Does Market Structure Affect the Immediacy of Stock Price Responses to News?

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Does Market Structure Affect How Quickly Stock Prices React to News?

Abstract

This study compares the speed of price adjustments to seasoned equity offering announcements by NYSE/AMEX and NASDAQ stocks. We find that price adjustments are quicker by as much as one hour on NASDAQ. This result is not due to differences in issuer characteristics or announcement effects across the markets, but due to differences in market structures. Greater risk-taking by dealers, more rapid order execution and more frequent informed trading (SOES bandits) on NASDAQ, as well as stale limit orders and a less efficient opening price setting mechanism on the NYSE/AMEX, all contribute to faster stock price adjustments on NASDAQ.

I. Introduction

This study examines how different stock markets affect the speed with which new information is incorporated into prices. Using transactions data, we compare the price reaction speeds on NASDAQ with those on the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX). These markets are governed by separate rules and employ distinctly different organizational structures. Thus, they offer us the opportunity to explore how these structural differences affect the speed of price reaction to news.

A number of prior studies examine the impact of alternative market structures on stock return volatility (e.g., Amihud and Mendelson (1987), Stoll and Whaley (1990), Masulis and Ng (1995)). We extend this comparative analysis by examining price adjustment speeds across markets to a common type of information event, an announcement of seasoned equity offering (SEO). This comparison is also interesting because all the markets are in the U.S., which holds constant the underlying economic, legal and regulatory environment. We document evidence pointing to several causes for differences in price reaction speeds across these markets, furthering our understanding of how various trading mechanisms affect price discovery.

The speed of price reaction to news is of interest not only to investors and market microstructure researchers, but also concerns to stock exchanges facing increased competition from foreign markets expanding their trading hours and from the creation of new electronic communication networks (ECNs). The competitive positions of stock markets can be significantly changed, not only by the cost of trading, but also by the timeliness of trades and the accuracy and transparency of prices. Thus, understanding how various market mechanisms and rules affect the price discovery process can be very important to the ultimate success of competing stock markets. These issues are also relevant to market regulators, who are continually confronted with the need to enact regulations in response to technological changes in trading environments so as to enhance accuracy of prices without favoring some markets over others.

To preview our results, we find stock price reactions are significantly faster on NASDAQ compared to the NYSE/AMEX and that difference can be as much as one hour. Since stock characteristics and the information conveyed by SEO announcements can differ across the exchange samples, we examine their role in

explaining the faster price reactions on NASDAQ. We show that the faster price changes on NASDAQ cannot be attributed to differences in (1) magnitudes of two-day announcement returns, (2) frequencies of trading halts, (3) frequencies of overnight and daytime announcements, or (4) equity capitalization, trading frequencies or bid-ask spreads. This suggests that the average difference in price reaction speeds across these markets is not due to cross-exchange differences in issuer or offering characteristics. In fact, the evidence is more striking when these differences in characteristics are accounted for.

When we examine market microstructure features, we find that NASDAQ's faster electronic execution system, greater quote depth and dealer risk-bearing, along with the threat of SOES bandits and stale NYSE/AMEX limit orders, all contribute to NASDAQ's faster price adjustment to news. For overnight announcements, the opening mechanism on NASDAQ appears to disseminate price information more efficiently, consistent with several other recent studies. Overall, we find market microstructure features are more important than stock or offer characteristics in explaining differences in price reaction speeds to news.

The remainder of the paper is organized as follows. In section II we review institutional details and discuss possible causes for differences in price reaction speeds across the exchanges. Section III discusses our methodology and data and the following section presents the empirical results. In section V, we examine the out-of-sample validity of our findings using more recent data and in section VI, conclude.

II. Institutional Details

The NYSE and AMEX are order-driven continuous auction markets, with individual market makers called specialists assigned to each stock. Specialists facilitate continuous trading by posting quotes for their own account or by reflecting the best quotes on their limit order book. Limit orders play a major role in providing immediacy and liquidity on the NYSE/AMEX as seen by the fact that over 80% (88%) of the volume on NYSE (AMEX) arise from trades in which the specialists do not participate for their own account.[1] In contrast, the NASDAQ market is based on a competing dealer system in which each dealer continually posts firm bid and ask quotes on an

[1] 1992 NYSE and AMEX fact books respectively. Stoll (1985) estimates that in approximately half of trades in which specialists participate, they act as brokers in executing limit orders.

electronic screen. Further, there is no central limit order book on NASDAQ, although limit orders may be left with individual broker-dealers. However, unlike the NYSE/AMEX, limit orders on NASDAQ do not drive the posted quotes since dealers are not required to set quotes equal to or better than the inside limit orders.[2] Also, dealer competition is diminished by rules allowing directed order flow to preferred dealers, who agree to trade at the best posted quotes.

Other institutional differences between the NYSE/AMEX and NASDAQ markets can affect price adjustment speeds. Limit orders on the NYSE/AMEX cannot be updated instantaneously, nor can they be conditioned on public information such as the stock's last transaction price. Thus, limit prices can be temporarily stale following price relevant news releases. This slow updating of limit orders can delay revisions in the specialist's bid and ask quotes. Elimination of stale limit orders following negative news can be delayed by the uptick rule because it prevents arbitrageurs from short selling the stock on a price down tick or a zero tick following a down tick. Alexander and Peterson (1999) document that the NYSE uptick rule significantly delays and often precludes execution of short sales.

NASDAQ dealers must post firm bid and ask quotes for at least 1000 shares and can not rely on investor limit orders to substitute for their quote obligations. Thus, if dealers do not immediately adjust their quotes for new information, they are vulnerable to other traders selectively hitting their stale quotes, causing them trading losses. Hence, NASDAQ dealers have strong financial incentives to immediately revise their quotes following public announcements, even in the absence of trades.[3] In contrast, NYSE/AMEX specialists are less vulnerable to information traders for several reasons. First, specialists frequently quote the best limit orders on their books, rather than quote for their own account. Since the execution of posted quotes often has no impact on specialists' inventory positions or wealth, their incentives to immediately adjust quotes to new information are reduced. Second, the specialists' required quote depth is one round lot of 100 shares. Third, when quoting for their own accounts specialists benefit from manual execution of SuperDot electronic orders, which allows them to step away from incoming market orders just prior to execution. Madhavan and Sofianos (1998)

[2] Since January 1997, NASDAQ dealers are required to either execute or display customer limit orders. However, NASDAQ continues not to have a centralized book of limit orders.

[3] As of September 6, 1994, NASDAQ adopted a rule similar to the NYSE uptick rule.

and Kavajecz (1999) report evidence consistent with these patterns. In addition, specialists also have affirmative obligation to stabilize prices, which creates incentives for them to buy some stock when prices are falling, especially in the face of temporary order imbalances. This behavior can slow the price adjustment process on the NYSE/AMEX as Madhavan and Sofianos (1998) and Madhavan and Panchapagesan (2000) document. In addition, the specialist's obligation to provide price continuity can reinforce this effect since it requires them to go tick by tick through the limit order book.[4] In summary, these considerations suggest NASDAQ quotes should react faster to public announcements than NYSE/AMEX quotes.

The market reaction speeds can also differ due to cross-exchange differences in the trade execution systems. Incoming market orders on the NYSE/AMEX are manually executed on the exchange floor to expose them to potential new market orders from specialists and floor brokers that can better the currently posted quotes. Smaller NYSE orders routed through the Super DOT execution system can substantially reduce this execution time. In contrast, during the period examined in this study, the best price quotes of NASDAQ stocks were electronically disseminated. For orders of 1000 shares or less, electronic execution on the Small Order Execution System (SOES) was available. Thus, NASDAQ investors could often execute trades more expeditiously, but with little opportunity for price enhancement. These differences in trading mechanisms may also facilitate faster order execution on NASDAQ than on the NYSE/AMEX.

For overnight news, the opening price setting mechanism has a potentially important impact on price adjustment speed. Opening prices on NYSE/AMEX are generally set in a process resembling a call auction. Each specialist examines overnight orders and the limit order book before choosing an opening price. Order imbalances can be offset by a specialists trading for their own accounts or by delaying the opening to allow for offsetting order flow. Stoll and Whaley (1990) demonstrate that the reduced competition enjoyed by specialists at the open increases the noise in NYSE/AMEX opening prices.[5] Price stabilization obligations of specialists can compound this problem by encouraging them to buy stock when the opening price is

[4] NYSE staff members indicate this is unlikely to explain delays as long as even 15 minutes, since the price stabilization obligation can be met by quickly trading down the price in 100 share orders.

far away from the prior close. Finally, NYSE/AMEX limit order investors cannot observe the limit order book, thereby allowing more disparate opinions, which can further slow price adjustments.

In contrast to the NYSE/AMEX, trading on NASDAQ opens with competing dealers posting firm quotes. However, the dealers can post indicative quotes over the two hours prior to the official open. Cao, Ghysels and Hathaway (2000) reports that this pre-opening process conveys significant information to other dealers, thereby aiding price discovery. So the NASDAQ pre-opening process can also increase its price reaction speed to news.

The above discussions point to several differences in institutional features, such as trading rules, dealer obligations, order execution systems, treatment of limit orders, and opening price setting mechanisms, that could cause the price adjustment process to differ between NASDAQ and NYSE/AMEX listed stocks. We investigate the importance of these features in affecting a stock's average price reaction speed to news.

III. Methodology and Data Description

To assess the empirical relevance of cross-exchange differences in price adjustment speeds, we analyze returns in fifteen-minute trading intervals around SEO announcements. We focus on SEO announcements since they tend to be unanticipated, have statistically and economically significant stock price impacts whose average size is comparable to many typical corporate announcements. Further, a high fraction of these announcements have price effects of the same sign, with a reasonably concentrated distribution as documented in Asquith and Mullins (1986) and Masulis and Korwar (1986). Finally, by focusing on one particular type of news announcement, we gain the benefit of analyzing a relatively homogenous information event.

Our analyses focus on the announcement interval, the 12 subsequent fifteen-minute intervals (3 hours) and the 2 prior fifteen-minute intervals.[6] Event interval 0 is defined as the fifteen-minute trading interval containing a daytime SEO announcement

[5] Since many limit orders are only good for the day, the limit order book tends to be thinner at the open reducing competition with the specialist.

[6] Twelve 15-minute pre-announcement intervals are examined, but since they are generally insignificant before interval –2, they are not reported.

or the first fifteen-minute trading interval following an overnight SEO announcement, which includes announcements occurring after 9:30 a.m. but before the actual opening of trading. All other event intervals are identified relative to interval 0. Since NYSE, AMEX and NASDAQ markets are open from 9:30 a.m. to 4:00 p.m. EST, there are 26 fifteen-minute intervals in a normal trading day. The first interval of each trading day ends at 9:45 a.m. and begins at 4:00 p.m. on previous trading day, so it includes the overnight return as well as the return over the first 15 minutes of trading. Returns are treated as missing for all intervals prior to the interval containing the day's first quote.[7]

Since the probability distribution of fifteen-minute returns is unknown, we use a bootstrap resampling technique to test the null hypothesis that the mean return in an event interval is zero. Under the bootstrapping procedure, for each event interval, we randomly select from the benchmark period a return for the same 15-minutes of the trading day. The benchmark period covers event days –30 to -5 relative to the SEO announcement date. The randomly selected returns are then averaged across the sample firms and the procedure is repeated 500 times to generate an empirical distribution. The event interval mean returns are then compared with the empirical distributions to determine their statistical significance.

The sample consists of initial announcements of SEOs completed between January 1990 and December 1992 by NYSE, AMEX and NASDAQ listed firms. The announcement times are obtained from the Dow Jones Text and the LEXIS on-line services. We exclude offerings contaminated by other major firm news releases, such as earnings, dividends, splits, investment or financing decisions, occurring in the announcement period, days 0 and +1. SEO announcements occurring within a month of a listing change from NASDAQ to NYSE/AMEX are excluded to avoid listing effect contamination, which Christie and Huang (1994) show substantially decreases bid-ask spreads when stocks switch from NASDAQ to the NYSE/AMEX. SEO characteristics come from Thomson Financial's SDC 'New Issues' database. We exclude non-underwritten offerings, rights offerings, standby offerings, shelf offerings, non-U.S. issues, offers by non-U.S. issuers, pure secondary offerings and simultaneous

[7] When quotes are unavailable for the opening 15 minute interval, we expand the event interval to include the first half of the next interval. When quotes remain unavailable, the last quote for the first interval with trades or quotes is used and the overnight interval is expanded to include the intervening intervals. Alternatively, when we treat such overnight returns as missing, our basic results remain unchanged. NASDAQ stocks almost always have quotes or prices available in the first interval following the official open, but NYSE/AMEX stocks frequently do not.

offerings of other securities. After these exclusions, the sample consists of 458 NASDAQ offerings and 408 NYSE/AMEX offerings.

