

Off but Not Gone: A Study of Nasdaq Delistings

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Abstract

We examine 1,098 Nasdaq firms delisted in 1999-2002 that subsequently traded in the OTC Bulletin Board and/or the Pink Sheets. Market quality deteriorates significantly after delisting: share volume declines by two-thirds; quoted spreads almost triple from 12.1 to 33.9 percent; effective spreads triple from 3.3 to 9.9 percent; and volatility more than triples from 4.4 to 14.3 percent. Deterioration is significantly larger for more severe violations (e.g. bankruptcy) than for lesser infractions (e.g. minimum bid price). We find the OTC Bulletin Board provides a “soft landing” for delisted firms relative to the Pink Sheets. Although the delisting process takes at least 90 days, the drop in market quality is concentrated on the delisting date, highlighting the benefits of Nasdaq listing and the economic rationale for tiered listing fees. We argue that the increased costs resulting from enforcing Nasdaq’s minor (non-core) listing criteria outweigh the benefits.

Between 1998 and 2004, almost 4,000 firms were delisted by the Nasdaq Stock Market—roughly one in five Nasdaq-listed firms are delisted each year! While many firms leave Nasdaq voluntarily (via merger or acquisition) almost half are delisted because the firm violates Nasdaq's listing requirements. These listing requirements include *non-core* requirements such as minimum market float and bid price, and *core* requirements such as minimum number of shareholders, market capitalization, and number of market makers. They also include a set of *corporate-governance* related requirements such as timely Securities and Exchange Commission (SEC) disclosure. Lastly, a firm is commonly delisted from Nasdaq following a *bankruptcy* filing.

A well-kept secret is that most delisted firms continue to trade, sometimes very actively, in the OTC Bulletin Board and in the Pink Sheets. For example, on March 3, 2004, more than a year after WorldCom declared bankruptcy, Pink Sheet trading volume in the three cent WorldCom stock was almost 15 million shares. That same day, \$1.30 I2 Technologies shares, delisted the prior year for failure to file a 10-K with the SEC, traded 3 million shares. Many delisted firms continue trading immediately in the OTC Bulletin Board or Pink Sheets, allowing for a rich examination of market quality across these venues.

In this paper, we test whether market quality deteriorates after a firm is delisted from Nasdaq based on 1,098 delistings during 1999-2002. We compute measures of market quality such as spreads, volume and volatility during the three months of Nasdaq trading prior to delisting as well as the three months of OTC Bulletin Board and/or Pink Sheet trading after delisting. We find that all dimensions of market quality deteriorate significantly following a delisting. As a result, shareholders of delisted firms face a tremendous increase in trading costs and volatility accompanied by a drop in trading

volume and market maker activity. Share volume declines by almost two-thirds, quoted spreads almost triple from 12.1 to 33.6 basis points, effective spreads triple from 3.3 to 9.9 basis points, and intraday volatility more than triples from 4.4 to 14.3 percent when stocks are delisted.

Firms may be delisted for violating a number of different criteria, ranging from *non-core* violations that Nasdaq deems relatively minor to *bankruptcy*, the most severe. We test whether the deterioration in market quality is related to the severity of these listing violations. Consistent with our severity rankings, we find the deterioration in market quality is largest for bankruptcy, followed by *corporate governance* (e.g., SEC disclosure), *core* (e.g., size), and *non-core* (e.g., stock price below \$1.00) listing violations. For example, firms that are delisted for bankruptcy experience an 80 percent decline in share volume and an increase in quoted spreads from 11.3 to 50.0 percent. By comparison, the average *non-core* violation results in a 25 percent decline in share volume and an increase in quoted spreads from 13.4 to 29.7 percent. Similar differences in effective spreads and intraday volatility obtain as well.

Nasdaq firms can be delisted from the National Market (NM) or from the SmallCap Market (SC).¹ Delisted firms may end up trading on the OTC Bulletin Board, on the Pink Sheets, or not at all. We test whether the extent of deterioration in market quality is related to how far the firm falls in the hierarchy of these dealer markets, ranking venues from top to bottom as Nasdaq NM, Nasdaq SC, OTC Bulletin Board, and Pink Sheets. We find that that the further the firm falls, the worse the erosion in market quality. *Ceteris paribus*, delisted firms landing on the OTC Bulletin Board experience less deterioration than firms landing on the Pink Sheets, indicating that OTC Bulletin

¹ On July 1, 2006 Nasdaq is reorganizing into three distinct market tiers—Global Market Select, Global Market (the former NM), and Capital Market (formerly SC).

Board provides a “softer landing” for delisted firms. For example, consider firms delisted from Nasdaq’s NM. Median share volume declines by 25 percent with a move to the OTC Bulletin Board, but declines a full 60 percent on the Pink Sheets. Similarly, quoted spreads increase significantly from 10.0 to 23.7 percent with a move to the OTC Bulletin Board but increase precipitously from 9.4 to 49.3 on the Pink Sheets. These results hold for volatility and effective spreads, after controlling for the reason for delisting and qualitatively for SmallCap delistings as well.

For Nasdaq, the costs borne by shareholders and the firm have to be weighed against the benefits that Nasdaq might reap from enforcing their listing standards. Macey, O’Hara, and Pompilio (2005) argue that markets enforce listing criteria to ensure that the market’s relationship with the listed company remains profitable while protecting the reputation of the listing venue. Listed stocks need to have sufficient order flow to generate transactions fees that cover the costs of listing (systems, regulation and reputation). We provide rough estimates of these costs and benefits to evaluate the economic rationale behind enforcing Nasdaq’s *non-core* listing criteria. We argue that enforcing these criteria likely hurts Nasdaq economically and suggest that the *non-core* criteria be reconsidered or amended.

One of our contributions is to examine the economic effects of enforcing Nasdaq’s continued listing requirements. Primarily due to data considerations, the only other investigation of delistings is by Macey, O’Hara, and Pompilio (2005). They also find significant market quality deterioration for NYSE-delisted firms. They note that NYSE-delisted firms are not automatically eligible to trade on the OTC Bulletin Board and lament the fact that there is not a market to provide a softer landing than the Pink

Sheets.² We find that the OTC Bulletin Board provides a softer landing relative to the Pink Sheets.

Our second contribution is to provide the first comprehensive analysis of market quality in the OTC Bulletin Board and Pink Sheet markets. There has been almost no research on these markets in the literature. Shumway (1997) and Shumway and Warther (1999) examine the price patterns of delisted stocks in order to estimate the delisting bias in CRSP stock returns. Luft and Levine (2001, 2004) analyze the daily return characteristics of OTC Bulletin Board stocks.³ Our results are a first peek at market quality, trading costs and quoting activity for stocks trading in the OTC Bulletin Board and Pink Sheet markets.

Our results support the economic rationale for larger fees for listing higher in the hierarchy--Nasdaq charges higher initial and continued listing fees for National Market listing than for SmallCap listing. Firms violating more stringent listing requirements lose relatively more value upon delisting. Likewise, firms falling further down the hierarchy of listing standards lose relatively more value. Nasdaq's increasing fee structure across the listing hierarchy is economically justified by our results.

The rest of the paper proceeds as follows. We outline our hypotheses in Section I, and describe Nasdaq's continued listings requirements and the process of delisting in Section II. We briefly discuss the OTC Bulletin Board and Pink Sheet markets in Section III and describe our data in Section IV. Section V includes our results on market quality and Section VI discusses the economics of delisting more generally. Section VII concludes.

² Although all but eight NYSE delistings in Macey, O'Hara and Pompilio (2004) trade on the OTCBB, they do not have this data.

³ Seguin and Smoller (1997) study survival of low-priced IPOs on Nasdaq, but generally do not examine off-exchange trading. Bushee and Leuz (2005) examine the impact of the SEC's requirement that OTC Bulletin Board firms file financial statements with the SEC.

I. Hypotheses

When a firm is delisted from Nasdaq, there is no automatic transition to a new trading venue. For trading to continue, at least one market maker needs to apply to the National Association of Securities Dealers (NASD) to get permission to start quoting the stock in either the OTC Bulletin Board or the Pink Sheets (see Section III below). In the investment community, firms trading on these venues are viewed as highly risky. The SEC web-site (www.sec.gov) warns investors to beware of the lack of information available for firms listed on the Pink Sheets and the potential for fraud. Moreover, fewer dealers actively quote in these markets, so trading costs are likely to be higher and market quality (as measured by volatility and volume) lower as well (Stoll (1978) and Ho and Stoll (1981)).

H1: *Market quality deteriorates after delisting.*

Following Nasdaq's own ranking, we consider *bankruptcy* and/or liquidation to be the most serious violation, followed by *corporate governance* violations. Nasdaq groups other, less serious violations by *core* (size, profitability, ownership, and fees) and *non-core* (stock price and public float). These rankings are likely correlated with the degree of uncertainty regarding future firm value. The payoff to shareholders after bankruptcy is highly uncertain, whereas there is relatively less uncertainty about firms that have low stock prices but continue to file financials with the SEC. The deterioration in market quality should therefore be systematically related to this ranking.

H2: *Market quality deteriorates more for delisted firms that violate more important listing criteria.*

Some firms move to the OTC Bulletin Board after delisting while others end up trading in the Pink Sheets. We include a detailed description of these markets in Section III noting that, while neither market has other formal listing requirements, the OTC Bulletin Board has since 2000 required SEC disclosure. More public disclosure tends to be associated with less risk, so we expect less deterioration in market quality for firms landing on the OTC Bulletin Board than for firms landing in the Pink Sheets.

H3: *Market quality deteriorates more after delisting if the firm falls down further in the hierarchy of markets.*

II. Nasdaq's Listing Requirements and the Delisting Process

In order to qualify to have its stock listed on Nasdaq's National Market (NM) or on its SmallCap Market, a firm has to satisfy a set of initial listing requirements, formally apply to be listed and pay an initial listing fee. In addition, firms pay annual listing fees to maintain Nasdaq listing. Annual listing fees are uniformly higher for SmallCap listing than for National Market listing, indicating that the market perceives incremental benefits from National Market listing.⁴

Like many other markets, Nasdaq also enforces a set of continued listing requirements for each of its market segments, the so-called maintenance standards

⁴ SmallCap annual fees top out at \$21,000 whereas National Market fees may be as much as \$75,000. In 2005, initial and continued listing fees comprised 34% of Nasdaq revenues.

(described in Appendix A).⁵ Firms that have filed for bankruptcy protection or are in liquidation violate Nasdaq's *bankruptcy* standard and no longer qualify for listing. Beyond bankruptcy, Nasdaq groups its continued listing requirements into corporate governance, core, and non-core requirements. The *corporate governance* requirements include timely reporting to the SEC and items related to the firm's governance process. The *core* requirements include size- and profitability-related variables such as a minimum level of net tangible assets and net income and secondary market-related variables such as a minimum number of round lot shareholders and registered market makers. *Non-core* requirements include a minimum bid price and a minimum (market value) of the firm's public float.

Nasdaq monitors the continued listing requirements daily for all its listed stocks. When a firm is found to violate one of the requirements, the extensive and protracted process of delisting begins. Nasdaq initially sends a deficiency notice and the firm is given a grace period of 30 to 180 days to regain compliance. If the firm remains in violation through the grace period, Nasdaq sends a determination letter informing the firm that it does not meet listing standards. The firm may appeal this determination and request a hearing (to be held 45 days later) before an impartial panel to present a plan of compliance. The panel decides on the delisting within two to four weeks. Further appeals, although possible, do not delay delisting. The entire process takes a minimum of 90 days and may last more than 250 days, suggesting that the delisting itself is not an unanticipated event. We provide a timeline describing the sequence of delisting events in Figure 1 and provide further details of the delisting process in Appendix B.

