

## **Market Structure and Trading Volume\***

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## **Market Structure and Trading Volume**

Historically trading volume reported for Nasdaq stocks has been overstated vis-à-vis NYSE stocks, due both to the dealer's participation in trades as a market maker and to inter-dealer trading. Beginning in 1997, the SEC mandated various changes in order handling rules and trade reporting rules which may have reduced the amount by which Nasdaq trading is overstated. The Riskless Principal Trade Reporting Rules, in particular, are intended to eliminate the double counting of purely intermediary transactions. We investigate the effect of these rule changes on trading volumes for Nasdaq stocks by examining the trading volumes of firms changing from Nasdaq to the NYSE since 1997.

### **I. INTRODUCTION**

Conventional wisdom on Wall Street has long held that the trading volumes reported for Nasdaq stocks are greatly overstated vis-à-vis trading volumes reported for New York Stock Exchange (NYSE) stocks. An accurate and consistent measure of trading volume is important to investors and others. For example, institutional investors, and other investors with large shareholdings, frequently assess the liquidity of their investment in a particular common stock in terms of the number of days of normal trading volume represented by their holding or a similar volume-related measure. It is easier to liquidate a position equal to one-half day's trading volume without disrupting the market than it is to sell a holding comprising two days' trading volume.<sup>1</sup> Clearly problems arise in assessing the liquidity of a large investment in a stock if the trading volume reported by the stock exchange is not an accurate measure of actual trading volume for the stock and/or if the trading volumes reported for Nasdaq and NYSE securities are not comparable.

The discrepancy between trading volumes reported in the two primary U.S. stock markets arises because Nasdaq is primarily a dealer market, whereas the NYSE is largely an auction market. In a dealer market, market makers post bid and ask prices and buy shares from or sell shares to public investors at these prices. A dealer is therefore on one side of every transaction,

which results in trading volume being overstated. When an investor sells 100 shares of firm X to a dealer, the dealer reports a 100-share transaction; when another investor buys the 100 shares of firm X from the dealer, he reports another 100-share transaction. Only 100 shares of firm X have changed hands between the two investors, but trading volume of 200 shares has been reported for the day. Trading volume can be further overstated due to inter-dealer trading. For example, when a dealer acquires additional inventory from other dealers to fill a large order from a public investor, each of these inter-dealer trades is reported as trading volume even though no shares were bought yet by an investor. Regarding dealer trading, Hansch et al. (1998, p. 1625) point out that "Dealership markets like the London Stock Exchange and the Nasdaq in the United States are characterized by a large volume of interdealer trading. In particular, interdealer trading on the London Stock Exchange constitutes 53 percent of public trading."

Unlike dealer markets, the NYSE is primarily an auction market where most transactions are between an actual buyer and seller. There is only one market maker designated for each firm, a specialist who is assigned to oversee the market for the firm's stock. All offers to buy or sell the firm's shares at a specific price (limit orders) are recorded by the specialist in the order book. An incoming order to buy or sell the stock at the current price may be executed either in a transaction with a floor trader, against an existing limit order in the order book, or against the specialist's ask or bid quotes. Such an order is either filled at the best available quote—the lowest ask price in the case of a buy order and the highest bid price in the case of a sell order—or at a price inside the quotes.<sup>2</sup> The specialist participates in only a small portion of NYSE transactions, whereas on Nasdaq a dealer has traditionally been on one side or the other of essentially every transaction and is on both sides of all inter-dealer transactions. From 1998 to 2001 specialists participated in approximately 25-30 percent of all transactions on the NYSE--about equally divided between the

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<sup>1</sup> Numerous studies document the effect of large trades on stock prices, including Kraus and Stoll (1972), Holthausen et al. (1987, 1990), and Keim and Madhavan (1996).

<sup>2</sup> Bessembinder and Kaufman (1997) report that approximately 25 percent of the transactions on the NYSE occur at a price between the quotes. Specialists participate in relatively few of these trades.

buy side and the sell side. Specialist participation in transactions varies greatly from stock to stock, and is inversely related to a stock's trading volume (Madhavan and Sofianos (1998)).

Historically, a rule of thumb on the Street is that Nasdaq trading volume is roughly double-counted compared to NYSE volume, and so an adjustment factor of about 50 percent is required to make the trading volumes reported by the two exchanges comparable. A study of changes in reported trading volume when firms changed from Nasdaq to the NYSE during 1988 through 1990 finds that the median reported trading volume for these firms declines by about 50 percent (see Atkins and Dyl (1997b)). It is unlikely that any decline in actual trading volume (as opposed to reported volume) occurs when firms switch to the NYSE. First, there is substantial evidence that firms choose to list on the NYSE during periods of strong growth, when they are becoming more visible in the market, so the actual level of trading in their shares is probably increasing.<sup>3</sup> Second, transaction costs are lower on the NYSE than on Nasdaq and, ceteris paribus, trading volumes are higher when transactions costs are lower.<sup>4</sup> The decrease in reported trading volume when firms change from Nasdaq to the NYSE is, therefore, most likely merely an artifact of the change from a dealer market to an auction market rather than a change in the actual volume of trading among investors.