Stock transaction prices, quotes and trade information are taken from the Institute for Studies of Security Markets (ISSM) database. We exclude trades reported out-of-sequence and non-BBO eligible quotes. The limited coverage of NASDAQ stocks in the ISSM database, restricts our sample period to January 1990 to December 1992. We require stocks to have transaction data for event days -1 and 0 and for at least 10 days in the benchmark period (i.e., in the 25 trading day period between event days -30 and -5). Our final sample consists of 320 NASDAQ stocks and 253 NYSE/AMEX stocks.

Figure 1

Figure 1 presents the intraday frequency distribution of SEO announcements in each half-hour interval between 7 a.m. and 7 p.m. The frequency of announcements across the business day exhibits a bimodal pattern in both samples. Most firms announce SEOs between 9 a.m. and 11 a.m. or between 4 p.m. and 6 p.m. (after the market close). These findings suggest that firms often purposefully select the timing of their announcements relative to the stock's trading period.

Table 1

IV. Empirical Results

A. Univariate analysis of price reaction speeds and sample characteristics

Table 1 reports the mean returns in the fifteen-minute intervals around SEO announcements. On NASDAQ, mean returns in intervals 0 and +1 are significantly negative, with the absolute return in interval 0 being larger. On the NYSE/AMEX, the mean returns in intervals 0 through 5 are negative and significant, with the means in intervals 0 and 1 being most negative. Comparing returns across exchanges, the NYSE/AMEX has a less negative interval 0 mean than does NASDAQ. Beyond interval 0, returns less than -0.1% are observed only in interval +1 for NASDAQ stocks, while they are observed in most of the intervals +1 through +5 for NYSE/AMEX stocks. In fact, the negative returns on the NYSE/AMEX tend to be twice as large as those on

NASDAQ over intervals +1 through +5. While not reported, the median return indicates that NASDAQ's large negative return in interval 0 is not driven by a small number of outliers. Overall, the above evidence indicates faster price adjustments on NASDAQ. As a robustness check, we measure the price reaction speed by the number of post-announcement intervals needed to realize at least 75% of the 3-hour cumulative return following the SEO announcement. This measure also shows a significantly faster price reaction on NASDAQ.

Table 2

As further corroboration for the above findings, we categorize interval 0 and 1 returns into three states: negative, zero (with or without trading) or positive and then examine how individual stock price changes in interval 1 are related to changes in interval 0. Table 2 shows several interesting patterns. First, if the interval 0 return is negative, then the conditional probability of a negative interval 1 return is nearly twice as large for the NYSE/AMEX relative to the NASDAQ sample. Second, following a positive interval 0 return, the conditional probability of observing a non-positive interval 1 return is more than twice as large for the NYSE/AMEX sample. These patterns are consistent with faster price reactions on NASDAQ.

Table 3

One straightforward explanation for the faster price reaction observed on NASDAQ is the existence of significant differences in sample characteristics across exchange samples. Several prior studies report a lead-lag relation in stocks of different equity capitalization levels. Lo and Mackinlay (1990) find that returns of larger firms tend to lead those of smaller firms based on weekly data. Chan (1993) interprets this as evidence that larger firms react faster to economy-wide information due to greater media coverage and more timely information reporting. Table 3 shows larger equity capitalization for the NYSE/AMEX sample, which suggests that NYSE/AMEX stocks should actually exhibit faster price adjustments to SEO announcements, ceteris paribus.

Chordia and Swaminathan (2000) show that, after controlling for firm size, price reaction speed is positively related to trading activity level. Further, stocks with lower bid-ask spreads offer greater incentives for arbitrage and informed trading, which would raise their average price adjustment speed. Table 3 presents summary statistics for several trading activity and stock liquidity measures (number of trades, quoted bid-ask spreads, effective spreads and relative spreads) in the benchmark period. Average relative spreads and effective spreads are both lower on the NYSE/AMEX, which is consistent with the findings of Christie and Schultz (1994) and Huang and Stoll (1996). The average daily number of trades on NASDAQ is lower, even though trades on NASDAQ are typically double counted by separately reporting executions of buy and offsetting sell orders. In contrast, on the NYSE/AMEX most buy and sell orders are directly crossed and reported as single trades. Everything else the same, we expect the lower spreads and greater trading activity of NYSE/AMEX stocks to lead to faster price reactions in this market relative to NASDAQ.

Studies by Jennings and Stark (1985) and Woodruff and Senchack (1988) document a positive correlation between price reaction speed to earnings announcements and the size of the earnings price reaction. Mech (1993) reports that larger announcement effects are more rapidly incorporated into stock returns. We compare conventional two-day announcement returns (event days 0 and 1) across our exchange samples. These raw returns are taken from the CRSP daily NYSE/AMEX/NASDAQ master files. NASDAQ has a significant –1.75% mean raw return, while the NYSE/AMEX has a significantly larger mean of -2.70%. Analysis of market adjusted returns yields similar conclusions. Combining the prior arguments with the observed announcement effects suggests faster price reactions for NYSE/AMEX stocks.

Since overnight announcements provide more time for investors to evaluate its information content, overnight news should be incorporated into prices more quickly. Thus, the exchange sample with a larger proportion of overnight announcements is likely to show a faster reaction speed. We find that overnight announcements represent 35% of the NASDAQ sample and 43% of the NYSE/AMEX sample, which again suggests a faster price reaction on NYSE/AMEX.

Although all the above issuer and announcement characteristics suggest a faster price reaction on the NYSE/AMEX, our results show just the opposite. To better

understand what is causing this result, we sort our sample into overnight and daytime announcements and repeat the earlier analysis. Issuer and announcement characteristics for each exchange are statistically indistinguishable across daytime and overnight samples. Further, differences in two day mean returns found in the full sample are observed in both the overnight and daytime announcement samples. Specifically, the mean daytime and overnight announcement returns are –1.71% and –1.80% for NASDAQ and –2.77% and –2.61% for the NYSE/AMEX.

Table 4

Table 4 separately presents mean returns over 15-minute intervals for overnight and daytime announcements. Table 4, Panel A shows NASDAQ daytime announcement returns are significantly negative in intervals 0 and +1, with interval 0 representing 87% of the two-day announcement return. NYSE/AMEX daytime returns are significantly negative in intervals 0 through +2. The interval 0 mean (median) return is -1.01% (-.27%), and accounts for only 36% of the two-day announcement return. The interval 0 mean return for the NYSE/AMEX is also substantially smaller in size than that for NASDAQ. This result is reversed in interval +1, where the NYSE/AMEX return is larger in size than that on NASDAQ. Over intervals +2 through +5, the NYSE/AMEX mean returns are significantly negative in all but one interval, while they are approximately zero for NASDAQ. This suggests that stock prices on the NYSE/AMEX take as much as an hour longer to fully reflect SEO announcements.

There is also some evidence in this panel suggesting inside information leaks or broadcast delays of corporate press releases. Mean returns in interval -1 and –2 are negative for both NYSE/AMEX and NASDAQ stocks, though much smaller in magnitude than in interval 0 or +1. The interval –2 mean return is statistically significant for NASDAQ. To investigate whether the information leakage or broadcast delay can explain the differences in speed of price adjustment in the two samples, we study the mean returns for the 2 hours prior to event interval 0. We find very similar mean returns across the two samples, suggesting that a pre-announcement leakage effect or a broadcast delay are unlikely explanations for the NYSE/AMEX's slower price reaction.

Table 4, Panel B presents overnight SEO announcements returns. For NASDAQ stocks, the mean return in interval 0 is -1.60%, but positive in interval +1.

The mean returns in intervals +2 through +5 are all negative, with intervals +4 and +5 being statistically significant. This suggests some delay in the price adjustment process on NASDAQ to overnight news. For the NYSE/AMEX, the mean return in interval 0 is a less striking, but significant -0.92%. Mean returns are also negative in intervals +1 through +6 and statistically significant in half of these intervals. So compared to its two day announcement return, NASDAQ has faster price reaction to SEO overnight announcements as well.

The prior evidence indicates that NASDAQ stocks react faster to both daytime and overnight SEO announcements. The apparently slower NYSE/AMEX price reaction is somewhat surprising since the differences in stock characteristics predict the opposite. Moreover, our procedures are biased against finding a faster price reaction for NASDAQ stocks. When daytime announcements occur after the official open, but before the actual start of trading, we treat them as having occurred overnight. This trading delay, which occurs almost exclusively on the NYSE/AMEX. Thus, our procedure causes the NYSE/AMEX interval 0 return to appear to capture more of the overall two-day return than it actually does. Also, Porter and Weaver (1998) find that over our time period large price movements on NASDAQ are not always reported in a timely manner, while Schultz (2000) documents that in very active periods, NASDAQ trade reporting is delayed by several minutes. These two reporting problems can also slow the observed price reaction speed of NASDAQ stocks. In the following sub-section, we examine the role of market structure in explaining the faster price reaction of NASDAQ stocks.

B. Market Microstructure Influences on the Price Adjustment Process

One potential explanation for the slower NYSE/AMEX price adjustment to overnight announcements is a less efficient opening price setting mechanism. Consistent with this hypothesis, Francis, Pagach and Stephan (1992) find that overnight earnings announcements by NYSE listed stocks are not fully reflected in their opening prices. Madhavan and Panchapagesan (2000) document that the opening prices on NYSE/AMEX are often set close to the prior closing prices as a result of the specialist's price continuity obligation. Amihud and Mendelson (1987) and Stoll and Whaley (1990) find that NYSE opening prices exhibit much greater volatility than closing prices. In contrast, Chan, Christie and Schultz (1995) report that opening price

discovery on NASDAQ appears to occur within the first 5 minutes. These studies indicate that the opening price setting mechanism allows NASDAQ stocks to capitalize overnight SEO announcements faster.

To further assess the efficiency of opening price setting mechanisms, we calculate overnight stock returns measured from the close of day –1 to the opening price on day 0. However, this does not tell the full story since NASDAQ dealers are allowed to post quotes before the official open, which allows competing dealers to communicate information on overnight order flow with each other before trading starts. To examine this last issue, we split each NASDAQ overnight return into a return from the close of day –1 to the first quote on day 0 and a pre-opening return measured from the first quote to the official open on day 0.

Table 5

From Table 5, we see that NYSE/AMEX prices react to overnight SEO announcements primarily during the trading day rather than at the open. In marked contrast, the price reaction to NASDAQ overnight announcements is concentrated between the first quote and the official open of day 0, with an insignificant return over the remainder of the trading day. This suggests that one explanation for the faster price adjustment speed on NASDAQ is its more efficient opening price setting mechanism. However, this is not the full explanation since NYSE/AMEX daytime announcements also exhibit slower price adjustments.

Trading halts can affect price adjustment speeds across exchanges when the frequency or duration of trading halts in the two samples is dissimilar. This is a distinct possibility since exchange rules sanctioning trading halts are different. Specifically, NYSE/AMEX rules allow a specialist to request a trading halt when an unusually large order flow imbalance occurs or when pending or actual news releases are likely to have a substantial price impact. In contrast, trading halts on NASDAQ are allowed only for pending or actual news announcements and not for order imbalances.

We investigate the importance of trading halts by first calculating the fraction of stocks with halts on event day 0 across our samples. Then, we examine the effects on event interval returns of eliminating trading halt delays to assess the importance of these rule variations. NYSE/AMEX trading halts occur in 21% of daytime SEO

announcements and in 3% of overnight announcements. In contrast, NASDAQ trading halts occur in only 2.4% of daytime SEO announcements and in 1.8% of overnight announcements.[8] On average, SEO related trading halts last just over one hour.

To eliminate trading halt effects, we redefine interval 0 to be the first 15 minute interval with trading following an SEO announcement. Reexamining daytime announcements, we find interval 0 returns change negligibly for both markets. More specifically, the trading halt adjustment lowers interval 0 return from -1.49% to –1.58% for NASDAQ and from –1.01% to –1.06% for the NYSE/AMEX. Thus, trading delays do slow the NYSE/AMEX price reaction speed to news, but this does not cause NASDAQ to capitalize news into stock prices faster.