⁵ The maintenance standards are described in Marketplace 4450(a), 4450(b), 4350 and 4351 for NM, and in Marketplace 4310(c) for SC.

Once a firm is delisted from Nasdaq's NM or SC market, the firm cannot list itself on the OTC Bulletin Board or the Pink Sheets. Trading may only commence on the OTC Bulletin Board or Pink Sheets if at least one market maker files an application (Form 211) with (and is approved by) the NASD to start quoting the stock. The market maker has to show that he has access to the latest financial statements of the firm, and that he is otherwise informed about the firm's business (among other things). To be traded on the OTC Bulletin Board, the firm also has to be current in its SEC filings. However, the OTC Bulletin Board offers a minimum 30-day grace period so that a filing-delinquent firm might still qualify for OTC Bulletin Board trading. With current SEC filings, bankrupt firms can be traded on the OTC Bulletin Board. There is no SEC reporting requirement for quoting on the Pink Sheets.

III. The OTC Bulletin Board and Pink Sheets Markets

The OTC Bulletin Board and Pink Sheets markets trade stocks that either do not or choose not to qualify to trade on other markets in the United States. OTC Bulletin Board and Pink Sheet trading data are not included in traditional databases such as CRSP and TAQ. There is also very limited analyst coverage of these stocks. Hence, although approximately 3,200 stocks trade concurrently on both venues and another 4,300 stocks trade exclusively in the Pink Sheets, we know very little about trading in these markets.

The OTC Bulletin Board was established by the NASD in 1990 to serve as a quotation medium for stocks that were not traded on other markets. As noted above, companies are traded on the OTC Bulletin Board at the market maker community's

discretion. In fact, a company cannot prevent the trading of their shares in the OTC Bulletin Board if they are current with SEC financial statement filings.⁶

The OTC Bulletin Board operates a quotation service but does not provide order delivery or execution. Trades are executed via the telephone or through a private electronic linkage. Many OTC Bulletin Board trades were until very recently executed via telephone, but automated execution via Instinet/Island and Archipelago Electronic Communication Networks (ECNs) emerged in 2003.

Most OTC Bulletin Board stocks are penny stocks, priced below \$5 and fall under the SEC's Penny Stock Rules (Rules 15g-2 through 15g-9).⁷ Approximately 2,500 (78%) of OTCBB stocks are priced less than \$1, and almost 3,000 (94%) are priced less than \$5. The Penny Stock Rules are designed to combat micro-cap fraud, and require that the broker determine that the transaction is suitable for the customer, obtain a written agreement for a transaction from new customers before trading, and provide a written warning about the risks of penny stocks. These rules make it more difficult for brokers to recommend and trade low-priced stocks for their customers.

The Pink Sheets grew out of the price quotations for unlisted stocks that were originally published daily on pink sheets of paper by the National Quotation Bureau. The old physical Pink Sheets served as advertising for the market makers who quoted those stocks. The Pink Sheets introduced electronic quotations in 1999. On February 14, 2003, Pink Sheets LLC started allowing issuers to sponsor (for \$174.95/month) real-time quote display for their stocks on www.pinksheets.com, and on June 2, 2003, they introduced PinkLink – for electronic messaging and trade negotiation.

⁶ See SEC Rule 15c2-11, NASD Rule 6740, and Securities Exchange Act Release No. 29094 (April 17, 1991). Prior to 2000, companies were not required to be SEC registrants. Bushee and Leuz (2005) explore the consequences of this requirement.

⁷ Stocks listed on the NYSE, AMEX, and Nasdaq are automatically exempt from the Penny Stock Rules.

The broker-dealers who trade on the Pink Sheets are regulated by the NASD,⁸ but the Pink Sheets LLC itself is not required to submit to SEC regulation because it is neither a broker-dealer nor an exchange. Companies quoted in the Pink Sheets do not even need to be SEC registrants and, in fact, many well-known foreign stocks such as Nestlé are quoted through the Pink Sheets.

Trading rules are very different between the OTC Bulletin Board and the Pink Sheets and the major exchanges during our sample. For example, the SEC's Limit Order Display Rule (Rule 11ac1-4) requiring market makers to display customer limit orders in their quotes, did not apply to these markets.⁹ Similarly, these markets have no short sale rules like the NYSE's uptick rule or NASDAQ's bid test. However, short selling is difficult in these markets since it is difficult to borrow shares. Furthermore, no tick size rules govern these markets – participants are free to use any price increment they choose.

IV. Data

We identify the securities that were delisted during the period January 1, 1999 to December 31, 2002 using Nasdaq's website (www.nasdaqtrader.com). During these four years, 3,631 securities were delisted from Nasdaq. We eliminate all securities other than common stock or American Depositary Receipts (ADRs), reducing our sample to 2,943 delistings. Since we focus on regulatory delistings, we eliminate securities that were delisted voluntarily (e.g., those moving to the NYSE, AMEX or going private) and

⁸ Prior to April 2003, when the SEC approved NASD Rule 6630 requiring NASD members to record detailed information on Pink Sheet quotes, the NASD had difficulty enforcing regulations for lack of data. The Pink Sheets LLP now provides market maker quotations to the NASD for regulatory purposes.

⁹ In December 2002, the SEC approved a limit order protection rule (SR-NASD-2002-153) for OTCBB securities.

securities that were delisted via merger or acquisition. We also remove securities we could not track across many ticker changes reducing our sample to 1,260 securities.¹⁰

We obtain proprietary trades and quotes from the Nasdaq Stock Market Inc. and from Pink Sheets LLC. Our data includes trade-by-trade and quote data for all National Market, SmallCap, OTC Bulletin Board, and Pink Sheet stocks (quotes are daily summaries for Pink Sheets) for the period October 1, 1998 to March 31, 2003. In addition, we obtain daily data on open, close, intraday high and low, closing bid and ask quotes, and share volume for Pink Sheet stocks. Our event window is ± 60 trading days surrounding delisting. We match the delisted securities to Nasdaq trading data for the three-month period prior to delisting using Nasdaq's own issue identifiers. We find Nasdaq trading data for 1,245 securities in the three-month period preceding delisting, but only 1,098 trade in the OTC Bulletin Board and/or the Pink Sheets during the three-month period after delisting. Thus, our final sample consists of 1,098 securities that experienced an involuntary regulatory delisting from Nasdaq during 1999-2002. Since we cannot measure market quality for the 147 securities that do not trade after delisting, our estimates provide lower bounds for trading cost and market quality changes.

Table 1 describes the distribution of the final sample between markets. Note that securities may trade both in the National Market and SmallCap market in the three-months prior to delisting, and in both the OTC Bulletin Board and Pink Sheets after delisting. Roughly half our sample originally traded in the NM and the rest traded either on the SC or in both markets prior to delisting. After delisting, more than two-thirds of the firms trade exclusively on the OTC Bulletin Board.

¹⁰ One delisting (ticker=MCITE) from the Nasdaq website was postponed so we use the later date. Nasdaq uses a fifth symbol to identify special situations such as a bankruptcy.

A security may be delisted for violating one or several of the continued listing requirements discussed in Section I. Panel A of Table 2 breaks down our delisting sample by year, and provides information on the reason for the delisting. We group the reasons for delisting into *bankruptcy*, *governance*, *core*, and *non-core* violations. Almost two-thirds of our sample firms are delisted because they violate one or more *non-core* listing requirement. In fact, the most common violation is for a bid price below \$1.00—violated by almost half of our sample firms. Roughly forty percent of delisted firms violate *core* requirements. *Governance* violations force a delisting for roughly forty percent of the sample. Notably, governance violations have increased dramatically over the sample period. *Bankruptcy* delistings are, by comparison, rare.

A delisted firm often violates more than one listing requirement. In Table 2, Panel B, we tabulate the frequency distribution of violations across all delisting criteria. The numbers on the diagonal report the number of firms that violate a single delisting criterion. For example, 382 firms (roughly 35 percent) in our sample violated the *non-core* listing criteria, but did not violate any *core* listing criteria, *governance* requirements, and were not bankrupt. By comparison, 207 firms violated both *core* and *non-core* listing criteria. For completeness, Panel C breaks down these numbers by year of delisting, classifying delisted firms according to the severity of their violation: *bankruptcy*, *governance*, *core* and *non-core* in that order. We ultimately classify sample firms by their most severe violation. For instance, if a firm violates both *governance* and *core* requirements, we treat it as a *governance* violation.

Our sample of firms includes those that originated in Nasdaq's National Market and SmallCap market prior to delisting. After delisting, the firms may trade on the OTC Bulletin Board and/or the Pink Sheets. Table 3 illustrates the reasons for delisting by

market of origin (Panel A), and market of trading after delisting (Panel B). After delisting, a disproportionate number of *bankrupt* firms and *governance* violators trade exclusively on the Pink Sheets as might be expected given the higher degree of disclosure required for OTC Bulletin Board trading. Interestingly, securities delisted for less severe *non-core* infractions rarely trade on the Pink Sheets (only 27 of 382, about seven percent). This suggests that these firms choose to maintain regular filing status with the SEC thereby not worsening the information environment for their investors.

Table 4 presents summary statistics on the distribution of market capitalization, trading volume, volatility, quoted spread, and stock price, for our sample firms. Market capitalization is based on total shares outstanding and the stock price twelve months preceding delisting as reported by CRSP. Daily trading volume is the average daily share volume, volatility is the average daily (high-low)/low, quoted spread is the average daily closing ask-closing bid divided by the closing mid-quote, and the stock price is the average closing mid-quote as reported by CRSP. Average statistics are computed over the period between 18 and 12 months prior to delisting for 1,083 securities. Due to data limitations (i.e., CRSP does not cover the entire period), we use between 12 and 6 months prior to delisting for 14 securities and over the six-month period prior to delisting for 1 security.

The average (median) market capitalization of sample firms one year before delisting is \$149.8 (\$24.82) million. The market capitalization declines to \$12.7 (\$4.4) million at the time of delisting. Hence, the market capitalization for these firms is truly decimated before delisting occurs. The average (median) price is \$5.53 (\$3.13) and quoted spread 5.59 (4.31) percent for sample firms one year before delisting. These firms

were already relatively low-priced stocks with relatively high spreads.¹¹ Lastly, our measures of volatility suggest that the market was very uncertain about the value of these stocks already one year before delisting with the average (median) intraday price range at 11.2 (10.3) percent. The cross-sectional distribution across characteristics in our sample is significant. For example, the market capitalization one year before delisting ranges from \$10,000 to \$42 billion and average daily share volume ranges from 132 shares to 32 million shares.

V. Delisting Effects

We first examine how delisting impacts market quality and firm value by analyzing intraday trading data for the six-month period straddling the actual delisting date in the accompanying tables. In almost all cases, these firms are on Nasdaq's watch list for delisting announced at least six weeks (and up to three months) in advance of the delisting date. The delisting event itself simply confirms the fact that the firm will no longer benefit from the advantages of Nasdaq listing. Therefore, we present daily patterns in the accompanying figures to highlight changes concurrent with the event.

