft at \$40 per share and sell 500 shares at \$40.05 per share. Goldman's quotes could represent either Goldman's proprietary trading interest, customer limit orders, or a combination of both. Goldman might have dozens of other limit orders that did not represent the best prices at that time, but

percentage order into a limit order to make a bid or offer or to participate directly in a trade. ... The conversion instruction authorizes the specialist to convert all or part of a percentage order into a limit order and to be on parity with the converted percentage order.

Order Excepting Options Specialists, Exchange Act Release No. 47,319, n.4 (Feb. 5, 2003) (citations omitted), 68 Fed. Reg. 7156-57 (Feb. 12, 2003). The SEC believes that federal securities laws and exchange rules offer adequate protections to percentage orders to make them sufficiently equivalent to limit orders, which expressly receive exchange price and time priority protections. *Id.* at nn. 4-5 and accompanying text. As such, a percentage order would be like the undisplayed portion of a reserved size order in that it would provide greater size than that displayed to the public. Because percentage orders generally require that an execution occur at the limit price specified in that order (or better, before those orders become "live" orders) they would appear to differ from discretionary orders, which are two-tiered orders, consisting of a displayed tier and an undisplayed tier with a better price (from the public's perspective) than the displayed portion. As such, there is substantial information not reflected in the price of a stock.

NASDAQ provided no way to display those other orders, although many ECNs did.⁵¹

Moreover, unless it placed its orders in an ECN or through another quoting market participant, Goldman had no way of disguising its trading interest in NASDAQ other than through the reserve size feature discussed above. For example, assume that Goldman had a 25,000-share order to buy that it did not want the market to see in its entirety for fear of signaling to the market that Goldman or its customer was a large buyer. Goldman could display part of the order in its quote and could hold the rest in reserve or place the remainder in an ECN. Using a reserve or ECN would not identify Goldman as a buyer (a so-called anonymity feature), but Goldman could not display its interest anonymously in NASDAQ without going through an intermediary.⁵² As a result, many viewed NASDAQ as a less desirable place to trade due to the absence of a full depth of book feature and the lack of an anonymity feature. With the implementation of SuperMontage, NASDAQ market participants now have the choice to display order and proprietary quotes at multiple price levels. For example, if Goldman has three customer limit orders to buy Microsoft at \$40.00, \$40.03, and \$40.05 per share, Goldman may display each such order in SuperMontage under its own MPID, and all of those orders will receive execution priority over orders at the same price entered later in time. SuperMontage aggregates all trading interests at the top five price levels and displays the aggregated size at each of those five prices to market participants that purchase that data stream from NASDAQ or from a vendor of market information. Indeed, by introducing SuperMontage as a new trading system, NASDAQ also introduced several new market information products to which market participants may subscribe.⁵³ For

⁵¹ By contrast, on the New York Stock Exchange, the specialist maintains all limit orders that brokers choose to place in the specialist's limit order book, which, until recently, was not available for display to the public.

⁵² Trading interest displayed through an ECN is identified only through the ECN's unique market identification symbol.

⁵³ The products are called DepthView, PowerView, and TotalView. DepthView provides the aggregate size of all quotes and orders at each of the top five price levels in SuperMontage. PowerView includes all DepthView information and adds the best bid and offer from each registered NASDAQ market participant. TotalView includes all PowerView information and all quotes at the top five prices levels and aggregate anonymous interest at each of those levels. By comparison, NASDAQ Level 1 data, which is the minimum that must be provided to the public under the Vendor Display Rule, includes only the single best bid and offer of each NASDAQ market participant and the single best price of all of the regional markets that trade such stock.

subscribers, the information products offer more information than the minimum required by the Vendor Display Rule.

The so-called “depth of book” information should enhance market efficiency by allowing more information about trading interest in a stock to be available to investors and other market participants. From an efficient market theory perspective, “depth of book” information has little value since the price of the stock would already reflect the existence of this information. However, professional and non-professional traders are willing to pay for such information, suggesting that they find some value in its content. Sanford J. Grossman & Joseph E. Stiglitz provide one possible theoretical response to this conflict between theory and practice, contending that “because information is costly, prices cannot perfectly reflect the information which is available, since if it did, those who spent resources to obtain it would receive no compensation.”⁵⁴

SuperMontage also introduced SIZE, a generic MPID, through which market participants may display limit orders that they do not wish to have associated with their own firm MPID. Broker-dealers that do not make a market in a particular stock may also use SIZE to display limit orders without using a market maker or ECN that is a NASDAQ market participant. SIZE allows market participants to display limit orders in NASDAQ anonymously (a feature that has long been offered by ECNs). From a market efficiency standpoint, there are two sides to the SIZE argument. Some would contend that SIZE reduces the amount of available information in a particular stock (i.e., who is displaying the trading interest). Others would argue that anonymity features like SIZE, while hiding an important piece of information about who is the buyer or seller behind a given order, on balance, actually increase the amount of information available to the public by encouraging firms and their customers to display orders that they would otherwise keep hidden.