A number of recent changes in the operation of the Nasdaq market, which may have altered the traditional relation between reported trading volumes on Nasdaq and the NYSE, motivate this study. In response to research by Christie and Schultz (1994) revealing possible non-competitive behavior by Nasdaq dealers, in 1997 the Securities and Exchange Commission (SEC) mandated a number of changes in the way Nasdaq dealers handle customers' orders. Two

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<sup>3</sup> Sanger and McConnell (1986), Cowan et al. (1992), and Baker et al. (1999).

<sup>4</sup> Huang and Stoll (1996), Bessembinder and Kaufman (1997), and Bessembinder (1999) document lower transaction costs on the NYSE. Christie and Huang (1994), Kadlec and McConnell (1994), and Barclay et al. (1998) find that when firms move from Nasdaq to the NYSE their spreads generally decrease. Keim and Madhavan (1997) report lower trading costs for institutions on the NYSE than on Nasdaq. Amihud and Mendelson (1986) show analytically that higher trading volumes are associated with lower transaction costs and vice versa, and Atkins and Dyl (1997a) report an inverse empirical relation between trading volume and transaction costs for both NYSE and Nasdaq stocks.

of these rules, in particular, may affect the degree to which dealers on Nasdaq continue to participate in every trade. First, public limit orders now compete directly with market makers' quotes. When dealers receive a limit order they must do one of the following: (1) execute the order immediately, taking the other side of the trade; (2) post the order as their own quote; (3) list the order on an electronic communication network such as Instinet; or (4) send the order to another market maker who must comply with these rules.<sup>5</sup> Second, the public now has access to the favorable prices posted by market makers on electronic communication networks (ECNs), which historically have been used primarily by market makers and large institutions to trade with one another. Both of these changes may cause Nasdaq to become more like the NYSE.<sup>6</sup>

In addition, the overall proportion of Nasdaq trading volume accounted for by ECNs has been increasing in recent years. Although ECNs usually receive fees from both parties to transactions where they serve as broker, the number of shares traded is generally counted only once when they report trading volume. Counting trades where an ECN was on either one or both sides of the transaction, ECNs participated in 25.5 percent of Nasdaq volume in 1999, 32.8 percent in 2000, and a remarkable 44.7 percent in 2001.<sup>7</sup> If the increase in ECNs' percentage of Nasdaq volume means that more public investors are using ECNs, the result may be less double counting in the trading volume reported for Nasdaq stocks. If the increase in ECNs' trading volume is due to more inter-dealer trading among Nasdaq market makers, however, then it may result in more over-counting.

Another change in the financial markets, which, like the SEC-mandated changes, also occurred in 1997, was the change from quoting prices in eighths of a dollar to quoting prices in sixteenths of a dollar effective June 1997. Goldstein and Kavajecz (2000) report that this change caused a decline in both quoted spreads and the corresponding depths. Subsequently, both the

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<sup>5</sup> Market makers may also refuse to accept limit orders from customers.

<sup>6</sup> See Barclay et al. (1999) and Weston (2000) for a discussion of some of the effects of these market reforms on the cost of trading Nasdaq stocks.

<sup>7</sup> Smith (2002).

NYSE and Nasdaq changed to quoting prices in decimals (in January 2001 and April 2001, respectively). These changes in the minimum price variation for both NYSE and Nasdaq stocks dramatically lowered bid-ask spreads, reducing potential profits for dealers. It may therefore result in an increase in the number of trades conducted electronically, which would reduce the extent to which trades on Nasdaq are double counted.

Most important, in early 2001 Nasdaq implemented Riskless Principal Trade-Reporting Rules specifically intended to reduce the degree of double counting of customer transactions. A riskless principal transaction is one where the market maker, after receiving an order to buy or sell a stock, purchases or sells the same security at the same price to fill the order. The Riskless Principal Trade-Reporting Rules require the dealer to report such a trade as one transaction rather than, for example, reporting both the purchase by the dealer and the subsequent sale to the customer as separate transactions. The impact of these rules on reported trading volume for Nasdaq stocks depends on the proportion of dealer transactions on Nasdaq that qualify as riskless principal trades.

## II. THE IMPORTANCE OF TRADING VOLUME

Measures of trading volume and, in particular, consistent measures of trading volume across securities and markets, are important for a number of reasons: (1) many inter-firm and inter-market comparisons involve trading volume; (2) various SEC rules are couched in terms of daily trading volume; (3) accurate trading volumes are required for litigation (e.g., computing damages in securities fraud litigation); and (4) common stock trading volume is used in financial research.