A. Market Quality around Delisting

Our first hypothesis is that market quality deteriorates after delisting from Nasdaq. We test this hypothesis by comparing market quality measures in the three month period preceding delisting to market quality measures in the three month period following delisting. In Table 5 we report the equally weighted cross-sectional average (or median) of the individual security averages both pre- and post-delisting. The superscript, ^{OTCBB}, indicates measures computed only with OTC Bulletin Board data.

¹¹ Spreads one year before delisting are higher, in part, from tick size effects.

The last column reports percentage differences between pre- and post-delisting statistics with significance tests (pair-wise t-tests for means and Wilcoxon tests for medians).

Table 5 reveals that share volume declines by two-thirds from 386,000 to 133,000 shares per day, quoted spreads almost triple from 12.1 to 33.9 percent, and effective spreads triple from 3.3 to 9.9 percent when stocks are delisted from Nasdaq. In addition, average quoting activity declines significantly, from 25 to 5 quote updates per day. Our volatility measures also point to declining market quality. Average intraday return volatility more than triples from 4.4 to 14.3 percent and percentage intraday price ranges almost double from 34.4 to 61.5 percent. These economically and statistically significant changes clearly demonstrate that Nasdaq delisting decimates market quality.

In Figures 2 through 5, we illustrate that market quality deteriorates dramatically on the delisting day, indicating that a 3-month window partially obscures the shock to trading upon delisting. Figure 2 shows that trading activity declines markedly following delisting. The top panel shows significant volatility in daily share volume and the number of trades preceding a marked drop at delisting. This volatility in the two weeks preceding delisting suggests that traders have different views on the likelihood of an ultimate delisting of (at least some) sample stocks. The bottom panel illustrates that the decline in dollar volume is much smoother than the decline in share volume. The bottom panel also shows that stock prices decline steadily in the three months preceding delisting, from slightly above \$1 to near \$0.80 per share. Since the average stock price stabilizes after delisting, we infer that a significant part of the price decline reflects the anticipated delisting.

We illustrate quoting activity changes in Figure 3, presenting data for the 871 stocks that trade on the OTC Bulletin Board after delisting. In the top panel, quoting

activity declines significantly at the delisting date from about 15 to about 5 quote updates per day. The bottom panel illustrates the change in quoted spreads around delisting. Quoted percentage spreads creep up gradually in the period leading up to delisting (as the average stock price declines) and jump dramatically on the delisting day from about 14 to 40 percent. However, part of this increase is temporary with quoted spreads stabilizing at about 25 percent within three months of delisting.

We illustrate the change in effective spreads in Figure 4, again including data only from the 871 stocks that trade in the OTC Bulletin Board after delisting. Effective spreads hover around 4 percent prior to delisting and increase dramatically to around 18 percent on the delisting date. As with quoted spreads, post-delisting effective spreads decline gradually, stabilizing near 13 percent.

Figure 5 illustrates changing volatility around delistings measured as the event-time cross-sectional average of: (i) the standard deviation of intraday transactions returns; and (ii) the intraday price range (high-low/low). Clearly, the delisting event itself is associated with a six- to eight-fold increase in volatility on the day of delisting, reverting quickly after the delisting day to a relatively stable two-fold increase after about a month.

B. Market Quality and Violation Severity

We next test whether the deterioration in market quality is related to the severity of listing violation. Table 6 reports market quality changes by severity and illustrates that the declines in share and dollar volume are significantly higher the more severe the violation. For example, *bankruptcy* violations experience significant declines in median volume from 117,000 to 59,000 shares per day and from \$56,000 to \$3,000 per day. By comparison, *non-core* violations result in declines from 27,000 to 20,000 shares per day and from \$13,000 to \$6,000 per day. The increases in percent quoted and effective

spreads are also higher the more severe the violation. Time-weighted quoted spreads increase from 11 to 50 percent for *bankrupt* firms but only from 13 to 30 percent for *non-core* violators. The pattern for effective spreads is similar, but muted since we are only able to calculate effective spreads for OTC Bulletin Board stocks. The increase in volatility is larger for *bankrupt* firms (4.2 to 22.1 percent) than for *non-core* violators (4.6 to 11.2 percent) as well. Virtually all the changes in market quality are statistically significant.

C. *Market Quality and the Listing Hierarchy*

We also test whether the deterioration in market quality is related to the number of levels that the delisted firm drops in the listing hierarchy in Table 7. As indicated by the spread changes in Table 6, the drop in market quality appeared to be muted for firms dropping to the OTCBB. We assign each security to an originating market based on whether it traded in that market anytime during the three months prior to delisting. Similarly, we assign the each security to a destination market if it trades in that market during the three months post-delisting. We report equally weighted cross-sectional average (and median) of the individual security averages for ± 3 months around delisting.

By and large, market quality deteriorates more the further the firm falls in the listing hierarchy. At the extremes, market quality deteriorates more for firms falling from the NM to the Pink Sheets (Group 2) than for firms falling from the SC to OTC Bulletin Board (Group 3). The intermediate groups (1 and 4) generally fall in between these two extremes. For example, consider percentage quoted spreads. The largest drop (Group 2) implies an almost fivefold increase in spreads from 9.4 to 49.3 percent whereas the smallest drop (Group 3) instead implies a doubling of spreads from 14.2 to 31.7 percent. These results also hold once we control for market of origination. Market quality

declines more for moves from both the NM and SC to the Pink Sheets (Groups 2 and 4) than to the OTC Bulletin Board (Groups 1 and 3).

Macey, O'Hara, and Pompilio (2005) find that daily share volume is cut in half, spreads increase from 5.9 to 8.7 percent and volatility more than doubles for NYSE to Pink Sheet delistings. Our NM to Pink Sheet delistings (Group 2) experience similar changes with share volume declining by almost 60 percent, quoted spreads increasing from 7.6 to 11.8 percent and volatility more than doubling as well. The decline in market quality for NM to OTC Bulletin Board delistings (Group 1) is much less dramatic, suggesting that the OTC Bulletin board provides a softer landing than the Pink Sheets.

We examine market quality changes both by market of origin and destination and the dominant reason for delisting in Table 8. Even after controlling for the markets of origin and destination, we find that market quality deteriorates significantly more for firms that engage in a more severe listing violation. Similarly, controlling for the severity of the listing violation, we find that the deterioration in market quality is larger the further the company drops in the hierarchy of markets.

D. Multivariate Analysis of Quoted Spread Changes

Table 9 presents regressions exploring the sources of quoted spread deterioration around delisting. We examine the determinants of percentage quoted spreads for delisted firms accounting for firm, market and trading characteristics. As found in previous research, the first column shows that quoted spreads are decreasing in trading volume and firm size and increasing with volatility. The second column shows that after controlling for these firm and trading characteristics, spreads are uniformly higher after delisting. This regression indicates that the change in quoted spreads is largely due to trading and market characteristics and is not related to the reason for delisting. Consistent with the

soft landing afforded by the Bulletin Board, quoted Pink Sheet spreads exceed Bulletin Board spreads after delisting. Quoted spreads are also significantly more sensitive to dollar trading volume following delisting, perhaps indicating that the relative lack of permanent liquidity suppliers creates a more order-driven market post-delisting. Post-delisting quoted spreads are less sensitive to transaction volatility, however.

The third column in Table 9 indicates that post-delisting Pink Sheet spreads are also significantly more sensitive to dollar trading volume and volatility than are Bulletin Board spreads. Thus, as represented by quoted spreads, the softer landing afforded by Bulletin Board listing is driven by a more muted response to both volume and volatility.

E. Delisting and Firm Value

We test whether the increases in trading costs and reduction in liquidity reported in Tables 6 to 8 are economically important by examining firm value around delistings. We measure the delisting effect on firm value by following an equally-weighted buy-and-hold portfolio of delisted stocks from the day before to 60 days following delisting. We scale to a \$100 starting portfolio and follow daily changes after delisting. The losses in value are significant and occur almost entirely from days -1 to +1. For the overall sample, the value of the portfolio drops by 19.0 percent (to \$81) by day +1. The downward drift in the following 60 days is minor by comparison. Over the next sixty days, the portfolio drops another 3.2 percent (to \$77.8), for a cumulative loss of 22.2 percent by the end of the window.¹² Portfolio values diminish more for firms with more serious listings violations, suggesting that delisting returns are at least partially driven by information effects.

¹² Value-weighted portfolio losses are greater, with an initial loss of 21.1 percent and cumulative 60-day loss of 26.7 percent.

VI. The Economics of *Non-core* Delisting Criteria

The analysis above focuses on the costs facing shareholders of Nasdaq-delisted firms. The flip side of these costs is the potential net benefits to Nasdaq from enforcing the continued listing criteria. In delisting a firm, Nasdaq balances the loss in listing fees, the savings in systems and regulatory costs, and the enhanced value of the Nasdaq brand name believed to be associated with maintaining the listing standards. While we believe that *bankruptcy*, *governance*, and *core* violations are reasonable grounds for delisting, we explore here whether enforcing *non-core* requirements make economic sense. We analyze rough estimates of the costs and benefits incurred by enforcing the minimum bid price and minimum float rules, focusing on the last year of the sample (2002) to avoid discounting issues.

Using the two-day delisting drop in value for these firms, we estimate an average 15.8 percent shareholder loss from 65 *non-core* violations in 2002. Given that the aggregate market capitalization of these firms is \$422 million on the day prior to delisting, a 15.8 percent drop in value generates a total loss of \$67 million.

Calculating Nasdaq's foregone listing fees is straightforward. Figure 6 reports the lost listing fees by year both for the overall sample and *non-core* violators. We also present total listing revenues by year to gauge the importance of lost listing fees to Nasdaq's bottom line. In 2002, continued listing fees represent about 12.5 percent of Nasdaq's \$787.2 million in revenues. That same year, Nasdaq lost \$1.5 million, or 1.5 percent, of its total listing revenues by delisting 65 *non-core* violators.

Calculating the savings in systems and regulatory costs is more challenging. Nasdaq's total expenses for 2002 were \$675.4 million with computers and equipment costs of \$147.3 million and regulatory costs of \$75.0 million. Nasdaq had 3,725 firms

listed at the end of 2002 with an average daily trading volume near 1.75 billion shares. The 65 *non-core* violators represent 1.7% of all firms, but only about 0.4% of total share volume. Assuming that computer and regulatory costs are proportional to share volume, the costs savings from delisting *non-core* violators would be \$0.9 million, falling short of the \$1.5 million in foregone listing fees (and without considering the costs imposed on delisting firm shareholders).

To address whether *non-core* violations presage subsequent problems or emerge to re-list, we track our sample of 378 *non-core* delistings for two years post-delisting. We estimate that just 170 (45.0 percent) would have been delisted for other reasons within two years, with 84 Pink Sheet firms likely violating *governance* standards, 43 bankrupt firms, and 43 liquidated firms. On the other hand, 4.8 percent (18 of the 378) of firms emerge to list on the American Stock Exchange (12) or Nasdaq (6).

The costs and benefits of enforcing non-core standards are perhaps best illustrated by the case of Ericsson AB. Ericsson AB, a member of the Nasdaq100 index in 2002, had a market value exceeding \$6 billion and a closing price under \$1.00 per share with 20 million shares traded per day. Ericsson AB executed a relatively expensive (Lamoureux and Poon (1987)) 10:1 reverse stock split on October 23, 2002, to comply with Nasdaq's *non-core* listing requirements. Ericsson AB arguably had sufficient order flow for profitable NM trading, and likely would not have compromised the integrity of the Nasdaq market by remaining listed at low prices. In spite of it all, Ericsson was forced into a costly reverse split by Nasdaq's *non-core* requirements.