Part II: Efficiency and the Market Information Debate

Assuming that an efficient capital market is a desirable policy goal, it would certainly be worthwhile to determine which position in the market information debate (i.e., how much information should the government require to be publicly disseminated, if any) would most likely increase efficiency. The recommendations of the Seligman Committee provide a framework for making that determination.

⁵⁴ Sanford J. Grossman & Joseph E. Stiglitz, ON THE IMPOSSIBILITY OF INFORMATIONALLY EFFICIENT MARKETS, 70 AM. ECON. REV. 393, 405 (1980). *See also* Langevoort, *supra* note 15, at n. 6.

Seligman Committee Recommendation on Vendor Display Rule

The Seligman Committee addressed two questions in this context: (1) whether the government should retain the Vendor Display Rule; and (2) whether the government should expand the amount of market information currently mandated by the rule (i.e., the NBBO and information regarding the last sale). A majority of the committee, including representatives from the New York Stock Exchange, the American Stock Exchange, NASDAQ, institutional investors, and academics, favored retaining the Vendor Display Rule. Those supporting the rule thought it played an important role in ensuring that vendors provide market participants a minimum baseline level of trade and quote information. As such, the rule's proponents viewed it as serving an investor protection and a market integrity function. Some that favored retaining the rule also argued that the rule promotes intermarket competition by ensuring the dissemination of market information from newer markets or smaller markets. Some rule proponents noted that, without the Vendor Display Rule, investors could not determine whether they were seeing the best price, possibly causing them to mis-price their limit orders. They also noted that investors might have a harder time, in the absence of the rule, determining whether their orders received the best execution from brokers.

Those supporting elimination of the Vendor Display Rule, including an ECN, two online brokers, a large NASDAQ market maker, and a market information vendor, argued that market forces and the broker-dealers' duty of best execution should lead investors to receive affordable, high-quality market data. Therefore, no government mandate is required. These market participants would allow investors, who chose not to pay for the NBBO and last sale information, to avoid receiving it, arguing that this flexibility could help lower transaction costs for data users. They also argued that this would remove the inordinate pricing power of non-primary markets, which currently can charge rates for information that is disproportionate to its value.

Finally, the Committee considered whether the Vendor Display Rule mandates the appropriate level of market information considering the industry's move to decimal pricing and the resulting reduction in trading depth. The committee recommended that vendors should not be required to furnish deeper information to subscribers than is currently required (i.e., the NBBO and last sale). They favored allowing market forces to govern the availability of this information.

Efficiency Analysis of Alternative Approaches to Display of Market Data

The Seligman Committee's recommendations illustrate that there are at least three possible approaches the SEC and Congress may consider in an attempt to resolve the market information debate. The first alternative involves maintaining the current level of government-mandated market information. This is the approach that the majority of the Seligman Committee, including NASDAQ and the New York Stock Exchange, favored. From an efficient market perspective, it would seem that maintaining the status quo, in light of the market structure and other changes (including the move to decimal pricing) discussed above, would leave the market in a less than optimally efficient state. Market participants widely agree that in a post decimals environment, the NBBO and last sale information (currently all that is required to be made available to the public), does not reflect all relevant information about the value of the stock. The NBBO is, at best, a small slice of the information necessary to make a rational investment decision. Even NASDAQ and the New York Stock Exchange, in developing enhanced data products post decimalization, acknowledge the limitations of the NBBO in the current market environment. Because of this incomplete public pricing information, professional traders and institutional investors still find it profitable to buy broader market information research, indicating an inefficient market.