**Inter-firm Comparisons .** We have already mentioned the importance of trading volume in assessing the liquidity of a large position in a particular stock. One mutual fund manager we know of has a stated policy that limits a fund's position to no more than 20 percent of its average

daily trading volume. Consider the effect of this policy on the fund's ability to invest in Michaels Stores Inc. (MIK), which trades on the NYSE, and Ross Stores Inc. (ROST) which trades through Nasdaq:<sup>8</sup>

<u>Daily Averages (50 days)</u>	<u>Michaels Stores (MIK)</u>	<u>Ross Stores (ROST)</u>
Share trading volume	1,097,700	1,050,500
Stock Price	\$29.68	\$30.33
Dollar Trading Volume	\$32.6 million	\$31.9 million

Both of these stocks are actively traded, and the "20 percent" rule permits an investment of roughly \$6.4 million in each firm. Michaels Stores' actual daily trading volume is probably close to 1.1 million shares, since the specialist's participation in trades will be minimal for such an actively traded stock. If the Nasdaq trading volume for Ross Stores is roughly double counted due to intermediate trades by dealers, however, the actual average daily share volume for Ross Stores is only 525,000 shares and the average daily dollar volume is only \$16 million. The "20 percent" rule dictates an investment of only \$3.2 million in Ross Stores' stock, not \$6.4 million.

**Regulation.** SEC Rules 144 and 148 under the Securities Act of 1933, Rule 10b-18 under the Securities Exchange Act of 1934, and Regulation M all use the concept of trading volume without differentiating between the measures of trading volume reported in dealer versus auction markets.<sup>9</sup> Rule 144 governs the sale of restricted securities by insiders. It limits the amount of such securities that can be sold within a certain period to the greater of either one percent of the shares outstanding or the "average weekly trading volume in such securities" during the preceding four weeks. The latter provision is generally binding, and limits the ability of entrepreneurs to diversify their personal portfolios. Rule 10b-18 governs open market share repurchases by firms, and limits the daily amount of such repurchases to 25 percent of the average daily trading volume for the security during the preceding four calendar weeks. The

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<sup>8</sup> The daily average stock prices and trading volumes are 50-day averages for the last 50 trading days in 2001.

typical open market share repurchase is very large relative to most firms' daily trading volumes, averaging about seven percent of the shares outstanding.<sup>10</sup> It is therefore likely that this rule is a binding constraint for most repurchasing firms. For example, Cook et al. (2003) report evidence that many firms repurchasing shares in the open market occasionally violate the volume limit specified in Rule 10b-18. If Nasdaq trading volume is overstated, then a typical open market repurchase will take much longer for NYSE firms than for Nasdaq firms (*ceteris paribus*). Regulation M exempts underwriters, prospective underwriters, and affiliated purchasers from certain trading restrictions during the distribution of "actively-traded securities." An actively traded security either has an average daily trading volume of at least \$1 million or is issued by a company with a public float value of at least \$150 million. Therefore, if Nasdaq volume is overstated, it is likely that, *ceteris paribus*, Regulation M is more beneficial to firms traded on Nasdaq than it is for firms trading on the NYSE.

In 1996 the NYSE petitioned the SEC to amend Rule 144 and Rule 10b-18 to specify a standard for determining trading volume that operates comparably in dealer and auction markets.<sup>11</sup> In particular, the petition urges that reported trading volume in auction markets be doubled for regulatory purposes if reported trading volume in dealer markets was to be used as trading volume for regulatory purposes. In 1997 the SEC informed the NYSE that it had no plans for action on its petition at that time. One of the reasons given was the evolving nature of the Nasdaq market, encompassing both the Commission's recently adopted order handling rules, which were just beginning to be implemented, and the increasing auction component in Nasdaq transactions due to the presence of ECNs.

As an interesting sidelight, "trading volume" is considered to be reported trading volume for regulatory purposes at the SEC, but apparently not for research purposes. In a recent study comparing order executions on the NYSE and Nasdaq, the SEC's Office of Economic Analysis

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<sup>9</sup> Rule 148 was rescinded on May 31, 1996, so the use of trading volume there is no longer an issue.

<sup>10</sup> Ikenberry et al. (1995) and Stephens and Weisbach (1998).

employs an adjustment factor that is in the spirit of the one proposed by the NYSE in 1996.<sup>12</sup> In fact, the adjustment factor they use is based on the decrease in reported volume observed for a sample of firms changing from Nasdaq to the NYSE.

**Securities Litigation.** Estimates of economic damages in class action litigation brought under SEC Rule 10b-5, alleging securities fraud, are necessarily based on a measure of the trading volume of the stock during the Class Period.<sup>13</sup> The Class (of plaintiffs) in such litigation encompasses all individuals who both purchased the security during the period when the fraud was in effect and who continued to hold the security at the end of the period. Estimates of the damages suffered by these individuals begin with an estimate of the total amount of stock purchased by investors during the Class Period (i.e., generally the reported trading volume times the stock price for each day). The amount of this reported trading volume that merely reflects intermediate trades by market makers, and not purchases by final investors, is an important issue, especially when the stock in question was traded via Nasdaq. The most common approach to adjusting the trading volume reported for Nasdaq stocks to account for dealer transactions is to simply halve the reported volume. This study provides evidence about whether this adjustment factor remains reasonable for the post-1997 and/or the post-2001 Nasdaq stock market.