VII. Conclusions

We test whether market quality deteriorates significantly for 1,098 firms whose stocks were delisted from Nasdaq during the period January 1, 1999 to December 31, 2002. With the exception of bankrupt firms, firms are publicly put on Nasdaq's watch list for delisting at least six weeks, and sometimes more than three months before the actual delisting date. Hence, most delisting events do not provide any material information about the firm beyond the fact that it will no longer trade in Nasdaq's systems. Over the three-month period before to the three-month period after delisting, we find that market quality deteriorates significantly, with most of the deterioration centered on the delisting day. Moreover, the average stock price declines by more than 58 percent from \$0.63 to \$0.26, highlighting that delisting imposes tremendous costs on shareholders in terms of lost share value coupled with higher trading costs.

Violations of the continued listing requirements range from minor (*non-core*) infractions such as a bid price below \$1.00 to severe problems such as *bankruptcy*. We hypothesize and confirm that market quality deteriorates significantly more for severe violations. These results show that Nasdaq classifications about the severity of violation is reflected in market quality changes.

Nasdaq can delist firms from the National Market or from the SmallCap Market. Delisted firms may end up trading on the OTC Bulletin Board, on the Pink Sheets, or not at all. We hypothesize and confirm that the extent of deterioration in market quality is related to how far the firm falls in the hierarchy of these venues. We find that the further a firm falls in the hierarchy, the worse the erosion in market quality, indicating that the OTC Bulletin Board provides a softer landing relative to the Pink Sheets. These results

also support the economic rationale for larger fees for listing higher in the hierarchy (National Market listing).

If deteriorating market quality is economically significant for shareholders, delisting should translate into a loss in firm value. We find, on an equal-weighted basis, firms lose 19 percent of value from the day before delisting to the day after delisting! Since delisting itself is anticipated and may depress prices leading up to delisting, this lost value likely underestimates total shareholder losses. The loss in firm value is related to the severity of the violation as well (*bankrupt* firms lose 24 percent whereas *non-core* violators lose 16 percent of firm value in the 2-day event window).

After estimating the costs and benefits created from *non-core* listing standards, we argue that Nasdaq should reconsider the strict enforcement of *non-core* listing requirements on otherwise-compliant firms. Delisting significantly erodes market quality and appears to destroy firm value, adding insult to injury to struggling firms that violate relatively minor *non-core* standards.

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Table 1
Distribution of Regulatory Nasdaq Delistings Between 1999-2002 Across
Markets of Origin and Destination

This table presents distribution of all regulatory Nasdaq delistings of common stock and ADRs between January 1, 1999 to December 31, 2002. Delistings are defined as regulatory if they were triggered by (1) bankruptcy, or (2) violation of any of the Nasdaq delisting criteria listed in Table 1. All delistings data were obtained from Nasdaq's website (www.nasdaqtrader.com). A security is defined to originate from a market if it traded in that market anytime during the three months prior to its delisting. Similarly, a security is defined to reach a market of destination if it trades in that market anytime during the three months after its delisting. We do not consider delistings that did not trade in any market after their delisting. NM refers to the Nasdaq National Market, SC refers to the SmallCap Market, OTCBB refers to the OTC Bulletin Board Market operated by Nasdaq and PS refers to the Pink Sheets Markets operated by Pink Sheets LLC.

	Market of Destination			Total
	OTCBB only	PS only	OTCBB and PS	
<u>Market of Origin</u>				
NM only	331	148	65	544
SC only	403	72	45	520
NM and SC	22	7	5	34
Total	756	227	115	1,098

NM to OTCBB = 423 firms
 NM to PS = 225 firms
 SC to OTCBB = 475 firms
 SC to PS = 129 firms

Table 2
Regulatory Reasons for Delisting Nasdaq Firms Between 1999-2002

This table presents distribution of the regulatory reason for the delisting of all common stock and ADRs in Nasdaq between January 1, 1999 to December 31, 2002. All delistings data were obtained from Nasdaq's website (www.nasdaqtrader.com). Regulatory reasons for delistings are classified into four major categories in the descending order of the severity of the violation of Nasdaq's listing criteria: (1) Reasons triggered by bankruptcy filing or liquidation, (2) Reasons triggered by corporate governance issues such as SEC filing violation and public interest, (3) Reasons triggered by violation of 'core' objective listing criteria as defined by Nasdaq, and (4) Reasons triggered by violation of 'non-core' listing criteria. Since a security may be delisted for multiple reasons, we define the dominant reason as the reason triggered by the most severe violation. For example, if a security was delisted for public interest (corporate governance) as well as for having market capitalization below minimum (core listing), we will define its dominant reason for delisting as corporate governance.

**Panel A: Breakdown by all the reasons mentioned for delisting Nasdaq firms
between 1999-2002**

	1999	2000	2001	2002	Total
All Regulatory Delistings	272	186	371	269	1,098
Bankruptcy/Liquidation reasons	11	25	71	46	153
Governance-related reasons	47	40	148	172	407
Filing	25	20	51	30	126
Public Interest	15	11	61	17	104
Shareholder Meeting	12	18	62	141	233
Proxy-related	0	4	10	12	26
Independent Directors	2	0	3	8	13
Disclosure	0	0	2	1	3
Core listing reasons	109	76	126	121	432
Market capitalization below minimum	75	53	114	107	349
Net tangible assets below minimum	106	73	120	107	349
Revenue below minimum	34	34	59	43	170
Net income below minimum	54	25	61	78	218
Round lot shareholders below minimum	1	2	1	0	4
Insufficient market makers	1	1	4	0	6
Non-core listing reasons	207	102	221	140	670
Bid price below \$1	165	75	189	91	520
Market float below minimum	61	27	54	40	182
Nasdaq-related reasons (fees, qualifications exception etc.)	32	18	23	50	123

Table 2 (Continued)**Panel B: Frequency distribution of the overlap among reasons for delisting**
(numbers in the diagonal represent delistings for that reason alone)

	Bankruptcy	Governance	Core listing	Non-core listing
Bankruptcy	50	71	16	42
Governance		102	199	138
Core listing			104	207
Non-core listing				382

Panel C: Breakdown of final sample by the dominant reason for delisting

Dominant Reason	1999	2000	2001	2002	Total
Bankruptcy/Liquidation reasons	11	25	71	46	153
Governance-related reasons	44	35	99	158	336
Core listing reasons	98	63	66	0	227
Non-core listing reasons	119	63	135	65	382

Table 3
Regulatory Reasons for Delisting Nasdaq Firms By Markets of Origin and Destination

This table presents distribution of the regulatory reason for the delisting of all common stock and ADRs in Nasdaq between January 1, 1999 to December 31, 2002 by the markets of origin and destination. All delistings data were obtained from Nasdaq's website (www.nasdaqtrader.com). A security is defined to originate from a market if it traded in that market anytime during the three months prior to its delisting. Similarly, a security is defined to reach a market of destination if it trades in that market anytime during the three months after its delisting. We do not consider delistings that did not trade in any market after their delisting. NM refers to the Nasdaq National Market, SC refers to the SmallCap Market, OTCBB refers to the OTC Bulletin Board Market operated by Nasdaq and PS refers to the Pink Sheets Markets operated by Pink Sheets LLC. Regulatory reasons for delistings are classified into four major categories in the descending order of the severity of the violation of Nasdaq's listing criteria: (1) Reasons triggered by bankruptcy filing or liquidation, (2) Reasons triggered by corporate governance issues such as SEC filing violation and public interest, (3) Reasons triggered by violation of 'core' objective listing criteria as defined by Nasdaq, and (4) Reasons triggered by violation of 'non-core' listing criteria. Since a security may be delisted for multiple reasons, we define the dominant reason as the reason triggered by the most severe violation. For example, if a security was delisted for public interest (corporate governance) as well as for having market capitalization below minimum (core listing), we will define its dominant reason for delisting as corporate governance.

Panel A: Breakdown by the dominant (all) reason for delisting by market of origin				
	NM only	SC only	NM and SC	Total
All Regulatory Delistings	544	520	34	1,098
Bankruptcy/Liquidation reasons	121 (121)	24 (24)	8 (8)	153 (153)
Governance-related reasons	145 (203)	187 (200)	4 (4)	336 (407)
Core listing reasons	99 (181)	121 (240)	7 (11)	227 (432)
Non-core listing reasons	179 (311)	188 (336)	15 (23)	382 (670)

Table 3 (Continued)**Panel B: Breakdown by the dominant (all) reason for delisting by market of destination**

	OTCBB only	PS only	OTCBB and PS	Total
All Regulatory Delistings	756	227	115	1,098
Bankruptcy/Liquidation reasons	6 (6)	99 (99)	48 (48)	153 (153)
Governance-related reasons	185 (187)	120 (173)	31 (47)	336 (407)
Core listing reasons	210 (365)	1 (37)	16 (30)	227 (432)
Non-core listing reasons	355 (552)	7 (66)	20 (52)	382 (670)

Table 4
Descriptive Statistics for Delisted Firms One Year before Delisting

This table presents descriptive statistics for 1,098 securities that were delisted in Nasdaq between January 1, 1999 to December 31, 2002. All statistics are computed using data from CRSP. Average statistics are computed over the period between 18 months and 12 months prior to delisting for 1,083 securities, between 12 months and 6 months prior to delisting for 14 securities and over the six-month period prior to delisting for 1 security.

	Mean	Median	Minimum	Maximum
Market Capitalization one year before delisting in \$millions	149.78	24.82	0.01	42,196.82
Market Capitalization at the time of delisting in \$millions	12.68	4.42	0.01	890.25
Average closing price	5.53	3.13	0.17	80.51
Average daily share volume (in shares)	200,357	47,366	132	32,221,055
Average daily dollar volume (in \$000)	2,560.35	139.24	0.02	547,583.01
Average quoted spread at close (\$)	0.1669	0.1243	0.0134	2.4567
Average percentage quoted spread at close	5.59	4.31	0.16	115.73
Average standard deviation of close-to-close return in %	8.31	7.62	0.88	61.00
Average intra-day transaction price range ((High-Low)/Low in %)	11.15	10.30	1.22	276.53

Table 5
Changes in Market Quality around Delisting

This table presents changes in market quality for 1,098 securities in the six months around their delisting from Nasdaq. Securities that were delisted from the Nasdaq market (from the National Market or SmallCap Market) traded in the Bulletin Board or in the Pink Sheets or in both. All trading and quoting data were obtained from The Nasdaq Stock Market and Pink Sheets LLC. Quoting data in the Pink Sheets market is limited to the end of the day quotes. Each cell in the table represents the equally weighted cross-sectional average [median] of the individual security averages over the three-month period before and after their delisting. The superscript, ^{OTCBB}, indicates that the measure was computed only for securities that traded in the OTC Bulletin Board. The superscript, ^{*} indicates statistical significance (at the 5% level) using a paired t-test under the null that the average before delisting is the same as the average after delisting. The superscript ^{**} indicates statistical significance for the medians using a paired signed-rank test (Wilcoxon test).