We next investigate whether the stock return patterns uncovered previously are related to structural differences across the markets. Requiring the routing of NYSE/AMEX orders to the specialist's post for manual execution and possible price improvement by floor traders, introduces a potential delay in order execution and thus, in price adjustment. The uptick rule can also slow price response on the NYSE/AMEX to corporate news releases, especially negative news by preventing information traders from short selling stock to hit overpriced (stale) limit orders (to buy) following an SEO announcement. In contrast, traders on NASDAQ can rapidly execute trades of 1000 shares or less on SOES and are not constrained by an uptick rule over this period. Since order execution speed and opportunities for informed trading can affect price adjustment speeds, we start by examining abnormal number of trades, the proportion of 1000-share trades and relative bid-ask spreads around SEO announcements.

We define the abnormal number of trades for an event interval i as:

$$\text{(1)} \qquad \text{Abnormal number of trades}_i = \frac{K_i - ATRD_i}{DTRD}$$

where K_i is the number of trades in event interval i and $ATRD_i$ is the average number of trades in interval i for the benchmark period. DTRD is the *daily* average number of trades over the benchmark period, which consists of event days –30 to -5, relative to the SEO announcement date. Changes in proportion of 1000 share trades and the

[8] ISSM codes indicate that no trading halts occur around SEO announcements for NASDAQ stocks. Seven NASDAQ stocks exhibit sequences of bid and ask quotes with zero values around SEO announcements. Conversations with NASDAQ officials indicate that these are almost certainly trading halts and we treat them as such.

proportion of trades occurring at the bid relative to all trades in the event interval are also examined in a similar fashion. Finally, abnormal bid-ask spread is defined as:

$$\text{(2)} \qquad \text{Abnormal spread}_i = \frac{\sum_{j=1}^{J_i}(QSPRD_{ij} - ASPRD_i)T_{ij}}{DSPRD}$$

where $QSPRD_{ij}$ is the relative bid-ask spread (i.e., quoted bid-ask spread divided by the quote midpoint) for the jth quote in interval i (j=1..J), and T_{ij} is the proportion of interval i for which the jth quote is valid. $ASPRD_i$ is the time-weighted average relative spread from interval i of the benchmark period and DSPRD is the benchmark period *daily* average spread.[9] For each trading day, we define the time-weighted spread as the weighted average spread, where the weight is the proportion of the trading day the quote is valid. We evaluate the significance of these abnormal variables with bootstrap procedures similar to those used in the analysis of 15-minute returns. We also examined the number of shares traded and the relative effective spreads (defined as execution price minus prevailing bid-ask spreads divided by the bid-ask midpoint). They yield similar results to those based on number of trades and relative quoted spreads, respectively.

Figure 2

As Figure 2 shows, the mean abnormal number of trades in interval 0 is greater on NASDAQ than on the NYSE/AMEX for both daytime and overnight announcements. Subsequent trading falls faster on NASDAQ than on the NYSE/AMEX. This evidence indicates NASDAQ traders respond faster to news. It also supports the importance of greater information-based trading on NASDAQ in explaining faster price reactions on NASDAQ as discussed below.

Differences in exchange rules defining market maker quote responsibilities, particularly regarding minimum quote depth, combined with distinct order execution systems can affect information-based trading and, consequently, the price adjustment process. On NASDAQ, all dealer quotes are guaranteed for a minimum of a 1000 shares, which generally allows informed traders to execute larger trades at known

prices on NASDAQ than on the NYSE/AMEX. Also, with the introduction of the SOES, informed traders can execute their orders rapidly to take advantage of dealers who are slow to revise their quotes. According to Harris and Schultz (1997) informed traders on NASDAQ rely on SOES for their trade execution. Under NASDAQ rules, a dealer must accept five 1000 share trades over SOES before there is an automatic pause to allow the dealer to revise his or her quotes. Consistent with the above arguments, Battalio, Hatch and Jennings (1997) report evidence that SOES trading significantly increases the price reaction speed of NASDAQ stocks.

If SOES trading is important in the price adjustment process, then we expect the proportion of 1000 share trades to total trades to rise on NASDAQ in the intervals immediately after a SEO announcement, with an associated large price impact over this same time period. To test this proposition, we examine the abnormal proportion of 1000 share trades, defined similarly to the abnormal number of trades in equation (1), in 15 minute event intervals around the announcement. For NYSE/AMEX stocks, this variable acts as a proxy for information traders who cannot use electronic execution or rely on a guaranteed 1000 share quote depth. By taking proportions, we control for a positive correlation between the number of trades and equity capitalization, which is higher on the NYSE/AMEX.

Table 6

Table 6 shows a significant rise in the proportion of 1000 share trades on NASDAQ in interval 0. For daytime announcements, the first four 15 minute intervals following SEO announcements are significantly positive. The largest rise in 1000 share trades is in interval 0 and it slowly diminishes thereafter. The NYSE/AMEX also has a significant rise in 1000 share trades in intervals 0 and 1. For overnight announcements, the pattern is similar for NASDAQ, but the size is smaller and only intervals 0 and 1 are significant. There is no significant rise in NYSE/AMEX 1000 share trades, except in interval –1. This evidence is consistent with overnight news giving investors and market makers more time to learn about and assess the import of SEO announcements. This

[9] Scaling abnormal spread by $ASPRD_i$ and abnormal number of trades by $ATRD_i$ yields qualitatively identical results.

trading pattern appears to bear out the importance of SOES bandits and the more rapid information-based trading on NASDAQ.

Another possible reason for a slower response in NYSE/AMEX prices is slow updating of the limit order book following major news releases. Once an SEO is announced, with its typical negative price reaction, investors have incentives to cancel their old limit orders to buy stock (i.e., bids). Likewise, information traders have incentives to hit these limit orders if they own the stock or can short sell it quickly and cheaply. No such incentives exist with respect to limit orders to sell (ask). Until new limit orders arrive, the asymmetric response of limit order investors and information traders implies a widening bid-ask spread. Also, the SEO can temporarily raise adverse selection for liquidity providers, which can inhibit the arrival of new limit orders and discourage specialists from stepping in front of limit orders with more aggressive quotes. Thus, stale limit orders immediately after SEO announcements can result in: (1) prices exhibiting a slow decline as the highest limit orders to buy are sequentially hit or replaced, (2) widening bid-ask spreads and (3) an increasing proportion of trades occurring at the bid.

We saw several strands of evidence earlier in Table 2, where we examine the frequency of return signs in interval 1 conditional on their signs in interval 0, which support the importance of stale limit orders. First, the frequency of negative returns in both intervals 0 and 1 is twice as large for the NYSE/AMEX sample. Second, the frequency of a positive return in interval 0 followed by a negative return or no trade in interval 1 is more than twice as large for the NYSE/AMEX compared to NASDAQ. This evidence suggests that NYSE/AMEX stock prices do not immediately reflect the full import of SEO announcements.

Figure 3

Figure 3 presents mean abnormal spreads for 25 fifteen-minute intervals centered on a SEO news release. This figure shows that abnormal spreads following SEO announcements are significantly greater for the NYSE/AMEX than for NASDAQ. For NYSE/AMEX daytime announcements, abnormal spreads are significantly positive for intervals 0 through +3, which suggests that it takes about an hour for the limit order book to be fully updated. In sharp contrast, the mean abnormal spread following

daytime announcements for NASDAQ stocks is negligible. For overnight news events, NASDAQ exhibits a small positive, though not statistically significant, abnormal spread that persists out to interval 12, while the NYSE/AMEX exhibits a significantly positive abnormal spread in intervals 0 to +7, based on bootstrap procedures and drops quickly thereafter. These findings are consistent with the existence of stale limit orders or an inefficient opening mechanism on NYSE/AMEX and suggest that it takes an average of two hours following an overnight announcement for the limit order book to be fully updated.

To ensure that our results are not driven by cross-exchange differences in the scaling variable (DSPRD), we placed all firms (both NASDAQ and NYSE/AMEX) into two groups based on the median level of DSPRD. We find that the abnormal spreads following an announcement are lower for the NASDAQ stocks relative to both groups of NYSE/AMEX stocks, indicating that cross-exchange differences in DSPRD do not drive the results. We also reach similar conclusion for the abnormal number of trades presented in Figure 2.

Table 7

If NYSE/AMEX limit orders are stale immediately after SEO announcements, then we should observe stocks trading more frequently at the bid (buy) for several subsequent 15 minute intervals. Table 7 presents mean abnormal trades at the bid, which are defined similarly to the abnormal number of trades. For daytime announcements, trades at the bid rise significantly on the NYSE/AMEX over intervals 0 through 5. In contrast, daytime announcements on NASDAQ show a much smaller rise in abnormal trades at the bid and only after a delay of 45 minutes. This is consistent with stale limit orders being a factor in the slow NYSE/AMEX price response to daytime announcements. Not surprisingly, following overnight announcements, when there is more time to place new limit orders and cancel old ones, neither sample exhibits any significant patterns. In summary, after daytime news events, trading closer to the bid is observed. Overall, the evidence in Table 7 and Figure 3 as well as Table 2 is consistent with the stale limit orders partially explaining the slower price reaction speeds of NYSE/AMEX listed stocks following daytime SEO announcements.

Dutta and Madhavan (1995) argue that price continuity obligations of a specialist slow a stock's price adjustment speed. This could potentially explain the slower price reaction on NYSE/AMEX, particularly if there is a relatively high specialist participation in the NYSE/AMEX sample's trading. To assess this possibility, we split the NYSE/AMEX sample in halves based on specialists participation in a stock's trading. Following Madhavan and Sofianos (1998) we use firm characteristics such as trading volume, market capitalization and bid-ask spreads to proxy for the specialist participation. The quicker price reactions on NASDAQ continue to be observed even when these firms are compared only against NYSE/AMEX samples with lower predicted specialist participation, suggesting that the price continuity obligation can not be the dominant explanation for NASDAQ's speed advantage.

C. Multivariate Tests of Differences in Price Adjustment Speeds across Markets

Our earlier analysis uncovers evidence supporting a number of market microstructure features, which help explain differences in price reaction speeds to firm-specific news across exchanges. However, given that these features can be correlated, this evidence is not strong test of the marginal explanatory power of market microstructure characteristics examined earlier. In this section, we use a multivariate framework to investigate the power of these market microstructure characteristics to explain cross sectional differences in price reaction speeds to SEOs.

Our dependent variable is price adjustment speed (SPD_{it}), defined as an individual stock's return over the first 15 minutes (interval 0) relative to its return over the first three-hours following an SEO announcement. This variable captures the price reaction immediately following an SEO announcement relative to the approximate full impact of the announcement. Stocks that react faster to announcements should generally have a larger fraction of their total announcement effect concentrated in interval 0. The three-hour return is chosen because it captures the full SEO announcement effect for a majority of stocks, while minimizing the effects of industry and market effects as well as idiosyncratic noise, which all increase with the length of the return interval. Figure 4 plots the cumulative return across 15 minute intervals. We see the two day announcement effect for a typical stock is captured in the first three hours (intervals 0 to 11) following the news release.

Figure 4

We use the following explanatory variables to capture key aspects of the market microstructure environment: abnormal proportion of 1000 share trades (MSHRTRD), abnormal bid-ask spreads (ABNSPRD) and the abnormal number of shares traded (ABNTRD). Each variable is multiplied by an exchange listing indicator to allow for differing impacts across exchanges. We include offer size (OFFSIZE), measured by the percentage change in shares, as a control variable for the economic impact of the SEO announcement. We also examine the explanatory power of several additional regressors including: equity capitalization, number of NASDAQ dealers, a trading halt indicator and the proportion of prices at the bid. These variables had statistically insignificant coefficients.

The qualitative predictions of our explanatory variables follow. The frequency of 1000 share trades (MSHRTRD) is used to capture the influence of information motivated trading. If information trades increase the price adjustment speeds for NASDAQ stocks, then a positive coefficient on this variable is predicted. However, no strong relation between information motivated trading and proportion of 1000 share orders is expected for NYSE/AMEX stocks.