**Research.** Financial economics frequently employ trading volumes of both Nasdaq and NYSE stocks in research and must deal with differences in reported trading volume in dealer versus auction markets. They have dealt with this issue in a variety of ways. Some authors cite the earlier study by Atkins and Dyl (1997b) regarding reported trading volume in the two markets and either adjust the volume for Nasdaq stocks based on that study or wisely refrain from making possibly misleading cross-market comparisons of trading volumes.<sup>14</sup> Others develop their own

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<sup>11</sup> See Lohse and Kansas (1996).

<sup>12</sup> SEC (2001), p. 6.

<sup>13</sup> Issues in measuring such damages are discussed in Koslow (1991), Cone and Laurence (1994), Furbush and Smith (1994), and Dyl (1999).

<sup>14</sup> Kadlec and McConnell (1994), LaPlante and Muscarella (1997), Atkins and Dyl (1997a), Chalmers and Kadlec (1998), Krigman et al. (1999), and Chung et al. (2001).

adjustment factor,<sup>15</sup> and a few investigators have apparently been unaware of the non-comparability of Nasdaq and NYSE reported trading volumes.

In summary, the measurement of trading volume and the comparability of trading volumes reported for stocks traded in dealer versus auction markets are important issues in a number of contexts.

### **III. METHODOLOGY AND RESULTS**

We study firms that change from Nasdaq to the NYSE from 1997 through 2002—that is, after the SEC mandated changes described in Section I. We examine daily trading volumes reported for these firms for the 25 days before the change in trading location and for the 25 days after the change. Daily trading volumes are obtained from the Center for Research in Security Prices (CRSP), except for observations for the year 2002, which are from Yahoo.com. There are 299 firms that change from Nasdaq to the NYSE during this period. We eliminate 20 firms due to missing data or confounding events, such as stock issues or large acquisitions that cause in a material change in the number of shares outstanding around the time of the switch in markets, resulting in a final sample 279 firms.

Average daily trading volumes for firms switching from Nasdaq to the NYSE are depicted graphically in Figure I. Day 0 in Figure 1 is the day that the firm begins trading on the NYSE, and the horizontal lines show the average of the firms' daily trading volumes for the 25 days preceding and following day 0 excluding the seven-day window from day -3 to day +3. A noticeable decrease in reported average daily trading volume is evident after the firms change from Nasdaq to the NYSE.<sup>16</sup>

The numerical values underlying the results in Figure I are shown in Table 1. Panel A shows that the mean daily share trading volumes reported for firms that change from Nasdaq to

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<sup>15</sup> Barclay et al. (1998), Weston (2000), and SEC (2001).

the NYSE decline an average of 24.7 percent, which is statistically significant at the .01 level based on a two-tailed *t*-test, and that 80 percent of the firms experience a decrease in reported trading volume. The median decrease in daily trading volume is 37.9 percent.<sup>17</sup> The median decrease in reported trading volume when firms change from Nasdaq to the NYSE is probably the best indicator of the experience of the typical firm, because the means are heavily influenced by a few outliers that experience large increases in trading volume following listing on the NYSE. Most of these increases are probably due to events other than the change in trading venue per se. For example, Krispy Kreme Doughnut's average daily dollar trading volume--adjusted for stock splits-- was 189 percent higher following the change in markets, due to both an increase in share volume and a large increase in Krispy Kreme's share price. Neither the increase in trading nor the appreciation in share price can reasonably be attributed to the change from Nasdaq to the NYSE, however. Krispy Kreme simply happened to announce an 89 percent increase in profits on the same day that it began trading on the NYSE.

Have the SEC-mandated order handling rule affected the overstatement of Nasdaq trading volume? As a benchmark, it is useful to compare our overall findings to those for firms switching from Nasdaq to the NYSE during 1988-1990 reported in Atkins and Dyl (1997). They report a mean decline of 37 percent, compared to about 25 percent for our sample. They find a median decline of 50 percent, whereas we find a median decline of 38 percent. Over 90 percent of the switching firms in 1988-1990 exhibited decreases in reported trading volume, compared to just over 80 percent in 1997-2002. Nasdaq trading volume is still overstated, but to a lesser degree than it was a decade ago.

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<sup>16</sup> We conjecture that the spike in trading volume on the day before the stock trades on the NYSE results from Nasdaq dealers liquidating their inventories.

<sup>17</sup> Although there is no reason to believe a priori that the timing of firms' changing from Nasdaq to the NYSE is related to market-wide volume, we also adjusted the reported trading volume for each day by dividing it by an index of market-wide trading volume on that day. The results are essentially the same as those reported in this section.

Our analysis assumes that, on average, the change in reported trading volume that occurs when a firm changes from Nasdaq to the NYSE is due to the different way volume is reported in dealer versus auction markets. We should, therefore, see an increase in reported trading volume for firms that voluntarily switch from the NYSE to Nasdaq.<sup>18</sup> We are aware of only one firm that has voluntarily switched from the NYSE to Nasdaq. Aeroflex Inc., a small high technology company, shifted to Nasdaq on March 21, 2000. Kalay and Portniaguina (2001) study this firm's change in trading location and report that Aeroflex's average daily trading volume during the 305 days preceding the switch to Nasdaq was 251,835 and that for the 35 days following the switch it was 385,883 shares per day. This increase of roughly fifty percent is consistent with the findings reported in Table 1. The authors do not consider the possibility that the change in reported trading volume observed for Aeroflex might simply be a consequence of the change from an auction to a dealer market.