The second alternative, which eliminates the Vendor Display Rule requirements entirely, seems to increase pricing inefficiencies in the market. Without the NBBO and last sale information, brokers and vendors could return to a world similar to that which existed before the 1980 adoption of the Vendor Display Rule. At that time, vendors were free to disseminate only the prices of the primary markets, which could have excluded better prices on the non-primary markets. Given the current strong competition among the markets over order flow, particularly with respect to trading in securities listed on NASDAQ, the omission of market information from non-primary markets could eliminate any baseline pricing guide. As a result, those market participants able to buy and consolidate market information from all of the markets would likely generate favorable returns beyond those which they could earn from a diversified portfolio. These larger returns would result from the "informed" investor "competing" in their trading with "uninformed" investors who chose not to, or could not afford to buy, the enhanced market information. SEC vigilance in controlling the costs of this enhanced market information to nonprofessional traders may be warranted in this situation.

Finally, the third alternative for the SEC is to mandate the dissemination of more information than is currently required under the Vendor Display Rule. The SEC would have one of two choices if it required the dissemination of enhanced information: (1) require all quotes or orders to be made available to the public; or (2) draw an arbitrary line at a certain price level, such as requiring vendors to disseminate the top five prices. There are practical reasons why the SEC may find requiring dissemination of all quotes and orders undesirable. First, a large number of the quotes and orders several price levels away from the best prices in the market convey little useful pricing information. For example, in the case of a stock with very little volatility, disseminating the fact that a market maker has a limit order to buy 100 shares when the stock falls 10 points from its current level is not very relevant information because the likelihood of that limit order being triggered in any given day is negligible. While limit orders far away from the best prices convey little relevant information, they do impose additional costs on the markets and on the securities information processors who have to build systems with adequate capacity to capture that information.

The second alternative, drawing an arbitrary line about an enhanced amount of information, may be the only suitable alternative. There are a number of different approaches that regulators may wish to consider in drawing such a line. One is whether they should draw a fixed or variable line. For example, is it best to require dissemination of the top five or ten price levels or to require a range of pricing that takes into consideration a number of variables about the particular stock. There are a number of compelling reasons why a fixed number of prices is less desirable than a variable number. For example, assume that the SEC required vendors to make the top ten price levels available. Such a number might provide sufficient information in the current environment where established markets permit quotes in single penny increments, but the trend in the markets is toward permitting quoting in subpenny increments. Many ECNs allow their subscribers to trade in subpennies (i.e., trading increments finer than \$0.01), putting competitive pressures on the established markets to allow subpenny trading. Unless the SEC decides to ban subpenny pricing, which is not beyond the range of possibility, markets would be hard pressed not to allow subpenny pricing in the near future. If the established markets move to subpenny pricing, then the top ten pricing increments might again convey to investors only the liquidity that is available within a penny or two of the NBBO, a situation that is little better than the current environment.

In light of the potential trend in the markets toward subpennies, it would seem that the best alternative for the SEC would be to require the markets to

disseminate a variable number of prices that takes into consideration the price as well as the volatility of the stock. One approach is to divide stocks into categories based on their volatility. For example, there could be categories of stable, somewhat volatile, and volatile stocks. For stocks in the stable range, where the price fluctuates on average no more than a few cents in a given trading day, it may be sufficient to require price levels within two percent of the best price on that day. Somewhat volatile stocks might require dissemination of prices within four percent of the stock's price on that day. Volatile stocks might require dissemination of prices within ten percent of the best price on that day.

Assume Intel fell into the volatile category of stocks and its opening bid for the day was \$25 per share. The market would be required to disseminate all bids from that \$25 per share down to \$22.50 per share, ten percent below the best bid of \$25 per share. The same would be true for the offer prices. If the best offer was \$25.05 per share, the market would be required to disseminate the \$25.05 per share offer as well as all inferior offers up to \$27.56 per share, ten percent above the best offer.

Although the markets may have more difficulty administering this variable approach than a fixed price approach, the variable approach may ultimately be more useful because it takes into account the available relevant pricing information for that particular stock.

Part III: Conclusion

Over the last several years, a number of important changes in the nation's securities markets have impacted the efficiency of those markets. Perhaps the most fundamental of these changes was the move to decimal pricing. Less dramatic, but still important, are changes in the types of orders available on individual markets that allow market participants to avoid displaying the full level of their trading interest while still protecting its priority.

These changes tend to remove important information from the umbrella of information the SEC currently requires vendors to make available to the public through the Vendor Display Rule. Although market participants are divided on whether the level of information mandated by the government should be increased, maintained, or eliminated to enhance market efficiency to a level comparable to that of a pre-decimals environment, lawmakers should consider expanding the amount of mandated information to include the top five price levels with aggregated size or a

variable level of price information based on a stock's volatility. In the alternative, lawmakers should consider means of reducing the costs of purchasing enhanced market information to help ensure that all investors have access to this important information.