The abnormal relative spread can proxy for the effects of either stale limit orders on the NYSE/AMEX or increased adverse selection borne by market makers in both exchange environments. If the effect of stale limit orders is important, then we expect a positive coefficient on abnormal spreads for NYSE/AMEX stocks. We expect a positive coefficient for abnormal number of trades for both exchange samples, since a change in order flow, which reflects information motivated trading, should directly affect the price adjustment speed. Finally, offer size controls for the adverse selection effect of an SEO. Krasker (1986) shows that larger sized SEOs (as a percent of outstanding shares) have more negative price reactions due to greater adverse selection. We also expect a positive coefficient on offer size since price reaction speed is positively correlated with magnitude of the price reaction. To summarize, our price adjustment speed model is:

(3) $SPD_{it} = \alpha_0 + \alpha_1 MSHRTRD*NASD + \alpha_2 MSHRTRD*NYAM + \alpha_3 ABNSPRD*NASD$

$$+ \alpha_4 \text{ ABNSPRD *NYAM} + \alpha_5 \text{ ABNTRD*NASD} + \alpha_6 \text{ ABNTRD*NYAM}$$
$$+ \alpha_7 \text{ OFFSIZE} + \varepsilon_i$$

where all the variables are explicitly defined in Table 8. We estimate the model jointly for NYSE/AMEX and NASDAQ stocks, but separately for overnight and daytime SEO announcements.

A potential problem with our price adjustment speed measure, SPD_{it}, is that when the three-hour returns are close to zero, this scaled variable can be large even though the interval 0 return is small. These are economically misleading observations, which can be highly influential in a regression context. Such announcements could be anticipated by investors, have minimal economic impacts or are associated with incorrect dates or times. To preclude such unreliable observations from having an undue influence on our analysis, three-hour returns of less than 0.5% in absolute value are deleted. Our results are robust to excluding observations where the absolute value of three-hour return is less than 0.25% as well as to excluding observations with returns greater than –0.5%. To further assess the sensitivity of our results to outliers, we also report regression estimates that use the rank of SPD_{it} as the dependent variable.

Table 8

Panel A of Table 8 reports OLS regressions of SPD_{it} and the rank of SPD_{it} for SEO daytime announcements. *t*-statistics are based on White heteroscedasticity consistent standard errors. Examining the first regression of SPD_{it}, we find that a number of explanatory variables are statistically significant and qualitatively consistent with the earlier analyses. MSHRTRD is positive and significant for NASDAQ stocks, indicating that informed trading on the SOES system is an important influence on a stock's price reaction speed. ABNSPRD is positive and significant for NYSE/AMEX stocks, which is consistent with stale limit orders slowing the price adjustment process. Further, ABNTRD is positive and significant for both NASDAQ and NYSE/AMEX, which shows that heightened trading activity increases a stock's price reaction speed. Finally, OFFSIZE is not significant in any of the regressions. Qualitatively identical results are found for regressions of the rank of SPD_{it}.

For overnight announcements, the price reaction speed regressions reveal that abnormal spread on NYSE/AMEX is the only statistically significant variable. This is not surprising since investors typically have a lot of time to assess the economic impact of any news released before the start of trading. Given this additional time to evaluate news, we expect that the overnight and opening order flow will cause opening prices to more fully reflect the information content in news releases, especially given the efficiency of the NASDAQ opening pricing mechanism. We do not tabulate these results to conserve space.

To further evaluate the robustness of our daytime speed of adjustment regressions, we re-estimate our results using announcements by industrial issuers only. Two-day announcement returns of financial and utility issuers are less negative than those of industrials (see Masulis and Korwar (1986), Asquith and Mullins (1986) and Polonchek, Slovin and Sushka (1989)). While the fraction of financial firms with daytime and overnight announcements in the exchange samples are comparable, the fraction of utilities in the NYSE/AMEX daytime (overnight) sample represents 24% (14%), while the fraction of utilities in the NASDAQ daytime (overnight) sample is 5% (2%). We also reduce our larger NASDAQ sample by matching each NYSE/AMEX event with a NASDAQ event having a two-day announcement return most closely matching it. In this way, we create matched samples of similar two-day announcement returns across the two market environments. The objective of this procedure is to ensure that differences in mean two-day announcement returns and the proportions of utilities and financial issuers in the two samples do not impact our conclusions.

The results of matching two-day announcement returns are presented in Panel B of Table 8. We find the qualitative results in Table 8 Panel A are robust to these modifications of the dataset. Specifically, we find for daytime announcements that NASDAQ 1000 share trades continue to have a positive effect on speed as predicted, though it is not significant when the abnormal number of trades is included in the regression. The lack of significance may reflect the smaller sample size used in these regressions. We also observe that the NYSE/AMEX abnormal spread has a significantly negative coefficient indicating the continued importance of stale limit orders. Finally, the abnormal number of trades continues to be positive and significant for both exchange samples, while offer size remains statistically insignificant.

V. Out of Sample Analysis

In this section we examine the consistency of our earlier results to a later sample period. This is particularly important given that a number of regulatory and structural changes occur in the intervening years for both markets. To examine whether our findings continue to hold following these regulatory changes, we repeat our analysis for SEO announcements made between January 1998 and December 2000. Since there are only 45 NYSE/AMEX daytime announcements made in this period, we extend the NYSE/AMEX sample period back to January 1995. This increases the NYSE/AMEX daytime announcements by 30 observations. This longer sample period encompasses the July 1997 drop in the NYSE minimum tick size from 1/8th to 1/16th, which could influence our results. However, when we restrict the NYSE/AMEX sample to January 1998 to December 2000, our results are qualitatively unchanged. Our final sample consists of 115 (461) NASDAQ daytime (overnight) announcements from 1998-2000 and 75 (215) NYSE/AMEX daytime (overnight) announcements. The limited number of NYSE/AMEX daytime announcements in the sample precludes us from fully replicating the earlier analysis due to power considerations.

We begin the 1995-2000 analysis by examining SEO two-day announcement returns. Daytime and overnight mean returns are –1.45 and –2.59 for NASDAQ and –1.70 and –1.45 for NYSE/AMEX stocks respectively. Our primary focus is again on daytime announcements. As in the prior sample period, the daytime returns on NASDAQ are less negative than on the NYSE/AMEX. Thus, everything else the same, large announcement effects should be more rapidly incorporated into prices. Again the other stock characteristics of the NASDAQ and NYSE/AMEX samples are similar to the prior observation period. These differences in offer and firm characteristics should again a give the NYSE/AMEX a price reaction speed advantage.

Table 9

Table 9 replicates the earlier analysis presented in Table 4 for the more recent sample period. We see that NASDAQ price reactions are concentrated in the first 15-minute event interval following an SEO announcement, while the NYSE/AMEX price reaction is stronger in the second 15-minute interval. The percentage of negative returns in these event intervals mirrors the mean returns evidence, and indicates that

outliers are not driving the differences in mean returns.[10] Thus, we find consistency with our earlier conclusions that NASDAQ more rapidly processes information into stock prices. However, the timing advantage of NASDAQ appears to have lessened in the 1995-2000 period. Both samples also show some evidence of a broadcast delay or information leakage prior to the SEO announcement, with NASDAQ showing a stronger effect. One might worry that a large leakage effect could give NASDAQ an apparent speed advantage. However, when we examine the mean returns over the 2 hours prior to event interval 0, we find very similar means in the two exchange samples. This evidence suggests that pre-announcement news leakages and broadcast delays are unlikely explanations for the NYSE/AMEX's slower price reaction.

For overnight announcements, we need to take into account NASDAQ's larger two day announcement effect. However, if we compare the relative portion of the two day effect that is captured in event intervals 0 and 1, we again see that NASDAQ has a larger proportion of the announcement effect is in interval 0, while the NYSE/AMEX is larger in interval 1. This result is reinforced by the NYSE/AMEX's lower percentage of negative returns in interval 0. This is particularly noteworthy since there is no evidence of an information leakage effect in either overnight sample. Overall, the two observation periods produce consistent evidence of an information processing advantage for NASDAQ, which has persisted for over 10 years, although NASDAQ's speed advantage appears to have narrowed.

Table 10

Examining the abnormal proportion of 1000 share trades following daytime announcements, we see from Table 10 that intervals 0 and 1 are positive and significant (i.e. .57 and .66 respectively) for NASDAQ stocks, but are insignificant for the NYSE/AMEX sample. This reinforces our earlier evidence that SOES trading improves price reaction speed on NASDAQ. Since overnight announcements do not offer information traders a similar level of expected profits as daytime announcements, it isn't surprising that there is little evidence on NASDAQ of a rise in 1000 share trades in this sample. However, the NYSE/AMEX sample reveals evidence of a rise in these

[10] Over 90% of the 3-hour return following the SEO announcement occurs in interval 0 for NASDAQ stocks, while the corresponding figure for NYSE/AMEX stocks is only about 57%.

trades over intervals 1 through 3. Examining the overall number of abnormal trades shown in Figure 5 for the two samples, we again see a much more dramatic rise in NASDAQ trading in interval 0 and a much more rapid rate of decay afterwards. This is consistent with NASDAQ traders more rapidly reacting to information.

Figure 5

Figure 6

Figure 6 presents abnormal changes in bid-ask spreads. It shows that NASDAQ market makers more quickly raise spreads after daytime announcements and maintain them for longer than do NYSE/AMEX specialists. There is also evidence that some NASDAQ spreads begin rising 15 minutes ahead of the announcement. For overnight announcements, the pattern is very different. Both samples exhibit an immediate increase in event interval 0, but the NYSE/AMEX sample has a larger reaction and maintains higher spreads for two hours, while NASDAQ maintains higher spreads for only 30 minutes.

Examining the frequency of trades exactly at the bid, we find some evidence that these trades rise on the NYSE/AMEX in the first two 15 minute intervals following a SEO daytime announcement. However, there is also evidence of a rise on NASDAQ in intervals –1, 1 and 2, but not interval 0. Thus, the evidence of a stale limit order effect is weaker over the 1995-2000 period. Given the relatively small number of daytime SEO announcements in the NYSE/AMEX sample, it is not unexpected that significance of the estimates is illusive, though the signs of the marginal effects are consistent with the regression estimates for the earlier period. Overall, we find that the qualitative results we document in the 1990-92 period remain observable in the 1995-2000 period.

The significant mean return of –0.66% in interval +1 on NYSE/AMEX, raises the question of whether this represents an arbitrage opportunity. This is unlikely for at least two reasons. First, the slower price response on NYSE/AMEX reflects the institutional features, such as uptick rule, that prevents traders from taking advantage of stale limit orders. Secondly, commission fees to a broker together with implicit trading costs (associated with bid-ask spreads, price impacts and opportunity costs) range from 0.4% to over 2% for a one-way transaction (see Keim and Madhavan

(1997) and Stoll (1995)), which would make trading strategies that take advantage of the slower price response, unprofitable after transactions costs.

VI. Summary and Conclusions

This study compares the speed of NASDAQ and NYSE/AMEX price adjustments to seasoned equity offering announcements. Our analysis uncovers several interesting findings. First, NASDAQ stock prices react faster to seasoned stock offering announcements than do NYSE/AMEX stocks. Second, NYSE/AMEX stocks have higher equity capitalization, lower spreads, greater trading activity and larger mean two day announcement returns which existing market microstructure theories predict would favor faster price reactions by NYSE/AMEX stocks. Controlling for these sample differences strengthens the evidence of a NASDAQ speed advantage. Our results also suggest that differences in market structures can significantly accelerate or retard the incorporation of news into market prices.

Further analysis indicates that several structural differences across the markets have important impacts on the price adjustment process. NASDAQ's faster price reaction speed is related to its dealers bearing greater risk under the SOES electronic order system and the existence of stale limit orders on the NYSE/AMEX after major news events, which is reinforced by its price continuity and up-tick rules. In addition, we find that the NYSE/AMEX call auction process used to set opening prices is less efficient in processing overnight news than is NASDAQ opening price discovery mechanism, where competing dealers display indicative quotes prior to the market's opening. Evidence that the opening price mechanism on the NYSE/AMEX is less efficient is based on the findings that, following overnight announcements of seasoned equity offers, NYSE/AMEX stock prices on average fall at the open and continue to fall over the next one to two hours. In contrast, NASDAQ stock prices fall more dramatically at the open, and then show little tendency to fall further over the trading day. We extend our analysis to the 1995-2000 period and find that our qualitative conclusions continue to hold.