	3 months before delisting (trading in NM/SC)	3 months after delisting (trading in OTCBB/PS)	Difference after – before divided by before (in %)
Daily share volume (in shares)	385,788 [33,233]	133,457 [24,845]	-65.4 [-25.2 ^{**}]
Daily dollar volume (in \$000)	353.13 [20.28]	45.03 [6.50]	-87.3 [*] [-67.9 ^{**}]
Transaction price (in \$)	1.077 [0.629]	0.674 [0.260]	-37.4 [*] [-58.7 ^{**}]
Number of quotes per day ^{OTCBB}	25	5	-80.0 [*]
Time-weighted quoted spread (in \$)	0.0847	0.1286	51.8 [*]
Time-weighted percentage quoted spread	12.09	33.56	177.6 [*]
Value-weighted effective spread (in \$) ^{OTCBB}	0.0218	0.0399	83.0 [*]
Value-weighted percentage effective spread ^{OTCBB}	3.29	9.93	201.8 [*]
Standard deviation of intra-day transaction price return in %	4.44 [3.74]	14.34 [9.05]	223.0 [*] [142.0 ^{**}]
Intra-day transaction price range ((High-Low)/Low in %)	34.41 [27.00]	61.49 [34.50]	78.7 [*] [27.8 ^{**}]

Table 6

Changes in Market Quality around Delisting by the Dominant Regulatory Reason for Delisting

This table presents changes in market quality for 1,098 delisted Nasdaq securities by the dominant regulatory reason for their delisting. Regulatory reasons for delistings are classified into four major categories in the descending order of the severity of the violation of Nasdaq’s listing criteria: (1) Reasons triggered by bankruptcy filing or liquidation, (2) Reasons triggered by corporate governance issues such as SEC filing violation and public interest, (3) Reasons triggered by violation of ‘core’ objective listing criteria as defined by Nasdaq, and (4) Reasons triggered by violation of ‘non-core’ listing criteria. Since a security may be delisted for multiple reasons, we define the dominant reason as the reason triggered by the most severe violation. For example, if a security was delisted for public interest (corporate governance) as well as for having market capitalization below minimum (core listing), we will define its dominant reason for delisting as corporate governance. Securities that were delisted from the Nasdaq market (from the National Market or SmallCap Market) traded in the Bulletin Board or in the Pink Sheets or in both. NM refers to the Nasdaq National Market, SC refers to the SmallCap Market, OTCBB refers to the OTC Bulletin Board Market operated by Nasdaq and PS refers to the Pink Sheets Markets operated by Pink Sheets LLC. All trading and quoting data were obtained from The Nasdaq Stock Market and Pink Sheets LLC. Quoting data in the Pink Sheets market is limited to the end of the day quotes. Each cell in the table represents the equally weighted cross-sectional average [median] of the individual security averages over the three-month period before and after their delisting. The superscript, ‘^{OTCBB}’, indicates that the measure was computed only for securities that traded in the OTC Bulletin Board. The superscript, ‘*’ indicates statistical significance (at the 5% level) using a paired t-test under the null that the average before delisting is the same as the average after delisting. The superscript ** indicates statistical significance for the medians using a paired signed-rank test (Wilcoxon test). The last column reports a t-test for differences in relative changes (after-before)/before for the group of bankrupt compared to the group of non-core delistings, $H_0: \text{reldiff}_{\text{bankruptcy}} - \text{reldiff}_{\text{noncore}} = 0$.

	Bankruptcy/Liquidation		Governance Issues		Core Listing Issues		Non-Core Listing Issues		$\text{reldiff}_{\text{bankruptcy}} - \text{reldiff}_{\text{noncore}}$
Number of observations	153		336		227		382		
	NM/SC	OTCBB/PS	NM/SC	OTCBB/PS	NM/SC	OTCBB/PS	NM/SC	OTCBB/PS	t-statistic
Daily share volume (in shares)	1,761,962 [117,329]	333,274 [58,831**]	225,788 [23,741]	103,226* [20,441**]	148,963 [34,735]	112,739 [28,844**]	104,310 [26,829]	73,670* [19,88**]	-3.178
Daily dollar volume (in \$000)	1593.91 [55.76]	64.04 [2.84**]	282.63 [15.69]	38.42* [4.95**]	113.38 [28.00]	76.37 [12.20**]	51.64 [13.45]	22.63* [6.25**]	-4.1*
Transaction price (in \$)	1.235 [0.755]	0.209* [0.062**]	1.275 [0.639]	0.622* [0.269**]	1.107 [0.784]	1.210 [0.433**]	0.827 [0.517]	0.629* [0.300**]	-16.96*
Number of quotes per day ^{OTCBB}	56	4*	31	5*	16	6*	12	4*	-9.28*
Time-weighted quoted spread (in \$)	0.0658	0.0655	0.0831	0.1540*	0.1064	0.1279*	0.0809	0.1349*	-7.34*
Time-weighted percentage quoted spread	11.34	49.98*	11.23	35.92*	11.60	24.74*	13.43	29.73*	1.08
Value-weighted effective spread (in \$) ^{OTCBB}	0.0216	0.0185	0.0256	0.0352*	0.0211	0.0445*	0.0191	0.0430*	-0.14
Value-weighted percentage effective spread ^{OTCBB}	3.67	15.35*	3.52	9.13*	2.61	8.18*	3.33	10.65*	6.34*
Standard deviation of intra-day transaction price return in %	4.23 [3.44]	22.13* [12.46**]	4.22 [3.46]	15.02* [9.89**]	4.69 [4.21]	12.25* [8.90**]	4.55 [3.93]	11.22* [8.33**]	1.47
Intra-day transaction price range ((High-Low)/Low in %)	43.62 [35.35]	132.63* [91.04**]	35.19 [26.78]	63.07* [35.75**]	30.95 [26.37]	42.05* [32.01**]	32.04 [25.15]	40.06* [28.50**]	10.67*

Table 7
Changes in Market Quality around Delisting by Market of Origin and Market of Destination

This table presents changes in market quality for 1,098 delisted Nasdaq securities by the market of their origin and by the market of their destination. A security is defined to originate from a market if it traded in that market anytime during the three months prior to its delisting. Similarly, a security is defined to reach a market of destination if it trades in that market anytime during the three months after its delisting. We do not consider delistings that did not trade in any market after their delisting. NM refers to the Nasdaq National Market, SC refers to the SmallCap Market, OTCBB refers to the OTC Bulletin Board Market operated by Nasdaq and PS refers to the Pink Sheets Markets operated by Pink Sheets LLC. All trading and quoting data were obtained from The Nasdaq Stock Market and Pink Sheets LLC. Quoting data in the Pink Sheets market is limited to the end of the day quotes. Each cell in the table represents the equally weighted cross-sectional average [median] of the individual security averages over the three-month period before and after their delisting. The superscript, ‘*’ indicates statistical significance (at the 5% level) using a paired t-test under the null that the average before delisting is the same as the average after delisting. The superscript ** indicates statistical significance for the medians using a paired signed-rank test (Wilcoxon test).

	Group 1		Group 2		Group 3		Group 4	
Number of observations	423		225		475		129	
	NM	OTCBB	NM	PS	SC	OTCBB	SC	PS
Daily share volume (in shares)	192,760 [53,110]	117,548* [39,807**]	1,460,762 [115,773]	333,578 [46,702**]	90,221 [20,098]	69,665 [16,940**]	168,367 [22,432]	55,543* [11,187**]
Daily dollar volume (in \$000)	143.27 [32.14]	41.67* [11.59**]	1437.67 [68.27]	81.13* [3.96**]	73.45 [11.80]	41.48 [5.51**]	134.89 [14.06]	22.11 [1.22**]
Transaction price (in \$)	1.062 [0.647]	0.689* [0.298**]	1.606 [0.918]	0.942 [0.102**]	0.865 [0.575]	0.606* [0.338**]	0.858 [0.555]	0.345* [0.114**]
Number of quotes per day	24	6*	61	-	12	4*	17	-
Time-weighted quoted spread (in \$)	0.0717	0.1071*	0.0773	0.1183*	0.0959	0.1444*	0.0861	0.1509*
Time-weighted percentage quoted spread	10.00	23.70*	9.37	49.29*	14.24	31.74*	15.86	61.95*
Value-weighted effective spread (in \$)	0.0201	0.0326*	0.0269	-	0.0220	0.0458*	0.0168	-
Value-weighted percentage effective spread	3.17	8.65*	3.10	-	3.39	10.88*	3.38	-
Standard deviation of intra-day transaction price return in %	4.21 [3.61]	10.57* [8.01**]	4.28 [3.39]	25.01* [16.04**]	4.63 [3.97]	11.07* [8.42**]	4.74 [4.09]	24.24* [17.26**]
Intra-day transaction price range ((High-Low)/Low in %)	32.32 [27.03]	44.45* [32.02**]	37.58 [30.52]	137.69* [100.12**]	33.97 [25.69]	38.84* [28.66]	43.81 [31.56]	86.67* [62.78**]

Table 8

Changes in Market Quality around Delisting by the Dominant Regulatory Reason for Delisting and Markets of Origin and Destination

This table presents changes in market quality for 1,098 delisted Nasdaq securities by the dominant regulatory reason for their delisting and by the market of their origin and by the market of their destination. Regulatory reasons for delistings are classified into four major categories in the descending order of the severity of the violation of Nasdaq’s listing criteria: (1) Reasons triggered by bankruptcy filing or liquidation, (2) Reasons triggered by corporate governance issues such as SEC filing violation and public interest, (3) Reasons triggered by violation of ‘core’ objective listing criteria as defined by Nasdaq, and (4) Reasons triggered by violation of ‘non-core’ listing criteria. Since a security may be delisted for multiple reasons, we define the dominant reason as the reason triggered by the most severe violation. For example, if a security was delisted for public interest (corporate governance) as well as for having market capitalization below minimum (core listing), we will define its dominant reason for delisting as corporate governance. A security is defined to originate from a market if it traded in that market anytime during the three months prior to its delisting. Similarly, a security is defined to reach a market of destination if it trades in that market anytime during the three months after its delisting. We do not consider delistings that did not trade in any market after their delisting. NM refers to the Nasdaq National Market, SC refers to the SmallCap Market, OTCBB refers to the OTC Bulletin Board Market operated by Nasdaq and PS refers to the Pink Sheets Markets operated by Pink Sheets LLC. All trading and quoting data were obtained from The Nasdaq Stock Market and Pink Sheets LLC. Quoting data in the Pink Sheets market is limited to the end of the day quotes. Each cell in the table represents the equally weighted cross-sectional average of the individual security averages over the three-month period before and after their delisting. The superscript, ‘*’ indicates statistical significance (at the 5% level) using a paired t-test under the null that the average before delisting is the same as the average after delisting.