As a control we examine the change in reported trading volume for the 66 firms that change from trading on the American Stock Exchange (Amex) to trading on the NYSE during this same time period.<sup>19</sup> The Amex is primarily an auction market, like the NYSE, so we expect no change in reported trading volume caused by a change in market structure. The Amex-to-NYSE firms serve as a control group against the possibility that some unknown factor causes trading volumes to decline simply because firms change from one market to another. Figure II shows the mean daily trading volume reported for Amex firms that switch to the NYSE. The horizontal line depicts the average of the daily trading volumes for 25 days before and after the firms change to the NYSE. Evidently a change in trading location per se does not cause a decline in the reported volume of trading. The average daily trading volume reported for Amex firms actually increases after the firms switch to the NYSE. As shown in Panel B of Table 1, the

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<sup>18</sup> The same may not be true for involuntary changes from the NYSE to Nasdaq (e.g., when firms are delisted because they no longer meet the NYSE's listing requirements). In particular, delisting may convey negative information to the market.

<sup>19</sup> Seven firms were eliminated due to missing data or confounding events.

average percentage increase in daily share volume is 31.0 percent, although 48.5 percent of the firms experience a decrease in daily share trading volume. That is, only about half the firms have an increase in trading volume even though the mean percentage increase is quite large. The median increase in daily share volume is 2.8 percent. The median value is more representative of the typical firm than the mean values, and suggests that there is a modest increase in reported trading volumes when firms change from the Amex to the NYSE (i.e., from one auction market to another).

In summary, mean and median reported trading volumes decline when Nasdaq firms switch to the NYSE, but mean and median reported traded volumes increase slightly when Amex firms switch to the NYSE. Trading volumes reported for Nasdaq stocks continued to be overstated from 1997 through 2002 due to transactions by dealers.

#### **IV. WHICH FIRMS' TRADING VOLUMES ARE MOST OVERSTATED?**

The results reported thus far apply to the average or typical firm switching from Nasdaq to the NYSE. We now examine variation within this population of firms by categorizing the firms according to their Nasdaq trading volumes prior to the change from Nasdaq to the NYSE. The firms in our sample are divided into two groups--those with high trading volume and those with low trading volume, where high trading volume firms are defined as firms with an average daily volume of 125,000 shares or more. During 1997-2002, 56 percent of the firms changing from Nasdaq to the NYSE are classified as high-volume firms and 44 percent are classified as low-volume firms.

The results are shown in Table 2. The decrease in reported trading volume when firms change from Nasdaq to the NYSE is directly related to their previous trading volume on Nasdaq. High-volume firms experience a much larger percentage decrease in reported trading volume than low-volume firms, and a higher proportion of the firms experience a decrease in trading volume. The change from a dealer market to an auction market with a specialist has a greater impact for

firms that have high trading volumes because there will be more market orders that are likely to cross, more trading activity by floor traders, and more limit orders from investors. The NYSE is almost a pure auction market for these firms, in the sense that the specialist seldom participates in a transaction. In contrast, thinly traded firms on Nasdaq also have less market activity on the NYSE after the switch, so the specialist must participate as a dealer in a higher proportion of the transactions involving these stocks in to maintain an orderly market (Madhavan and Sofianos (1998)). For these firms, the NYSE frequently functions as a dealer market somewhat like Nasdaq, and is therefore subject to the same overstatement of reported trading volume due to the specialist's participation in trades as a dealer.

Although the findings reported in Table 2 are interesting in their own right, they also suggest that a firm's trading volume on Nasdaq predicts the firm's subsequent trading volume on the NYSE. The relation between pre- and post-listing daily trading volume is non-linear, since the percentage change for firms with high trading volumes is much larger than for low volume firms, so we use the following logarithmic regression model to estimate the parameters of the relation between pre- and post-listing daily trading volume:

$$PctChg_{NYSE} = \mathbf{b}_0 + \mathbf{b}_1 LogVol_{Nasdaq} \quad (1)$$

where the dependent variable,  $PctChg_{NYSE}$ , is the percentage change in reported trading volume when the firm changes from Nasdaq to the NYSE, the independent variable,  $LogVol_{Nasdaq}$ , is the logarithm of the firm's average daily trading volume (millions) on Nasdaq, and the  $\beta$ 's are the parameters of the regression. The results of the regression analysis are as follows:

$$PctChg_{NYSE} = -\underset{(8.59)}{0.42245} - \underset{(4.57)}{0.09487} LogVol_{Nasdaq} \quad (2)$$

where the numbers in parentheses are  $t$ -statistics. The intercept and the coefficient are both significant at the .0001 level. The intercept indicates that, on average, there is a 42 percent decrease in reported trading volume when a firm switches from Nasdaq to the NYSE before considering the firm's previous Nasdaq volume. The adjusted  $R^2$  of the regression is .0668. At least historically, a firm's reported trading volume on the NYSE is a function of the firm's pre-switch reported trading volume on Nasdaq, albeit a non-linear function.