It is noteworthy that all the causes we uncover for NASDAQ's superior price adjustment speed are due to differences in market structure, not to differences in stock characteristics over the samples. Since our analyses focus on SEO announcements, it

would be useful for future researchers to explore the generality of these results to other news events.

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TABLE 1

Event interval returns around 1990-92 seasoned equity offering announcements on NASDAQ and NYSE/AMEX

	NASDAQ						NYSE – AMEX					
Event Interval	*Mean return (%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**	*Mean return (%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**
-2	-.11	.00		11	82	.11	-.03	.43		27	56	.04
-1	-.12	.06		14	79	.00	-.01	.89		22	56	.92
0	-1.53	.00	-1.53	63	29	.00	-.98	.00	-.98	58	29	.00
1	-.30	.00	-1.83	29	53	.01	-.53	.00	-1.51	43	40	.00
2	-.04	.11	-1.87	15	68	.69	-.26	.00	-1.77	33	46	.02
3	-.06	.07	-1.93	13	74	1.00	-.09	.05	-1.86	28	51	.12
4	-.08	.05	-2.01	14	77	.05	-.18	.00	-2.04	30	50	.02
5	-.06	.04	-2.07	10	81	.80	-.12	.01	-2.16	28	51	.15
6	.09	.00	-1.98	8	81	.16	.01	.81	-2.15	25	54	.58
7	-.06	.12	-2.04	8	86	.65	.00	.96	-2.15	25	51	.72
8	-.03	.42	-2.07	9	83	1.00	-.04	.33	-2.19	19	61	.92
9	-.03	.30	-2.10	10	82	.43	-.01	.82	-2.20	23	57	.70
10	-.03	.37	-2.13	7	88	.52	.00	.93	-2.20	25	56	.22
11	.02	.47	-2.11	5	86	.17	.00	.92	-2.20	26	55	.19
12	.01	.66	-2.10	8	84	.78	.01	.75	-2.19	18	62	.68

* p-values test whether the proportion of non-zero values that are positive is significantly different from 0.5.

The table reports common stock returns over fifteen-minute trading intervals around seasoned equity offering announcements, separated into NASDAQ and NYSE/AMEX samples. The sample consists of 253 announcements by NYSE/AMEX firms and 320 announcements by NASDAQ firms, made between January 1990 and December 1992. The returns are based on the midpoints of the best bid and ask quotes at the end of each 15 minute trading interval. The p-values for mean returns are based on bootstrap probabilities testing the null hypothesis that the mean return is not different from zero. The bootstrap p-values are derived from a comparison of mean returns in the event interval with an empirical distribution of mean returns (based on 500 samples) generated from the corresponding trading intervals in the benchmark period.

TABLE 2

Frequencies of negative, zero and positive returns in 15 minute event intervals 0 and 1

Panel A: NASDAQ Announcements

		Return sign in Interval 1				
	% of Total / *% of Row*	*Nega-tive*	*Zero (No trades)*	*Zero (Trades)*	*Posi-tive*	*TOTAL (No. of obs.)*
Return Sign in Interval 0	*Negative*	18.7	9.8	20.3	15.5	64.2
		29.1	15.3	31.5	24.1	(203)
	Zero	2.9	7.9	1.9	0.0	12.7
	(No trades)	22.5	62.5	15.0	0.0	(40)
	Zero	6.3	3.8	4.8	0.3	15.2
	(Trades)	41.7	25.0	31.3	2.1	(48)
	Positive	2.5	1.0	2.2	2.22	7.9
		32.0	12.0	28.0	28.0	(25)
	TOTAL	30.4	22.5	29.1	18.0	100.0
	(No. of obs.)	(96)	(71)	(92)	(57)	(316)

Panel B: NYSE/AMEX Announcements

		Return sign in Interval 1				
	% of Total / *% of Row*	*Nega-tive*	*Zero (No trades)*		*Posi-tive*	*TOTAL (No. of obs.)*
Return Sign in Interval 0	*Negative*	31.5	8.6	9.5	13.4	62.9
		50.0	13.7	15.1	21.2	(146)
	Zero	4.7	5.6	0.9	0.4	11.6
	(No trades)	40.7	48.2	7.4	3.7	(27)
	Zero	5.6	1.7	2.2	2.2	11.6
	(Trades)	48.2	14.8	18.5	18.5	(27)
	Positive	6.5	3.9	0.9	2.6	13.8
		46.9	28.1	6.3	18.8	(32)
	TOTAL	48.3	19.8	13.4	18.5	100.0
	(No. of obs.)	(112)	(46)	(31)	(43)	(232)

Seasoned equity offering announcement returns are classified by sign as negative, zero (with no trading or with trading) or positive. The table reports the frequencies of signed returns in interval 1, conditional on the signed return in interval 0. The sample consists of 253 announcements on NYSE/AMEX and 320 announcements on NASDAQ, made between January 1990 and December 1992.

TABLE 3

Issuer and issue characteristics of firms completing seasoned equity offerings between 1990 and 1992

	NASDAQ			NYSE/AMEX			*t-statistic of diff in means*
	Mean	*Median*	*Std. dev.*	*Mean*	*Median*	*Std. dev.*	
Change in shares outstanding (%)	22.90	19.75	-14.06	18.26	13.93	-14.30	-4.00
Offer price ($)	18.65	16.25	-9.72	23.30	21.13	-15.36	5.30
Offer amount ($ million)	35.26	28.05	-27.18	79.03	50.80	-105.31	8.17
Gross underwriter spread ($ per share)	0.97	0.90	-0.41	0.94	0.91	-0.40	-0.57
Underwriter spread (% of offer price)	5.56	5.50	-1.13	4.59	4.52	-1.32	-10.95
Pre-offer market value of equity ($ million)	237.24	131.22	-318.35	1596.36	381.39	-4698.60	5.04
Quoted bid-ask spread (cents)	53.18	50.02	30.67	27.89	28.54	9.29	-13.98
Effective bid-ask spread (cents)	43.31	40.10	24.85	23.07	16.87	57.47	-5.23
Relative bid-ask spread (%)	3.34	2.70	2.58	1.56	1.34	0.95	-11.45
Share volume (100's of shares)	816.30	466.52	1190.73	969.66	381.50	1451.54	1.36
Number of trades	50.12	27.66	64.68	59.22	33.95	73.61	1.55

The table reports descriptive statistics of NASDAQ and NYSE/AMEX firms that announced seasoned equity offerings (SEO) during the period January 1990 to December 1992. The sample consists of 253 offering announcements on NYSE/AMEX and 320 announcements on NASDAQ. The summary statistics for the liquidity measures are computed from a benchmark period consisting of event days –30 to –5 relative to the SEO announcement date. Share volume and number of trades are the daily number of shares traded and daily number of trades, respectively. Relative spread is defined as the quoted bid-ask spread divided by the bid-ask midpoint. The effective spread is the difference between the execution price and the prevailing bid-ask quote midpoint. The spread measures are time weighted for the length of time each pair of quotes is outstanding within the day. The t-statistics for the differences in means are based on White's heteroscedasticity robust standard errors.

TABLE 4

15 minute event interval returns around 1990-92 seasoned equity offering announcements, classified by exchange listing and time of announcement

Panel A: Daytime Announcements

	NASDAQ						NYSE - AMEX					
Event Interval	*Mean return(%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**	*Mean return (%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**
-2	-.16	.00		14	79	.05	-.05	.31		27	55	.14
-1	-.14	.10		15	77	.03	-.02	.70		25	52	.81
0	-1.49	.00	-1.49	62	31	.00	-1.01	.00	-1.01	55	36	.00
1	-.52	.00	-2.01	37	45	.00	-.70	.00	-1.71	49	38	.00
2	-.01	.77	-2.02	14	66	.15	-.25	.00	-1.96	31	50	.07
3	-.06	.17	-2.08	12	73	.69	-.09	.09	-2.05	27	54	.21
4	.01	.82	-2.07	13	75	.68	-.21	.00	-2.26	32	48	.05
5	.00	.99	-2.07	11	78	1.00	-.16	.01	-2.42	28	51	.34
6	.08	.03	-1.99	6	84	.16	.09	.09	-2.33	25	49	.91
7	-.05	.20	-2.04	9	84	.86	.02	.76	-2.31	25	49	1.00
8	-.04	.33	-2.08	9	85	.38	-.05	.33	-2.36	18	60	.60
9	-.04	.34	-2.12	10	81	.75	.00	.97	-2.36	24	55	.80
10	.00	.99	-2.12	7	88	.85	-.02	.66	-2.38	26	52	.47
11	.02	.60	-2.10	6	85	.47	.04	.44	-2.34	27	49	.73
12	.01	.79	-2.09	9	83	1.00	.01	.85	-2.33	18	65	.89

TABLE 4 (contd.)

Panel B: Overnight Announcements

	NASDAQ						NYSE - AMEX					
Event Interval	*Mean return(%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**	*Mean return (%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**
-2	-.03	.66		5	88	1.00	.00	.97		26	56	.19
-1	-.08	.09		12	84	.10	.02	.81		17	61	.54
0	-1.60	.00	-1.60	64	25	.00	-.92	.00	-.92	62	20	.00
1	.13	.04	-1.47	14	70	.73	-.29	.00	-1.21	35	43	.13
2	-.11	.09	-1.58	18	71	.22	-.27	.00	-1.48	36	41	.16
3	-.06	.23	-1.64	14	76	.56	-.09	.24	-1.57	30	47	.43
4	-.26	.00	-1.90	17	80	.00	-.15	.04	-1.72	28	53	.26
5	-.18	.00	-2.08	8	85	.80	-.07	.30	-1.79	28	50	.34
6	.11	.05	-1.97	12	73	.71	-.09	.14	-1.88	24	61	.22
7	-.07	.26	-2.04	6	91	.75	-.01	.87	-1.89	26	54	.48
8	-.01	.82	-2.05	8	79	.40	-.03	.69	-1.92	20	62	.76
9	-.03	.53	-2.08	10	83	.48	-.02	.72	-1.94	21	60	.88
10	-.07	.08	-2.15	7	88	.58	.02	.74	-1.92	23	61	.36
11	.03	.45	-2.12	4	88	.27	-.06	.19	-1.98	24	62	.12
12	.01	.73	-2.11	6	86	.61	.01	.76	-1.97	17	59	.37

* p-values from tests of whether the proportion of non-zero values that are positive is significantly different from 0.5.

The table reports common stock returns in fifteen-minute trading intervals around seasoned equity offering announcements made between January 1990 and December 1992. The sample is separated by exchange listing (NASDAQ or NYSE/AMEX) and time of announcement (daytime or overnight) and consists of 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements. The returns are based on midpoints of the best bid and ask quotes. The p-values for mean returns are based on bootstrap probabilities for a test of the null hypothesis that the mean return in each interval is not different from zero. The bootstrap p-values are derived from a comparison of mean returns in the event interval with an empirical distribution of mean returns (based on 500 samples) generated from the same trading intervals in the benchmark period.

TABLE 5

Open-to-close and close-to-open stock returns in event days 0 and 1 for overnight SEO announcements

		NASDAQ					NYSE/AMEX			
Return Interval	*From:*	*Close(-1)*	*First(0)*	*Open(0)*	*Close(0)*	*Open(+1)*	*Close(-1)*	*Open(0)*	*Close(0)*	*Open(+1)*
	To:	*First(0)*	*Open(0)*	*Close(0)*	*Open(+1)*	*Close(+1)*	*Open(0)*	*Close(0)*	*Open(+1)*	*Close(+1)*
Mean (%)		-0.17	-0.97	-0.56	-0.02	0.38	-0.64	-1.27	0.05	-0.45
t-statistic		-1.83	-6.92	-1.54	-0.30	1.22	-2.82	-4.36	0.27	-2.00
Median (%)		0.00	-0.40	0.00	0.00	0.00	-0.44	-0.87	0.00	-0.34
Sign test (p-value)		0.09	0.00	0.24	1.00	0.06	0.00	0.00	1.00	0.02
No. of Obs. > 0		3	3	38	19	49	25	31	45	36
No. of Obs. ≠ 0		13	59	88	38	80	87	101	89	96

The table reports open-to-close and close-to-open stock returns in event days 0 and 1 following overnight announcements of seasoned equity offerings (SEOs). The sample is classified by exchange listing (NASDAQ or NYSE/AMEX) and consists of 110 NYSE/AMEX and 111 NASDAQ overnight announcements made between January 1990 and December 1992. The returns are based on midpoints of the best bid and ask quotes at the open and close of trading. For NASDAQ listed stocks, the table also presents the returns based on the first quote on day 0 (First(0)), which is generally posted over the two hours prior to the official opening of trading. The t-statistics are based on White's heteroscedasticity robust standard errors.