		Group 1		Group 2		Group 3		Group 4	
		NM	OTCBB	NM	PS	SC	OTCBB	SC	PS
Average Daily share volume (in shares)	Bankruptcy	461,441	162,576*	2,240,146	466,393	150,095	49,088	194,129	71,492
	Governance	155,694	141,964	557,974	195,068	106,521	46,646	193,818	63,007
	Core-listing	193,391	112,274*	613,515	183,014	111,072	118,344	110,378	25,221
	Non-core listing	141,750	98,916*	196,702	21,087	62,496	55,351	43,318	9,122*
Average Daily dollar volume (in \$000)	Bankruptcy	380.71	24.66*	2070.36	94.3	47.85	3.48*	45.55	4.44*
	Governance	140	44.48	765.31	64.54*	145.78	19.56	209.61	37.2
	Core-listing	160.35	60.82	657.4	145.84	71.25	105.9	54.16	1.27
	Non-core listing	76.49	34.09*	85.27	2.71*	25.98	17.16*	26.27	1.29*
Average Transaction price (in \$)	Bankruptcy	1.123	0.303*	1.37	0.207*	0.635	0.127*	0.601	0.068*
	Governance	1.212	0.889*	2.153	0.621*	0.883	0.56*	1.043	0.42*
	Core-listing	1.157	0.699*	0.888	13.474	1.063	0.738*	0.603	0.09*
	Non-core listing	0.931	0.695*	0.966	0.171	0.737	0.578*	0.675	0.638
Average Number of quotes per day	Bankruptcy	51	5*	65	-	18	3*	22	-
	Governance	32	7*	63	-	17	4*	16	-
	Core-listing	21	7*	21	-	12	5*	19	-
	Non-core listing	16	5*	22	-	9	3*	9	-

Table 8 (Continued)

		Group 1		Group 2		Group 3		Group 4	
		NM	OTCBB	NM	PS	SC	OTCBB	SC	PS
Average Time-weighted quoted spread (in \$)	Bankruptcy	0.0513	0.0516	0.0605	0.0683	0.1149	0.0996	0.0842	0.0724
	Governance	0.0583	0.1236*	0.1034	0.1997*	0.0815	0.1372*	0.0926	0.1841*
	Core-listing	0.0883	0.1085*	0.0655	0.1097	0.1215	0.1433	0.0631	0.0784
	Non-core listing	0.0735	0.113*	0.087	0.081	0.0885	0.1522*	0.0723	0.1902
Average Time-weighted percentage quoted spread	Bankruptcy	7.51	35.61*	9.49	53.26*	21.44	58.52*	19.58	72.38*
	Governance	9.41	22.85*	9.06	43.25*	12.54	33.2*	13.46	55.31*
	Core-listing	9.38	20.17*	9.93	59.10	13.46	25.2*	20.05	56.62*
	Non-core listing	11.2	23.06*	9.83	40.09*	15.56	33.55*	17.25	77.93*
Average Value-weighted effective spread (in \$)	Bankruptcy	0.024	0.0147	0.0233	-	0.0157	0.0325	0.0129	-
	Governance	0.0231	0.0276*	0.0354	-	0.0245	0.0396*	0.0208	-
	Core-listing	0.0197	0.0412	0.0194	-	0.0223	0.0461*	0.0137	-
	Non-core listing	0.0182	0.0344*	0.013	-	0.0204	0.0505*	0.0091	-
Average Value-weighted percentage effective spread	Bankruptcy	3.76	13.58*	3.37	-	3.48	17.53	4.56	-
	Governance	4.18	7.89*	2.82	-	3.55	9.95*	3.3	-
	Core-listing	2.09	6.92*	2.45	-	3.05	8.91*	3.27	-
	Non-core listing	3.2	8.72*	2.64	-	3.5	12.44*	1.68	-
Average Standard deviation of intra-day transaction price return in %	Bankruptcy	4.18	14.27*	4.04	25.54*	6.31	22.53*	5.06	24.14*
	Governance	3.65	7.66*	4.72	23.51*	4.09	11.06*	4.57	22.86*
	Core-listing	4.52	11.72*	4.16	31.48*	4.83	10.59*	5.23	24.03
	Non-core listing	4.28	10.24*	3.99	24.79*	4.8	10.8*	4.68	39.91*
Average Intra-day transaction price range ((High-Low)/Low in %)	Bankruptcy	44.21	84.58*	43.33	166.13*	54.9	137.7*	44.92	79.52
	Governance	31.31	37.76	30.68	104.69*	36.55	38.82	46.53	97.3*
	Core-listing	31.6	38.76*	29.31	124.35	30.29	37.68*	40.07	61.82
	Non-core listing	30.22	40.87*	31.55	102.21*	33.49	34.62	32.41	64.01

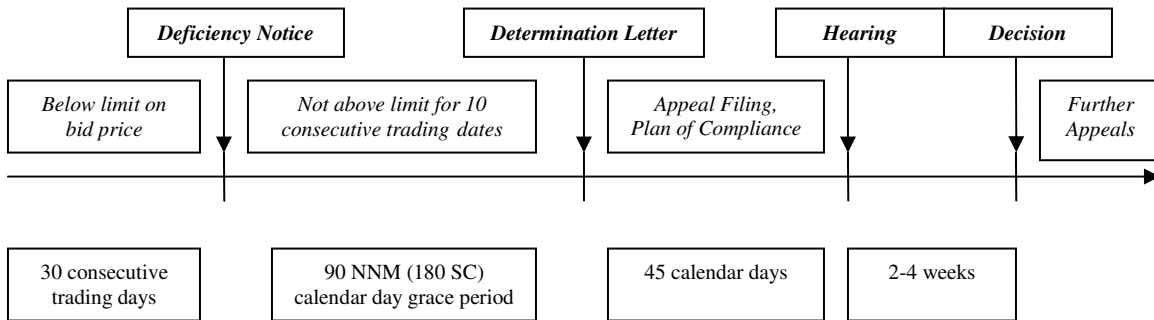
Table 9 Quoted Spread Determinants for Delisted Nasdaq Stocks

This table presents the determinants of quoted spreads for 1,098 delisted Nasdaq securities where the dependent variable is the average daily percentage quoted spread. We classify regulatory reasons for delistings with dummy variables for four major listing violation types: (1) *Bankruptcy* filing or liquidation, (2) *Corporate Governance* issues (such as SEC filing violations), (3) *Core* violations (such as minimum number of market makers), and (4) *Non-core* violations (such as minimum bid price). Nasdaq's *core* and *non-core* violations are defined in Appendix Table 1. We classify firms by their most severe violation and do not consider delistings that did not trade after Nasdaq delisting. *Delist* is a dummy variable that takes the value of 1 after delisting and 0 before. *Pink Sheets* takes the value of 1 for data compiled from trading on the Pink Sheets LLC and 0 otherwise. *Bulletin Board* takes the value of 1 for data compiled from trading on the OTC Bulletin Board and 0 otherwise. *Decimals* is a dummy variable taking the value of 0 prior to Nasdaq decimalization and 1 afterwards. *Dollar Volume* is the log of daily dollar trading volume and *Volatility* is the average intraday trade price volatility. *Size* refers to the log of market capitalization for each firm. All trading and quoting data were obtained from The Nasdaq Stock Market and Pink Sheets LLC. Quoting data in the Pink Sheets market is limited to the end of the day quotes. Each observation in the table represents individual security averages over the three-month period before and after their delisting. Standard errors are in parentheses. Superscripts, *, ** and *** indicate statistical significance (at the 10%, 5% and 1% level).

	(1)	(2)	(3)
<i>Intercept</i>	38.96*** (2.76)	21.36*** (3.09)	20.65*** (3.05)
<i>Bankruptcy</i>	8.78*** (1.08)	1.84 (1.43)	1.79 (1.40)
<i>Corporate Governance</i>	2.15** (0.84)	0.06 (1.06)	0.01 (1.04)
<i>Core</i>	-0.11 (0.89)	-1.27 (1.14)	-1.27 (1.12)
<i>Delist*Bankruptcy</i>		3.17 (2.12)	3.74* (2.10)
<i>Delist*Corporate Governance</i>		1.80 (1.51)	1.83 (1.49)
<i>Delist*Core</i>		2.00 (1.61)	1.30 (1.58)
<i>Delist*Bulletin Board</i>		20.94*** (1.89)	20.17*** (1.96)
<i>Delist*Pink Sheets</i>		28.28*** (2.40)	27.65*** (2.71)
<i>Dollar Volume</i>	-4.19*** (0.29)	-1.33*** (0.31)	-1.35*** (0.30)
<i>Delist*Dollar Volume</i>		-6.83*** (0.37)	-5.83*** (0.42)
<i>Delist*Dollar Volume*Pink Sheets</i>			-3.77*** (0.58)
<i>Volatility</i>	2.16*** (0.07)	2.67*** (0.32)	2.70*** (0.32)
<i>Delist*Volatility</i>		-0.84** (0.33)	-1.01*** (0.32)
<i>Delist*Volatility*Pink Sheets</i>			0.60*** (0.15)
<i>Size</i>	-2.49*** (0.37)	-1.59*** (0.34)	-1.52*** (0.33)
<i>Decimals</i>	-0.72 (0.75)	-0.94 (0.71)	-0.79 (0.70)
Adj. R ²	0.62	0.69	0.70

Figure 1: Timeline of Delisting Process

Panel A. Bid Price Limit or Market Value of Public Float



Panel B. Market Value

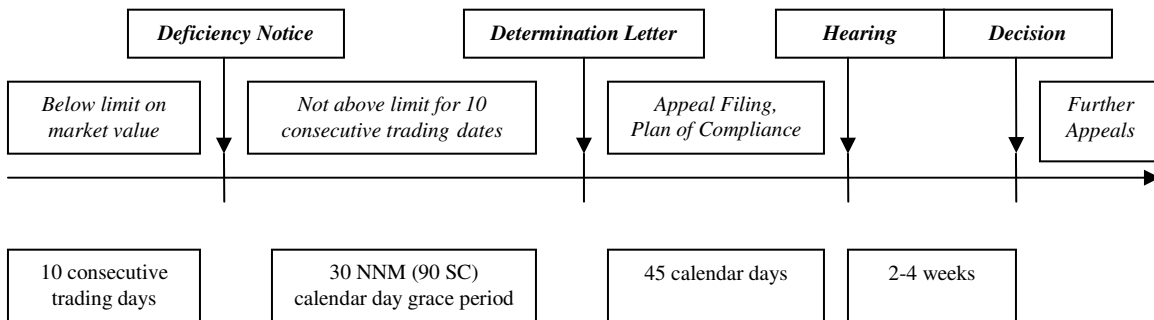


Figure 2
Daily Trading Activity of Nasdaq Delisted Securities Around Delisting

These charts show changes in the daily cross-sectional averages of measures of trading activity of 1,098 Nasdaq delisted securities in the six months around their delisting. Securities that were delisted from the Nasdaq market (from the National Market or SmallCap Market) traded in the Bulletin Board or in the Pink Sheets or in both.