Investors, regulators, expert witnesses, and other interested parties may find Equation (2) useful as a benchmark to adjust trading volumes reported for Nasdaq firms to make them comparable to the trading volumes reported for firms traded on the NYSE. Consider our earlier example of Ross Stores. What would its reported trading volume be on the NYSE? According to Equation (2), after the change Ross Stores' average daily reported trading volume would be

$$-0.42245 - .09487[\log(1.0505)] = -0.4271 = -42.71\%,$$

resulting in an average reported daily trading volume of 601,831 shares if Ross Stores was trading on the NYSE, about 67 percent of the average daily volume reported on Nasdaq. Alternatively, a rule of thumb based on the results in Table 2 could be used, where a high volume stock such as Ross Stores might be expected to exhibit a 45 percent decline in trading volume if it traded on the NYSE.

In summary, no single "adjustment factor" can be used across the board to make trading volume reported for Nasdaq stocks comparable to trading volume reported for NYSE stocks. The required adjustment varies with the trading volume of the Nasdaq security. Over-counting of volume for Nasdaq stocks is itself a function of trading volume, so using a single adjustment factor for trading volume is potentially troublesome.<sup>20</sup> At a minimum, the differences between

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<sup>20</sup>The results of the numerous academic studies that have adopted a "one size fits all" adjustment when comparing Nasdaq and NYSE trading volumes may therefore require reexamination. For example,

high-volume and low-volume firms, documented in Table 2, should be taken into account. The median change in reported trading volume for high-volume firms changing to the NYSE is minus 45 percent, compared to only minus 22 percent for low-volume firms.

## V. RISKLESS PRINCIPAL TRADE-REPORTING RULES

In 1999 the SEC approved proposals to amend the National Association of Securities Dealers' (NASD) trade-reporting rules relating to so-called riskless principal transactions.<sup>21</sup> A "riskless" principal transaction is one in which an NASD member, after receiving an order to buy (or sell) a stock, purchases (or sells) the same security as principal at the same price to fill the order to buy (or sell). The Riskless Principal Trade-Reporting (RPTR) Rules require the dealer to report a riskless principal trade as one transaction, rather than reporting both the purchase (or sale) by the dealer and the subsequent sale to (or purchase from) the customer as separate transactions. These rules finally took effect on February 1, 2001, for transactions that qualify as riskless principal trades.

The effect of this SEC-mandated change on the trading volume reported for Nasdaq stocks is an empirical question. We examine the change in reported trading volume when firms switch from Nasdaq to the NYSE during or after March 2001, when their trading volumes on Nasdaq reflect the impact of the RPTR Rules. There are 59 firms in this group. One of these firms is Krispy Kreme Doughnuts, which we eliminate for reasons mentioned earlier. We match each of the 58 remaining firms changing from Nasdaq to the NYSE during or after March 2001 with a firm that switched before March 2001. The matching pre-Rules firm is the firm in our sample that has the closest Nasdaq trading volume to that of the post-Rules firm. This matching

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LaPlante and Muscarella (1997), Barclay et al. (1998), Krigman et al. (1999), Weston (2000), Chung et al. (2001), and SEC (2001).

<sup>21</sup>See NASD (1999a, 1999b, 2000).

criterion is chosen because section firms' pre-switch Nasdaq trading volumes explain the level of the firms' post-switch NYSE volumes.

The results of our comparison of pre- and post-Rules changes in reported trading volume when firms switch from Nasdaq to the NYSE appear in Table 3. The post-Rules firms' mean and median trading volumes on Nasdaq are indistinguishable from that of the pre-Rules control group, indicating that the firms are well matched. Although the majority of the post-Rules firms continue to exhibit a decrease in reported trading volume when they change to the NYSE, the proportion is 82.8 percent of the firms, compared to 86.2 percent of the firms in the pre-Rules control group.

The median post-Rules drop in reported trading volume--about 34 percent--is a better measure of the degree to which trading volume for Nasdaq stocks continues to be over-counted since the adoption of the rules than the mean value of 26 percent. The median pre- and post-RPTR Rules changes in trading volume are not statistically different based on a Wilcoxon sign-rank test. It appears that, at least to date, the adoption of the Riskless Principal Trade-Reporting Rules on Nasdaq has not materially changed the degree to which Nasdaq trading volumes are overstated. Possibly the number of Nasdaq trades that qualify as pure riskless principal trade, as defined in the RP Rules, is only a small percentage of all trades through Nasdaq dealers.

Finally, we use the same sample of 58 matched firms to examine the pre- and post-Rules change in reported trading volume for high-volume versus low-volume firms changing from Nasdaq to the NYSE. Seventy five percent of the firms changing from Nasdaq to the NYSE from March, 2001, through 2002 are classified as high-volume firms and the remaining 25 percent are low-volume firms.<sup>22</sup> The percentage changes in reported trading volume when the firms switch to the NYSE are as follows:

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<sup>22</sup> The smaller proportion of low-volume firms changing to the NYSE during this period, compared to the overall 1997-2002 period, may be a particular characteristic of a bear market and/or an economic downturn.