TABLE 6

The abnormal proportion of 1000 share trades around SEO announcements made between 1990 and 1992

	Daytime Announcements				Overnight Announcements			
	NASDAQ		NYSE/AMEX		NASDAQ		NYSE/AMEX	
Event Interval	*Mean*	*p-value*	*Mean*	*p-value*	*Mean*	*p-value*	*Mean*	*p-value*
-2	0.54	.00	-0.17	.63	0.28	.20	-0.29	.28
-1	0.38	.05	0.48	.18	0.31	.13	0.76	.01
0	2.04	.00	0.56	.04	0.78	.00	0.41	.11
1	1.25	.00	0.93	.02	0.45	.04	0.36	.19
2	0.64	.00	0.49	.11	0.40	.09	0.00	.99
3	0.89	.00	0.50	.11	0.40	.12	0.37	.25
4	0.18	.34	0.08	.80	0.40	.11	0.56	.11
5	0.09	.61	0.08	.80	-0.01	.97	0.17	.61
6	0.21	.30	0.84	.02	0.57	.01	0.75	.02
7	0.29	.16	0.37	.32	0.13	.59	0.39	.34
8	0.34	.07	0.58	.07	0.45	.05	-0.10	.77
9	0.25	.24	0.30	.41	-0.04	.87	-0.05	.89
10	0.12	.54	0.31	.31	0.26	.33	0.02	.95
11	0.25	.16	0.09	.73	0.32	.14	0.79	.03
12	0.28	.15	0.10	.81	-0.17	.49	0.20	.54

This table presents the abnormal proportion of 1000 share trades in 15 minute trading intervals around seasoned equity offering (SEO) announcements, separated by exchange listing (NASDAQ or NYSE/AMEX) and time of announcement (daytime or overnight). The sample consists of 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements made between January 1990 and December 1992. The abnormal proportion of 1000 share trades is measured by

$$\text{Abnormal proportion of 1000 share trade}_i = \frac{\text{PROP}_i - \text{APROP}_i}{\text{DPROP}}$$

where PROP_i is the proportion of 1000 share trades in interval i relative to the total number of trades in interval i. This proportion is treated as missing when there are no trades in the event interval. APROP_i is the benchmark period mean proportion of 1000 share trades in the same fifteen-minute as event interval i and DPROP is the mean daily proportion of 1000 share trades in the benchmark period. The p-values are based on bootstrap resampling under the null hypothesis that the mean abnormal proportion of 1000 share trades in each interval is zero.

TABLE 7

Proportion of trades executed at the bid relative to all trades in the 15 minute event intervals surrounding 1990-92 SEO announcements

	Daytime Announcements				Overnight Announcements			
	NASDAQ		NYSE/AMEX		NASDAQ		NYSE/AMEX	
Event Interval	*Mean*	*p-value*	*Mean*	*p-value*	*Mean*	*p-value*	*Mean*	*p-value*
-2	0.02	.87	0.90	.00	-0.08	.54	0.27	.10
-1	0.09	.45	-0.07	.67	-0.27	.06	-0.09	.62
0	0.11	.29	0.59	.00	-0.30	.02	-0.25	.19
1	0.02	.90	0.47	.00	0.05	.71	-0.14	.44
2	0.17	.13	0.55	.00	0.02	.91	-0.10	.60
3	0.24	.04	0.28	.06	0.08	.61	0.22	.18
4	0.29	.01	0.32	.03	0.01	.97	0.17	.33
5	0.30	.01	0.74	.00	0.29	.05	0.02	.90
6	0.23	.05	0.21	.17	-0.01	.96	0.00	.98
7	-0.05	.63	0.16	.28	-0.04	.75	-0.05	.77
8	0.25	.04	0.43	.00	-0.06	.71	0.15	.40
9	0.27	.04	-0.14	.37	0.08	.60	-0.02	.92
10	0.09	.44	0.54	.00	0.11	.50	0.22	.19
11	0.14	.26	0.28	.05	-0.06	.71	-0.03	.87
12	0.19	.12	0.16	.32	-0.02	.87	0.30	.12

The table reports the proportion of trades occurring exactly at the bid relative to all trades in the 15 minute event intervals surrounding seasoned equity offering (SEO) announcements. SEO announcements are classified by exchange listing (NASDAQ and NYSE/AMEX) and time of announcement (daytime and overnight). The SEO sample consists of 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements made between January 1990 and December 1992.

Abnormal quotes at the bid = (% of trades at the bid - average % of trades at the bid for the corresponding interval in the benchmark period) / (average % of trades at the bid in the same trading interval of benchmark period)

TABLE 8

Regression estimates of the speed of price adjustment for 1990-92 SEO announcements

Panel A: All firms

Dependent variable:	***SPEED***			***RANK OF SPEED***		
	1	**2**	**3**	**1**	**2**	**3**
INTERCEPT	0.35	0.35	0.43	119.46	119.98	136.96
	(3.78)	(3.79)	(7.49)	(15.03)	(15.04)	(23.38)
MSHRTRD*NASD	0.04	0.04	0.07	3.47	3.30	6.37
	(2.04)	(1.95)	(2.99)	(1.78)	(1.70)	(2.75)
MSHRTRD*NYAM	0.03	0.02	0.03	3.20	2.43	4.09
	(1.01)	(0.75)	(1.04)	(1.12)	(0.87)	(1.27)
ABNSPRD*NASD	0.08		0.06	-15.77		-17.99
	(0.26)		(0.18)	(-0.68)		(-0.72)
ABNSPRD*NYAM	0.21		0.18	22.05		20.99
	(3.11)		(2.71)	(3.41)		(3.58)
ABNTRD*NASD	0.97	0.96		116.07	115.56	
	(4.58)	(4.54)		(6.70)	(6.80)	
ABNTRD*NYAM	1.03	1.19		133.09	149.07	
	(2.83)	(2.94)		(3.41)	(3.54)	
OFFSIZE	-0.04	-0.03		-1.65	-1.25	
	(-1.49)	(-1.35)		(-0.88)	(-0.66)	
Adj-R-square	0.12	0.11	0.02	0.18	0.17	0.04
No. of Observations	233	233	233	233	233	233

TABLE 8 (contd.)

Panel B: Matched Industrial firms

Dependent variable:	*SPEED*			*RANK OF SPEED*		
	1	**2**	**3**	**1**	**2**	**3**
INTERCEPT	0.35	0.35	0.33	70.47	70.26	77.02
	(2.44)	(2.29)	(4.42)	(9.31)	(9.21)	(16.53)
MSHRTRD*NASD	0.05	0.06	0.09	2.39	2.18	5.05
	(1.34)	(1.28)	(2.24)	(1.00)	(0.94)	(1.92)
MSHRTRD*NYAM	0.03	0.02	0.04	1.84	1.22	2.66
	(0.94)	(0.58)	(1.12)	(1.02)	(0.67)	(1.31)
ABNSPRD*NASD	0.47		0.36	-0.89		-8.97
	(1.02)		(0.76)	(-0.04)		(-0.41)
ABNSPRD*NYAM	0.22		0.21	12.80		13.69
	(3.29)		(3.56)	(3.48)		(4.37)
ABNTRD*NASD	0.74	0.68		57.06	57.06	
	(3.29)	(2.97)		(4.24)	(4.45)	
ABNTRD*NYAM	1.03	1.24		82.10	92.37	
	(2.73)	(2.86)		(3.51)	(3.59)	
OFFSIZE	-0.05	-0.04		-1.16	-0.65	
	(-1.18)	(-0.95)		(-0.64)	(-0.36)	
Adj-R-square	0.09	0.07	0.04	0.15	0.14	0.04
No. of Observations	135	135	135	135	135	135

Table 8 (contd)

OLS regression estimates of a model explaining speed of price reaction (SPD_{it}) measured as the return in the 15 minute event interval 0 (CRET1) relative to cumulative returns in event intervals 0 to 11 (CRET12) following seasoned equity offering (SEO) announcements. The dependent variable in the regression is either the actual value of SPD_{it} or the rank of SPD_{it}. To control for extreme observations, the regression deletes firms with magnitudes of CRET12 less than the absolute value of 0.5%. The rank for speed is obtained by ranking all firms based on SPD_{it}. The sample for Panel A consists of all firms making daytime SEO announcements in 1990 - 1992. For Panel B, the sample is restricted to industrial firms making daytime SEO announcements. For this panel, stocks are matched across exchanges based on the two-day market reaction around the offering announcement. The t-statistics are based on White's heteroscedasticity robust standard errors and are placed in parentheses.

Variable Definitions:

MSHRTRD: Abnormal proportion of 1000 share trades in event interval 0, measured by the proportion of 1000 share trades relative to all trades in event interval 0 minus the average proportion of 1000 share trades in the same event interval of the benchmark period, scaled by the mean daily proportion of 1000 share trades in the benchmark period.

ABNSPRD: Abnormal relative bid-ask spread is measured by the time weighted average of the bid-ask spread divided by its mid-point (relative spread) in event interval i minus the time weighted average relative spread in interval i of the benchmark period, all divided by the daily time weighted average relative spread in the benchmark period.

ABNTRD: Abnormal number of trades measured by the number of trades in event interval i, less the average number of trades in the same trading interval of the benchmark period, standardized by the mean daily number of trades in the benchmark period.

OFFSIZE: logarithm of the offering's gross proceeds.

NYAM: 1 for NYSE/AMEX stocks, 0 otherwise.

NASD: 1 for NASDAQ stocks, 0 otherwise.

The benchmark period is defined as event days -30 to -5, where event day 0 is defined as the SEO announcement date, if the announcement occurs before 4pm. When the announcement occurs after 4pm, day 0 is defined as the following trading day.

TABLE 9

Fifteen minute event interval returns around 1995-2000 SEO announcements classified by exchange listing and time of announcement

Panel A: Daytime Announcements

	NASDAQ						NYSE - AMEX					
	Mean return (%)	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**	*Mean return (%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**
-2	-0.36	0.00		41	35	0.03	-0.06	0.45		32	39	0.65
-1	-0.40	0.00		38	35	0.16	-0.08	0.19		29	45	0.75
0	-1.41	0.00	-1.41	68	20	0.00	-0.56	0.00	-0.56	51	27	0.00
1	0.03	0.76	-1.38	33	32	0.73	-0.66	0.00	-1.22	56	29	0.00
2	-0.26	0.00	-1.64	33	39	0.55	0.10	0.11	-1.12	34	28	0.77
3	-0.20	0.02	-1.84	33	40	0.47	-0.03	0.61	-1.15	34	35	0.76
4	0.22	0.04	-1.62	26	41	0.27	-0.07	0.22	-1.22	34	44	0.24
5	-0.16	0.09	-1.78	30	44	0.53	-0.07	0.16	-1.29	32	40	0.75
6	-0.10	0.27	-1.88	26	47	0.80	0.09	0.09	-1.20	21	42	0.10
7	0.01	0.93	-1.87	29	50	0.23	-0.13	0.05	-1.33	38	44	0.04
8	-0.18	0.05	-2.05	29	58	0.01	0.06	0.29	-1.27	28	41	0.74
9	0.05	0.62	-2.00	15	58	0.04	0.08	0.21	-1.19	22	43	0.22
10	0.34	0.04	-1.66	17	58	0.19	0.10	0.19	-1.09	21	44	0.16
11	-0.02	0.87	-1.68	17	65	0.75	0.03	0.64	-1.06	25	47	0.72
12	0.14	0.10	-1.54	15	67	0.62	0.07	0.20	-0.99	28	40	0.72

TABLE 9 (contd.)