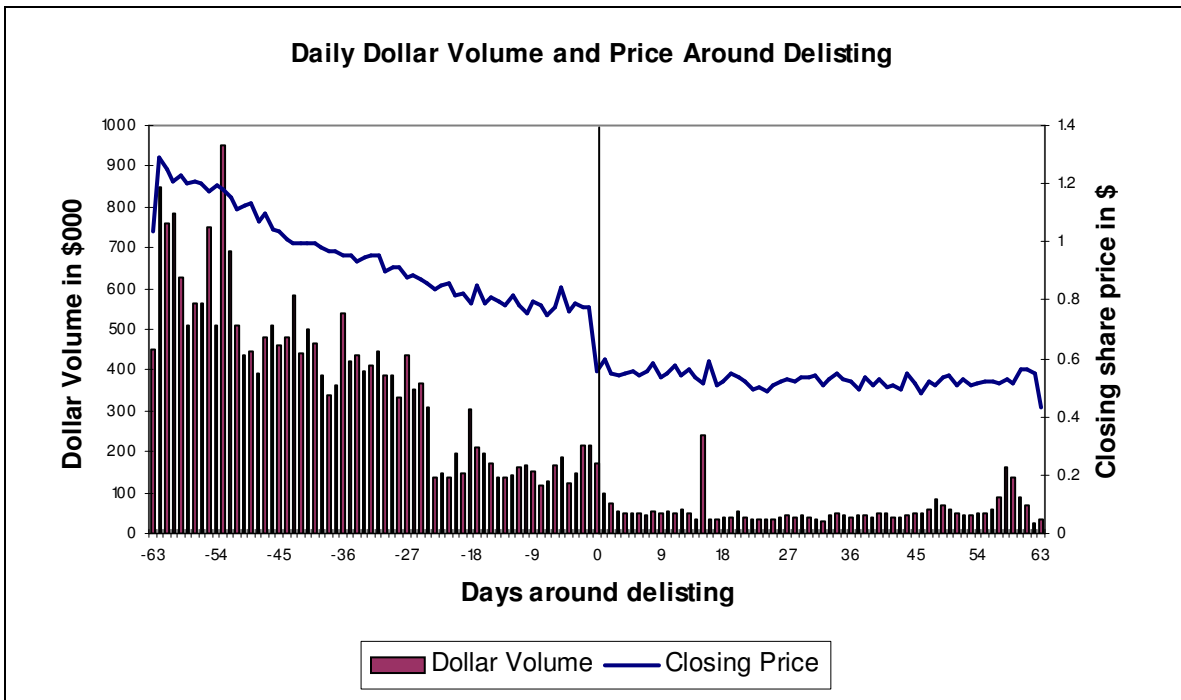
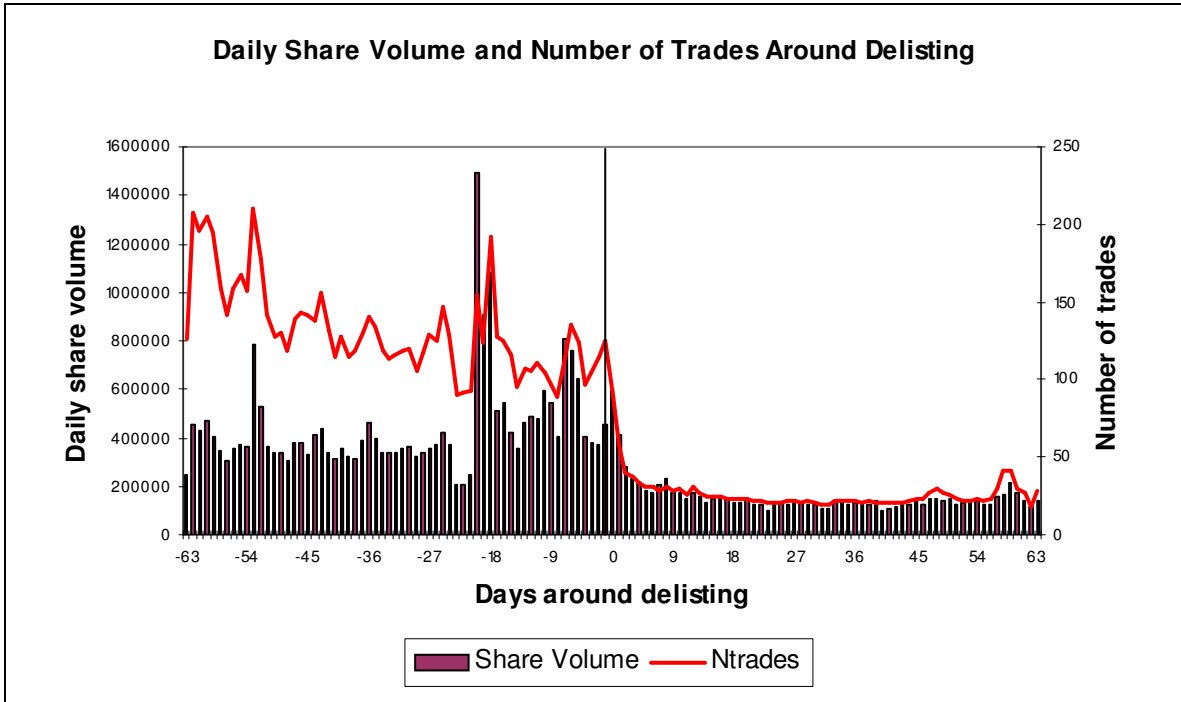


Figure 3

Daily Quoting Activity of Nasdaq Delisted Securities around Delisting

These charts show changes in the daily cross-sectional averages of measures of quoting activity of 1,098 Nasdaq delisted securities in the six months around their delisting. Securities that were delisted from the Nasdaq market (from the National Market or SmallCap Market) traded in the Bulletin Board or in the Pink Sheets or in both. Change in the average number of quotes is presented only for 871 securities that traded in the OTC Bulletin Board. Change in the dollar and percentage quoted spread is based on the closing quote of the day.

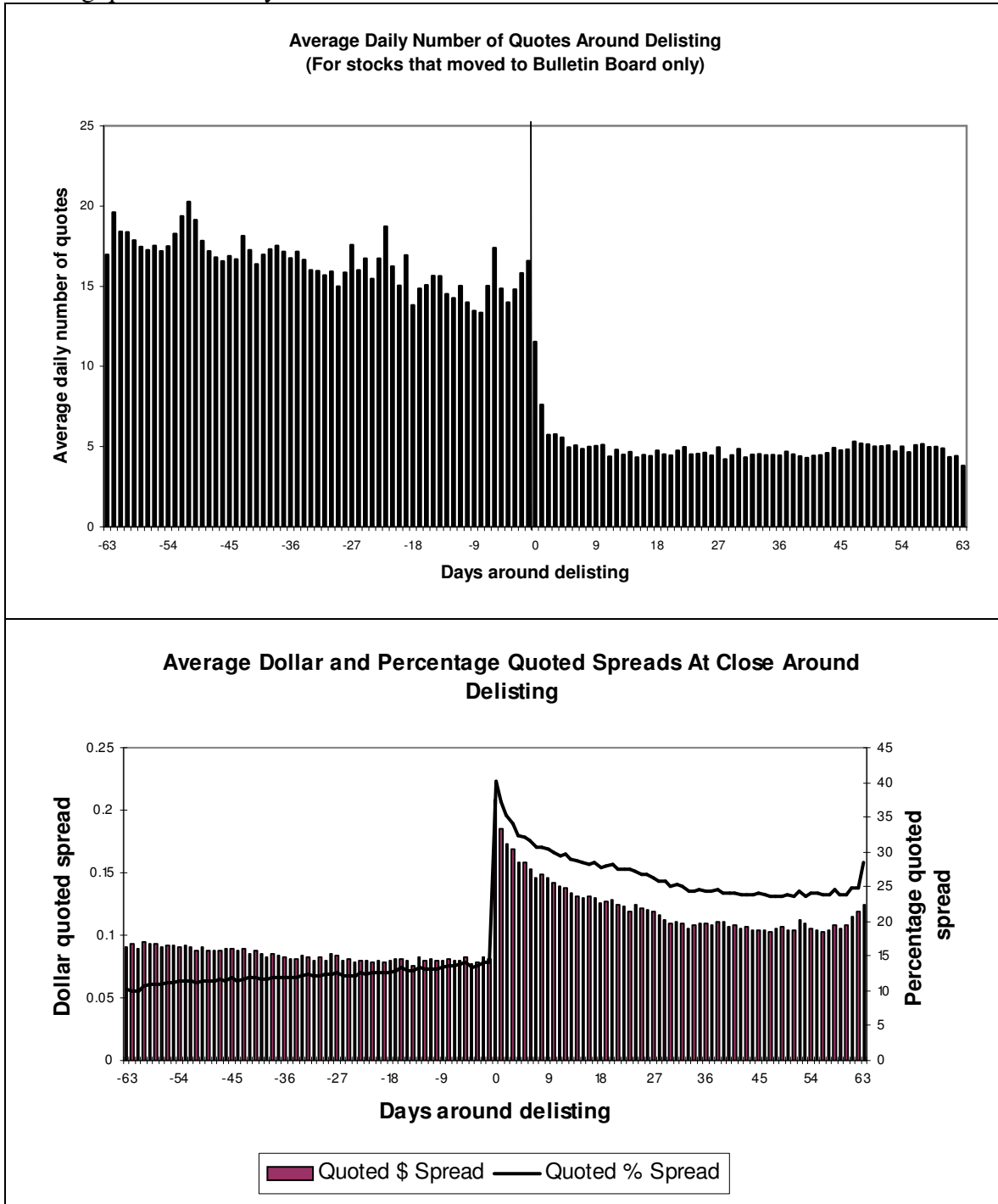


Figure 4
Change in Daily Effective Spreads around Delisting

This chart shows the change in the daily cross-sectional average effective spread of 871 Nasdaq delisted securities in the six months around their delisting. These securities were delisted from the Nasdaq market (from either the National Market or the SmallCap Market) and traded in the OTC Bulletin Board after delisting. Intra-day quoting data were not available for securities that were delisted from the Nasdaq market but traded in the Pink Sheets after delisting.

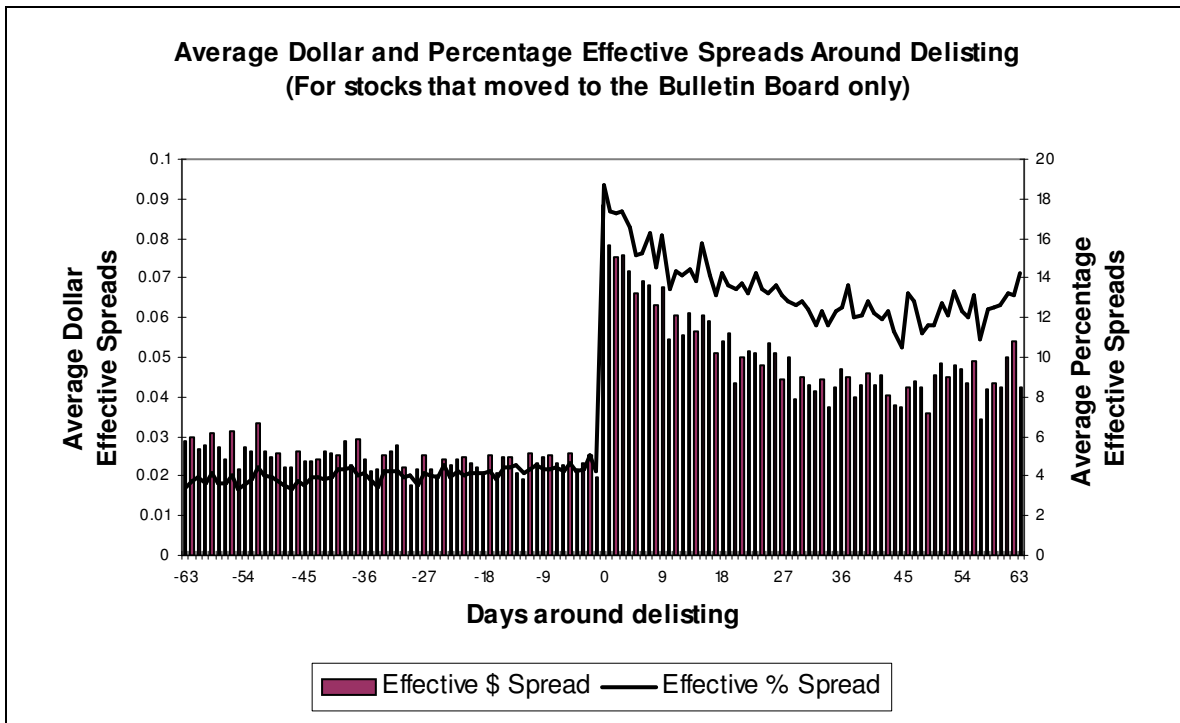


Figure 5
Volatility around Delisting

These charts show changes in the volatility measures of 1,098 Nasdaq delisted securities in the six months around their delisting. Securities that were delisted from the Nasdaq market (from the National Market or SmallCap Market) traded in the Bulletin Board or in the Pink Sheets or in both. Intra-day price volatility for day 't' is the cross-sectional average of the standard deviation of intra-day transaction return in day 't'. Intra-day price range for day 't' is the cross-sectional average of the intra-day price change of each security in day 't'. Price range is computed as the ratio of the difference between the highest price and the lowest price over the lowest price.