<u>Trading Volume</u>	<u>Statistic</u>	<u>Pre-Rules</u>	<u>Post-Rules</u>
>125,000 shares/day (n = 43)	Mean	-43.47%	-34.14%
	Median	-44.94%	-41.85%
	Percent Negative	93.02%	90.70%
<125,000 shares/day (n = 15)	Mean	-1.20%	-1.16%
	Median	-24.33%	-11.20%
	Percent Negative	66.67%	60.00%

As expected, both the pre- and post-rules declines in reported trading volume are larger for high volume firms than for low-volume firms. The post-Rules median declines in trading volume for high-volume stocks is not notably different from the pre-rules declines, and proportion of firms whose reported trading volume declines remains overwhelming. None of the differences between pre- and post-Rules changes in trading volume are statistically significant. Although the median post-rules decline for low-volume stocks is much smaller than for the matching pre-rules firms, there are only 15 observations.

In summary, the Riskless Principal Trade-Reporting Rules appear to have had little impact on the overstatement of reported trading volume for high-volume stocks, but they have reduced the extent to which Nasdaq trading volume for low-volume stocks is overstated compared to NYSE volume.

## V. CONCLUSIONS

Firms changing from Nasdaq to the NYSE from 1997 through 2002 exhibit a median decrease of 38 percent in reported trading volume of approximately, an indication of the overcounting of trading volume that occurs in dealer markets compared to auction markets. This decrease is smaller than the 50 percent decrease reported in earlier studies, but it is still substantial enough to warrant attention. Both dealers' participation in most trades on Nasdaq and inter-dealer trading continue to cause trading volumes for Nasdaq stocks to be overstated compared to trading volumes reported for NYSE stocks. Neither the changes in Nasdaq's order

handling rules in 1997 nor the increased role of ECNs in transactions on Nasdaq have eliminated the overstatement of reported trading volume for Nasdaq stocks.

Firms with high daily trading volumes exhibit the largest decreases in reported trading volume when they move from Nasdaq to the NYSE, because the NYSE specialist seldom needs to participate in trading their stock. Firms with low daily trading volumes exhibit the smallest decreases in reported trading volume, because the specialist on the NYSE frequently acts as a dealer in the market for their stock--either buying into his inventory or selling out of his inventory in order to bridge the non-synchronous pattern in the arrival of and buy and sell orders in a thin market and to maintain an orderly market for the firms' shares. The post-listing trading volume of firms changing from Nasdaq to the NYSE is therefore related to the firms' reported volume on Nasdaq. The relation between pre- and post-listing trading volume is not linear so the use of a single adjustment factor to compare Nasdaq and NYSE volumes may not be warranted.

Finally, we consider the Riskless Principal Trade-Reporting Rules approved by the SEC in 1999 and implemented in February of 2001, which specify that when the market maker acts only as an intermediary between the buyer and seller, her participation in the transaction is not reported as trading volume. We find that the median decrease in reported trading volume for firms switching from Nasdaq to the NYSE after February of 2001 is less than 35 percent, compared to a decrease of about 43 percent for a control group of similar firms during the 1997-2000 period. The median post-Rules decrease for high-volume firms, however, is about 42 percent compared to about 45 percent for a matched sample of firms switching exchanges before the rules took effect. We conclude that the Riskless Principal Trade-Reporting Rules have not meaningfully affected the overstatement of reported trading volume for Nasdaq firms that have high trading volumes.

In conclusion, the post-1997 trading volumes reported for Nasdaq stocks are still overstated by a considerable amount compared to trading volumes for NYSE stocks. The various

changes that have occurred during the past four years have reduced the discrepancy somewhat, but it remains material.

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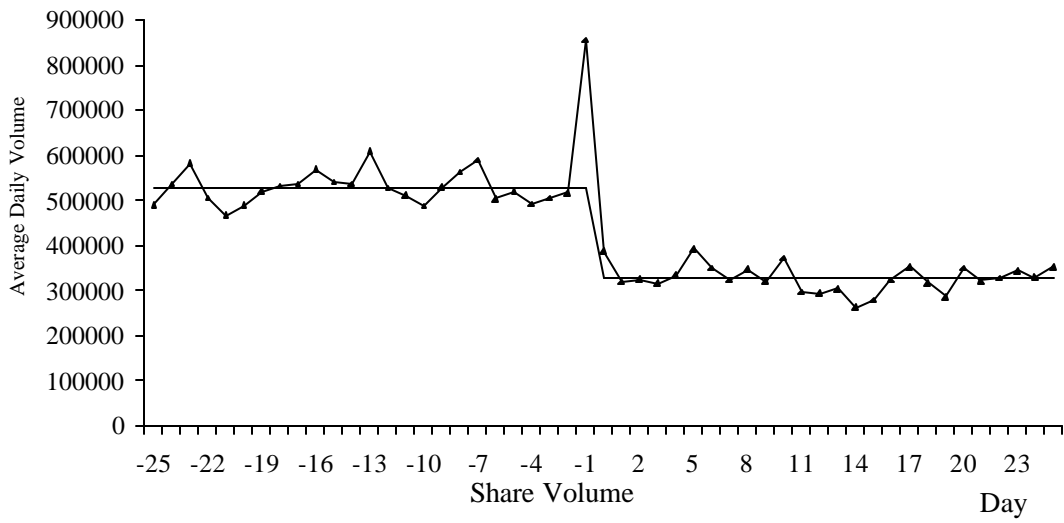