Panel B: Overnight Announcements

	NASDAQ						NYSE - AMEX					
Mean return (%)	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**	*Mean return (%)*	*Mean return (%)*	*p-value*	*Cumu-lative return*	*% of obs <0*	*% of obs =0*	*Sign test**
-2	-0.01	0.90		37	27	0.83	-0.04	0.30		33	40	0.29
-1	0.09	0.48		39	22	0.92	0.01	0.92		30	37	0.55
0	-2.97	0.00	-2.97	74	3	0.00	-0.64	0.00	-0.64	64	3	0.00
1	-0.22	0.01	-3.19	47	18	0.01	-0.21	0.00	-0.85	49	18	0.01
2	-0.12	0.12	-3.31	44	20	0.04	0.01	0.81	-0.84	40	24	0.53
3	-0.04	0.46	-3.35	42	21	0.19	-0.10	0.02	-0.94	41	26	0.15
4	-0.05	0.46	-3.40	41	24	0.22	-0.04	0.28	-0.98	37	28	0.81
5	-0.13	0.04	-3.53	41	23	0.15	-0.08	0.03	-1.06	35	32	0.68
6	-0.04	0.41	-3.57	40	24	0.36	0.07	0.03	-0.99	33	31	0.57
7	-0.02	0.66	-3.59	39	25	0.39	-0.05	0.09	-1.04	39	35	0.02
8	0.00	0.97	-3.59	35	27	0.33	-0.03	0.27	-1.07	36	33	0.36
9	-0.02	0.64	-3.61	37	29	0.32	-0.11	0.00	-1.18	36	34	0.21
10	-0.09	0.03	-3.70	37	27	0.83	0.00	0.89	-1.18	33	37	0.73
11	0.05	0.23	-3.65	34	32	0.91	-0.05	0.11	-1.23	33	40	0.25
12	0.03	0.53	-3.62	36	30	0.62	-0.01	0.72	-1.24	31	39	1.00

* p-values are based on tests of whether the proportion of positive returns to all non-zero returns in an event interval is significantly different from 0.5.

The table reports common stock returns in fifteen-minute trading intervals around seasoned equity offering (SEO) announcements separated by exchange listing (NASDAQ or NYSE/AMEX) and time of announcement (daytime or overnight). The sample consists of 75 (215) NYSE/AMEX daytime (overnight) announcements made between January 1995 and December 2000 and 115 (461)

NASDAQ daytime (overnight) announcements made between January 1998 and December 2000. The returns and bootstrap p-values are defined in Table 4.

TABLE 10

Abnormal proportion of 1000 share trades in 15 minute event intervals around SEO announcements made between 1995 and 2000

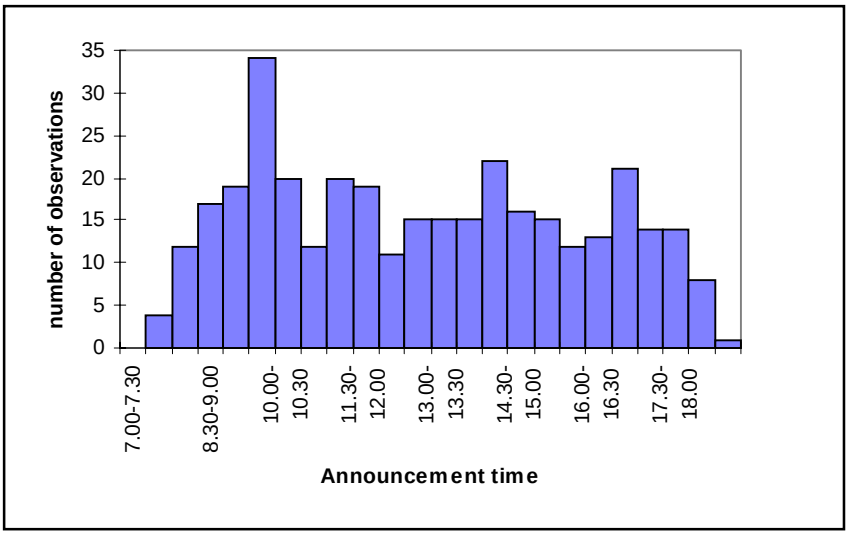
	Daytime Announcements				Overnight Announcements			
	NASDAQ		NYSE/AMEX		NASDAQ		NYSE/AMEX	
Event Interval	*Mean*	*p-value*	*Mean*	*p-value*	*Mean*	*p-value*	*Mean*	*p-value*
-2	-0.08	0.65	0.04	0.89	-0.01	0.87	-0.07	0.68
-1	0.02	0.92	-0.03	0.95	0.04	0.53	0.38	0.04
0	0.57	0.00	0.29	0.32	0.00	0.97	0.24	0.10
1	0.66	0.00	0.02	0.95	-0.04	0.58	0.65	0.00
2	0.19	0.30	-0.07	0.80	-0.01	0.91	0.32	0.04
3	-0.02	0.91	0.13	0.66	0.00	0.99	0.55	0.00
4	0.13	0.58	0.16	0.65	0.03	0.68	0.28	0.14
5	0.01	0.95	0.55	0.07	0.06	0.47	0.42	0.03
6	-0.12	0.58	-0.29	0.35	-0.05	0.56	0.59	0.00
7	-0.14	0.50	-0.33	0.33	0.04	0.65	0.43	0.02
8	0.06	0.77	0.46	0.24	0.08	0.34	0.23	0.23
9	-0.25	0.28	0.69	0.10	-0.02	0.77	0.11	0.58
10	0.00	0.99	0.50	0.33	-0.08	0.33	0.42	0.07
11	0.44	0.05	-0.13	0.76	-0.05	0.56	-0.06	0.78
12	0.39	0.18	-0.37	0.37	-0.11	0.21	0.08	0.66

This table presents the abnormal proportion of 1000 share trades in 15 minute trading intervals around seasoned equity offering (SEO) announcements classified by exchange listing (NASDAQ or NYSE/AMEX) and time of announcement (daytime or overnight). The sample consists of 75 (215) NYSE/AMEX daytime (overnight) announcements and 115 (461) NASDAQ daytime (overnight) announcements. The sample is based on SEO announcements made between January 1995 and December 2000 for NYSE/AMEX stocks and January 1998 and December 2000 for NASDAQ stocks. The abnormal proportion of 1000 share trades is defined in Table 6.

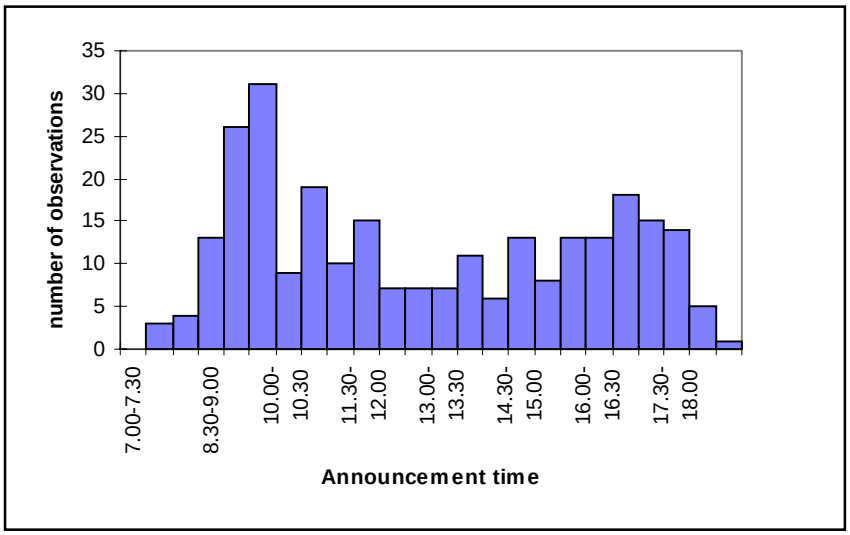
Figure 1

Intraday frequency distribution of announcement times
for seasoned equity offerings announced between
January 1990 and December 1992

NASDAQ



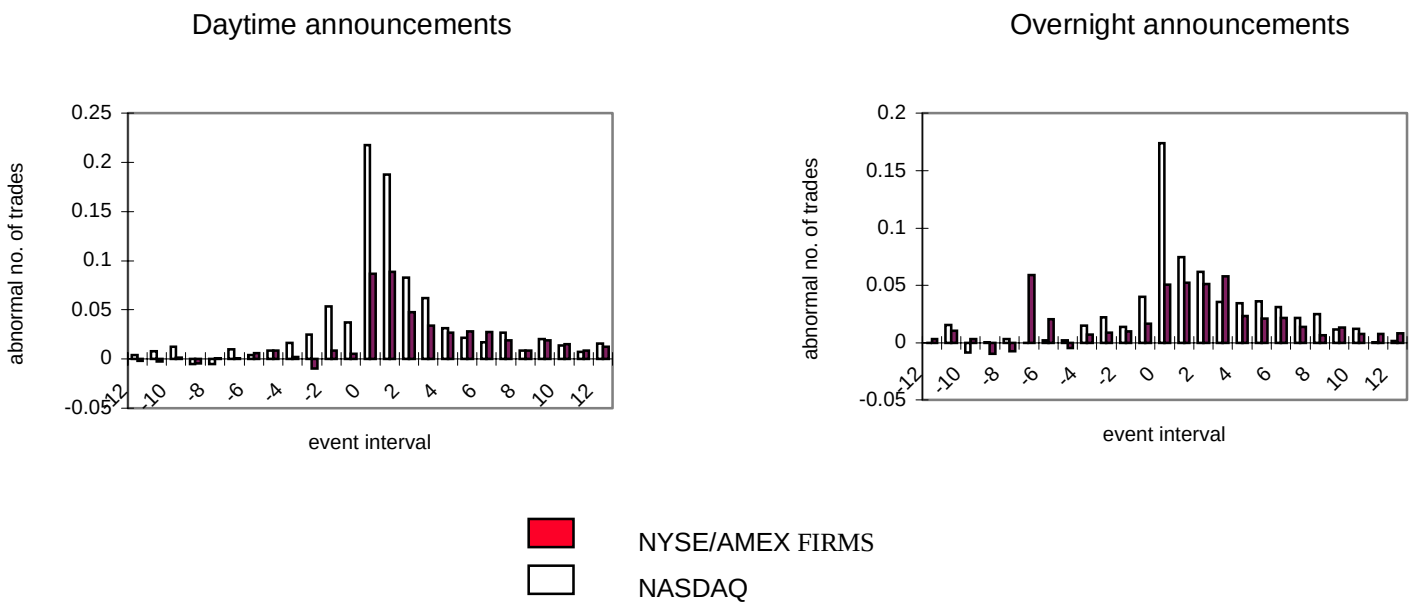
NYSE/AMEX



The sample consists of 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements made between January 1990 and December 1992.

Figure 2

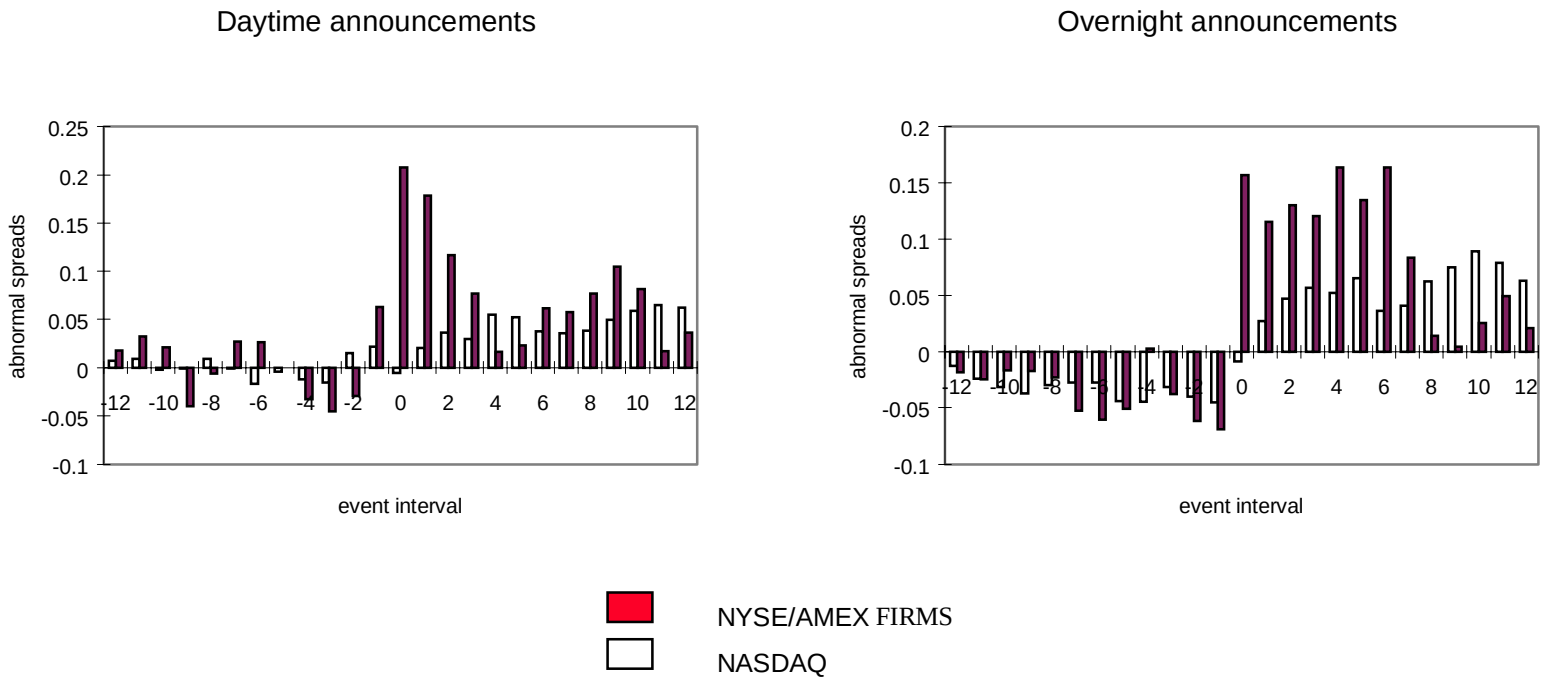
Abnormal number of trades around 1990-1992 seasoned equity offering announcements



This figure presents the mean number of trades in the fifteen-minute event intervals around seasoned equity offering announcements, where event interval 0 is defined as the trading interval containing the announcement or the first trading interval after an announcement occurring in a non-trading period. The sample consists of 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements made between January 1990 and December 1992. The abnormal number of trades is defined as:

Figure 3

Abnormal spreads around 1990-1992 seasoned equity offering announcements



This figure presents the mean abnormal spreads in fifteen-minute event intervals around seasoned equity offering announcements made between January 1990 and December 1992, where event interval 0 is the trading interval containing the announcement or the first trading interval following the announcement when it occurs in a non-trading period. There are 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements. The abnormal spread is defined as:

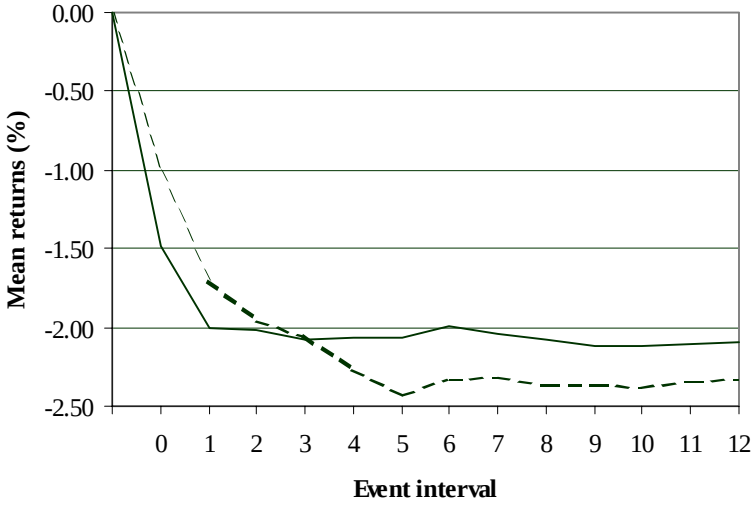
$$\text{Abnormal spread}_i = [\sum_{j=1}^{J_i}(\text{SPRD}_{ij} - \text{ASPRD}_i)\text{T}_{ij}] / \text{DSPRD}$$

where SPRD_{ij} is the relative or percentage bid-ask spread for the jth quote in interval i and T_{ij} is the proportion of interval i for which the jth quote is outstanding, ASPRD_i is the mean relative spread for the same trading interval i in the benchmark period and DSPRD is the benchmark period mean daily relative spread.

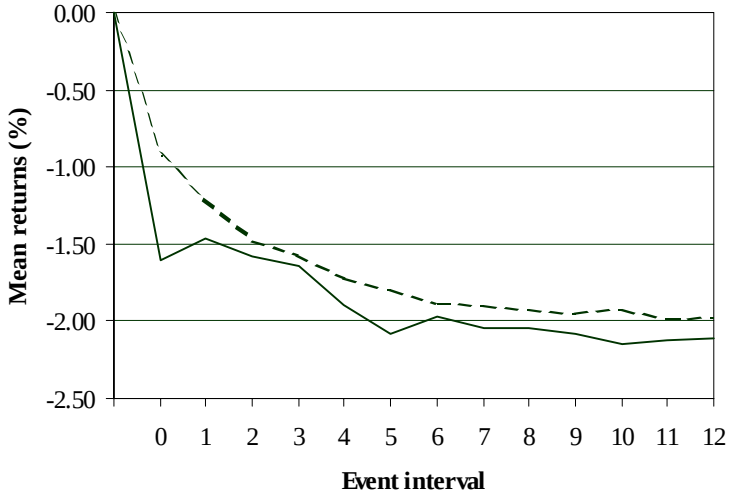
Figure 4

Cumulative stock returns around 1990-1992 seasoned equity offering announcements

Daytime announcements



Overnight announcements



_____ NASDAQ

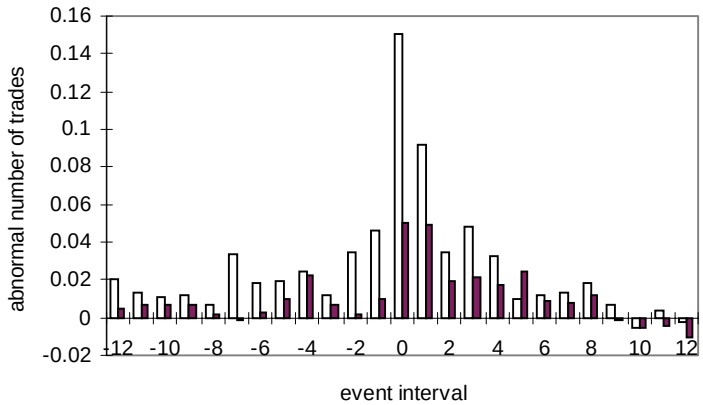
- - - - - - - NYSE/AMEX

This figure presents the mean cumulative stock returns in the fifteen-minute event intervals around announcements of seasoned equity offerings. Event interval 0 is defined as the interval containing the announcement or the first trading interval after an announcement occurring in a non-trading period. The sample consists of 143 (110) NYSE/AMEX daytime (overnight) announcements and 209 (111) NASDAQ daytime (overnight) announcements made between January 1990 and December 1992.

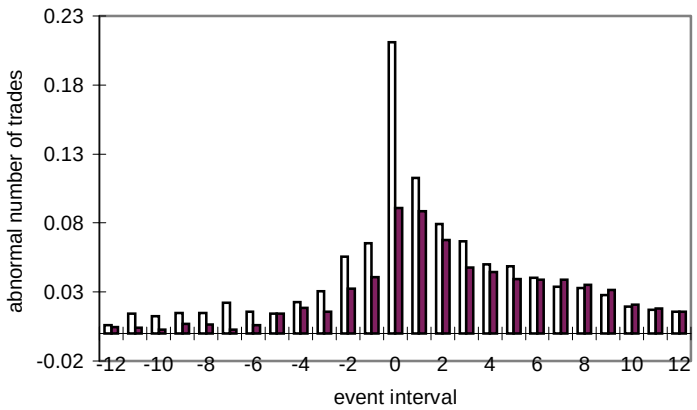
Figure 5

Abnormal number of trades around seasoned equity offering announcements made between 1995 and 2000

Daytime announcements



Overnight announcements



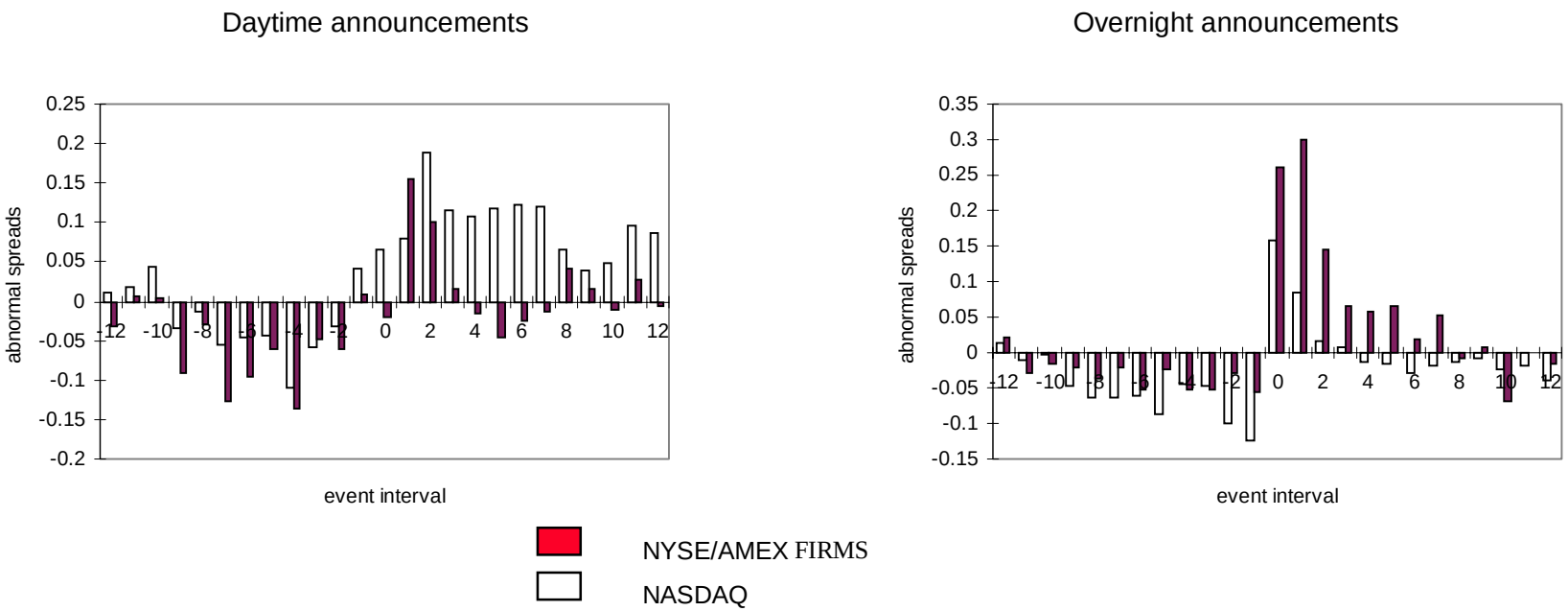
NYSE/AMEX FIRMS

NASDAQ

This figure presents the mean number of trades in the fifteen-minute event intervals around seasoned equity offering announcements The sample consists of 75 (215) NYSE/AMEX daytime (overnight) announcements and 115 (461) NASDAQ daytime (overnight) announcements made between January 1995 and December 2000 for NYSE/AMEX stocks and January 1998 and December 2000 for NASDAQ stocks. Event interval 0 is the interval containing the announcement or the first trading interval after an announcement occurring in a non-trading period. The abnormal number of trades is defined as:

Figure 6

Abnormal spreads around seasoned equity offering announcements made between 1995 and 2000



This figure presents the mean abnormal spreads in the fifteen-minute event intervals around seasoned equity offering announcements made between January 1995 and December 2000 for NYSE/AMEX stocks and January 1998 and December 2000 for NASDAQ stocks. The sample consists of 75 (215) NYSE/AMEX daytime (overnight) announcements and 115 (461) NASDAQ daytime (overnight) announcements. Event interval 0 is defined as the interval containing the announcement or the first trading interval following an announcement occurring in a non-trading period. Abnormal spread is defined as:

$$\text{Abnormal spread}_i = [\sum_{j=1}^{J_i}(\text{SPRD}_{ij} - \text{ASPRD}_i)\text{T}_{ij}] / \text{ DSPRD}$$

where SPRD_{ij} is the relative bid-ask spread for the jth quote in interval i and T_{ij} is the proportion of interval i for which the jth quote is outstanding, ASPRD_i is the benchmark period mean relative for trading interval i and DSPRD is the benchmark period mean daily relative spread.