Figure I. Daily Trading Volume of Firms that Change from Nasdaq to the NYSE

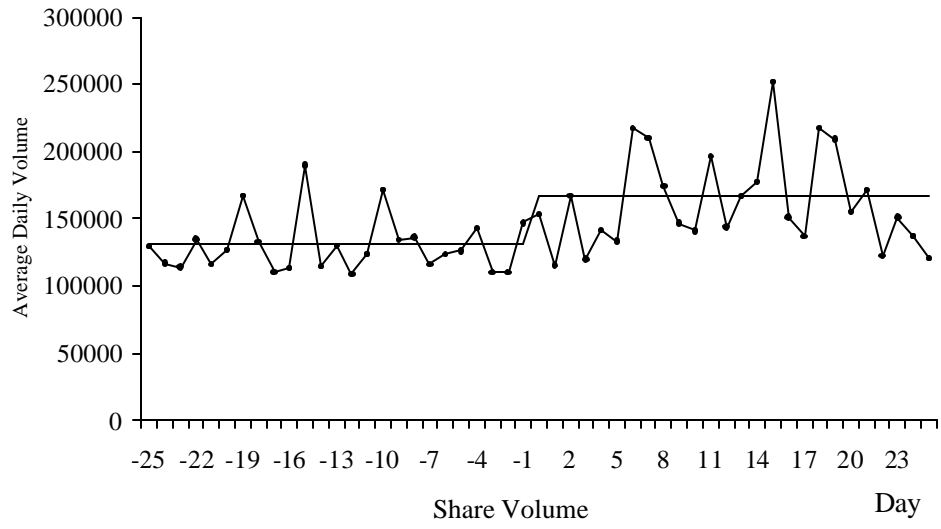


Figure II. Daily Trading Volume of Firms that Change from the Amex to the NYSE

Table 1  
Daily Trading Volumes of Firms Switching to the NYSE from either Nasdaq or the Amex

	Number of Firms	Pre-switch Volume (000s)	Post-switch Volume (000s)	Change (000s)	Percent Change	Percent Negative
A. Firms Changing from Nasdaq to the NYSE						
Mean	279	528.92	325.97	-202.95 <sup>a</sup>	-24.66% <sup>a</sup>	80.65%
( $\sigma$ )		(1356.01)	(894.07)	(564.79)	(52.98)	
Median		158.00	93.94	-45.15	-37.91%	
B. Firms Changing from the Amex to the NYSE						
Mean	66	130.83	166.88	36.05 <sup>c</sup>	30.96%	48.48%
( $\sigma$ )		(255.38)	(356.30)	(159.05)	(89.04)	
Median		48.43	43.14	0.30	2.83%	

a Significantly different from zero at the 1 percent level.

b Significantly different from zero at the 5 percent level.

c Significantly different from zero at the 10 percent level.

Table 2  
 Changes in Reported Trading Volume for Firms Classified According to Pre-NYSE Trading Volume

Volume Category	Number of Firms		Nasdaq Volume (000s)	NYSE Volume (000s)	Change (000s)	Percent Change	Percent Negative
> 125,000 shares/day	156	Mean ( $\sigma$ )	904.36 (1724.91)	544.16 (1150.31)	-360.20 <sup>a</sup> (717.30)	-39.41% <sup>a</sup> (36.09)	92.30%
		Median	345.59	199.95	-154.06	-45.24%	
<125,000 shares/day	123	Mean ( $\sigma$ )	52.76 (32.18)	49.25 (48.05)	-3.51 (38.09)	-5.94% (64.11)	65.85%
		Median	48.17	31.51	-8.62	-21.54%	

a Significantly different from zero at the 1 percent level.

b Significantly different from zero at the 5 percent level.

Table 3  
 Comparison of Pre- and Post-Riskless Principal Trade-Reporting Rule Changes in Trading Volume When Firms Switch from Nasdaq to the NYSE (58 matched firms)

		Pre-rule Firms (000s)	Post-rule Firms (000s)	Difference (Pre- minus Post-rule) (000s)	Significance Level
Nasdaq Volume	Mean	848.65	887.00	-38.351	.1975
	(s)	(1616.39)	(1665.26)	(224.01)	
	Median	375.51	378.82	-1.43	.8363
Change in Trading Volume	Mean	-331.10	-378.00	-46.90	.3877
	(s)	(620.19)	(814.71)	(410.32)	
	Median	-132.30	-122.21	-7.29	.6338
Percent Change in Trading Volume	Mean	-32.54%	-25.61%	-6.93%	.3272
	(s)	(46.04)	(37.84)	(53.37)	
	Median	-42.86%	-34.42%	-3.16%	.1296
Percent Decreases in Trading Volume		86.21%	82.76%		