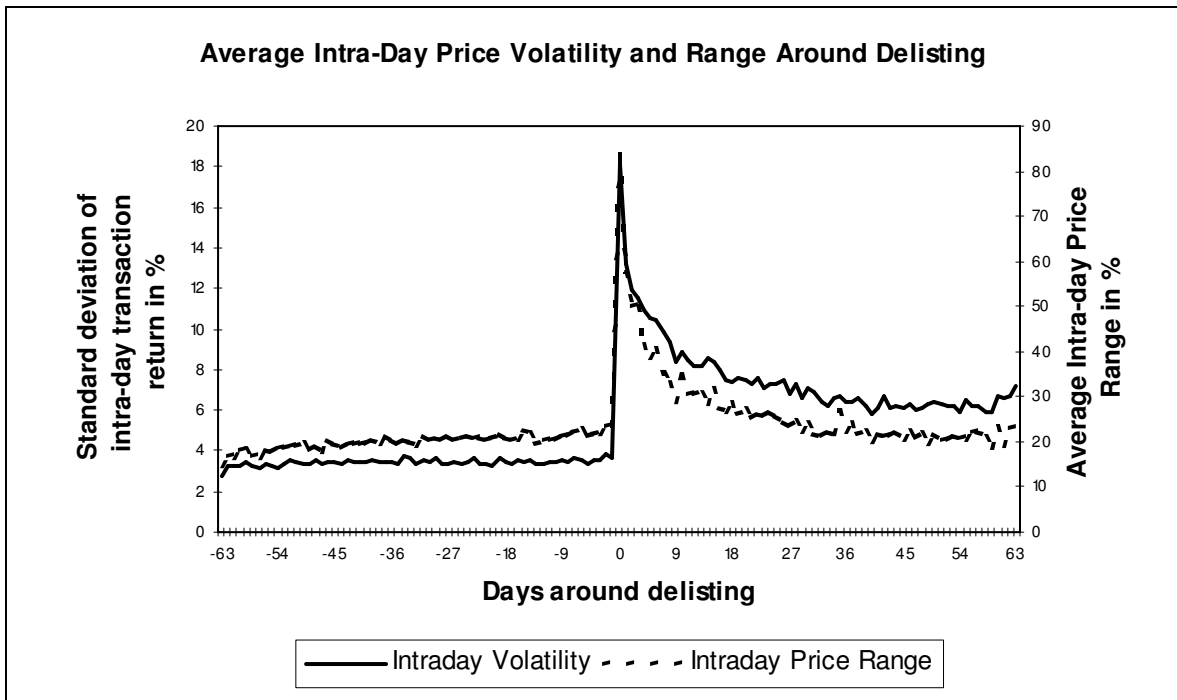
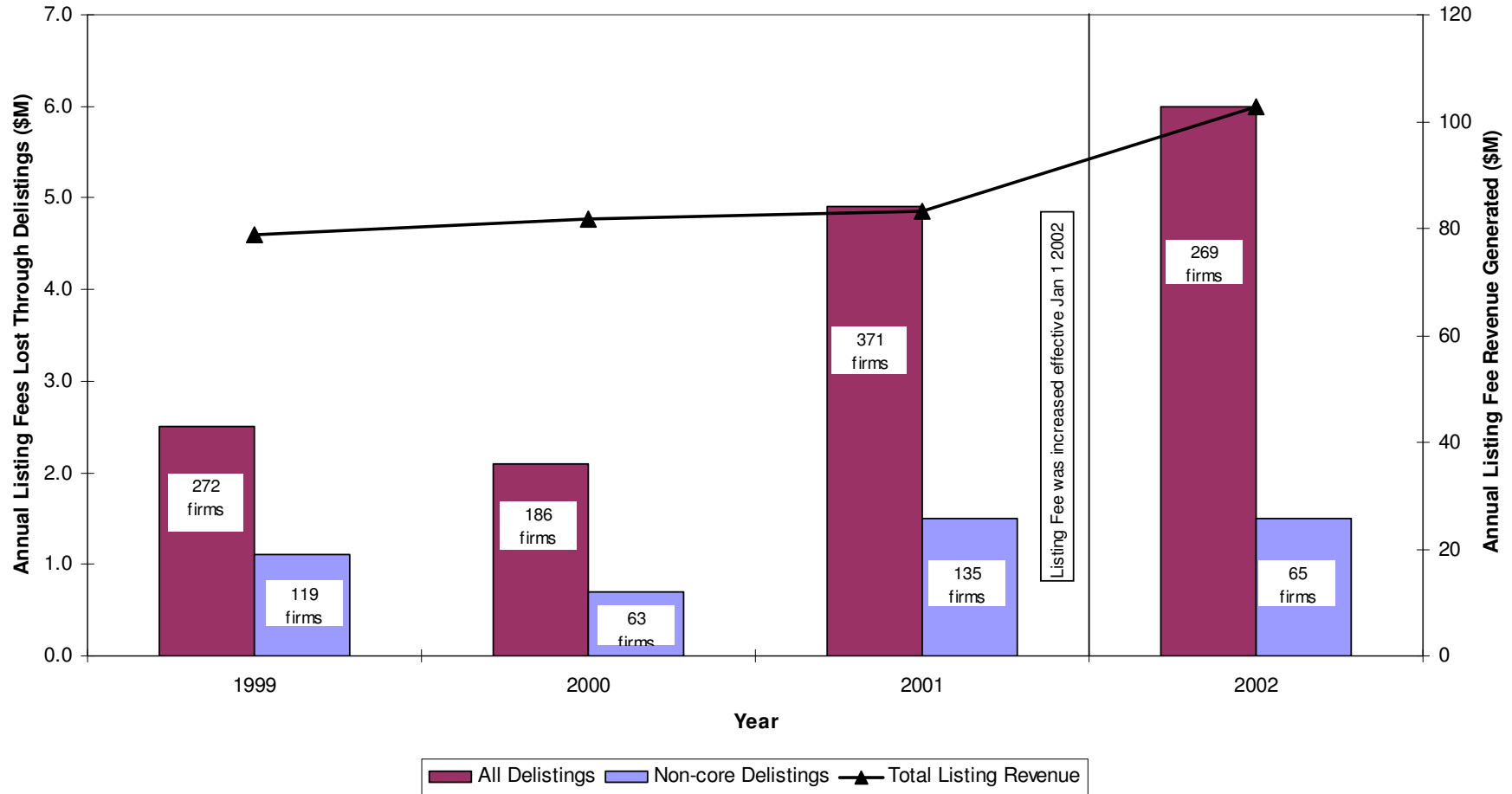


Figure 6
Annual Listing Fees Lost and Earned by Nasdaq Between 1999-2002



Appendix A: Nasdaq Maintenance Standards

The Appendix Table outlines the current Nasdaq maintenance standards. Notable changes to the listing requirements during our sample period include:

- Effective June 29, 2001, the minimum net tangible assets for NM-listed stocks was increased to \$10 million from \$4 million, and the minimum bid price was reduced from \$5 to \$3. At the same time, the minimum net tangible assets for SC-listed stocks were increased from \$2 million to \$2.5 million. Until November 1, 2002, companies could qualify under either the new or the old standards.
- There was a temporary moratorium of the minimum bid price and market value of public float requirements in effect between September 27, 2001, and January 2, 2002. This moratorium was declared after many Nasdaq stock prices fell in the spring of 2001 and further depressed in the wake of the terrorist attacks on September 11, 2001.
- On Dec. 12, 2001, Nasdaq reinstated an amended bid price rule as a pilot (1/2/2001-12/31/2003). For NM-listed stocks, the original minimum bid price requirement was reinstated. For SC-listed stocks, the minimum bid price requirement was reinstated, but with a 180 day grace period.
- On Jan. 30, 2003, Nasdaq extended an amended version of the pilot until Dec. 31, 2004. For NM-listed stocks, the grace period was extended to 180 days, with an additional 180 days available if the firm was able to demonstrate compliance with core NM initial listing criteria. For SC-listed stocks, the 180-day grace period was supplemented with an additional 540 days (18 months) if the firm could demonstrate compliance with core SC initial listing criteria.

Appendix Table 1--Nasdaq Maintenance Standards

Until November 1, 2002, companies may qualify for continued listing under either the new or former standards (in parentheses). After that date, the new rules apply. For NM stocks, either Marketplace Rule 4450(a) or Marketplace Rule 4450(b) has to be satisfied.

Nasdaq National Market

	Standards	Marketplace Rule 4450(a)	Marketplace Rule 4450(b)
Core requirements	Net Tangible Assets ¹³	\$10 million (\$4 million)	N/A
	Market Capitalization	N/A	\$50 million OR (\$50 million AND \$50 million)
	Total Assets		
	Total Revenue		
	Round Lot Shareholders	400	400
Market Makers	2	4	
Non-core requirements	Public Float (shares) ¹⁴	750,000	1.1 million
	Market Value of Public Float	\$5 million	\$15 million
	Minimum Bid Price	\$1.00	\$3.00 (\$5.00)

Nasdaq SmallCap Market

	Standard	Marketplace Rule 4310(c)
Core requirements	Shareholders' Equity (Net Tangible Assets)	\$2.5 million (\$2 million)
	Market Capitalization	\$35 million
	Net Income (most recently completed fiscal year or 2 of the last 3 years)	\$500,000
	Market Makers	2
	Round Lot Shareholders	300
Non-core requirements	Public Float (shares)	500,000
	Market Value of Public Float	\$1 million
	Minimum Bid Price	\$1.00

Corporate Governance Requirements (Marketplace Rules 4350 and 4351)

Distribution of Annual and Interim Reports	Solicitation of Proxies
Independent Directors	Conflicts of Interest
Audit Committees	Shareholder Approval
Shareholder Meetings	Stockholder Voting Rights
Quorum	Auditor Peer Review

¹³ Net Tangible Assets equals Total Assets minus Total Liabilities minus Goodwill minus Redeemable Securities.

¹⁴ Public Float is defined as total shares outstanding less any shares held by officers, directors or beneficial owners of 10% or more.

Appendix B: Nasdaq Delisting Process (Source: Hale and Dorr, LLP, 2003)

Deficiency Notice. If a company does not meet the minimum bid price or market value of public float requirements for *30 consecutive trading days*, Nasdaq sends a “deficiency notice” identifying the listing deficiency and informing the company that it will be delisted after *90 calendar days* unless it meets the required minimum bid price or market value of public float for at least *10 consecutive trading days* during the 90-day cure period.

- If the deficiency is based on insufficient market capitalization, the company is notified after *10 consecutive trading days* of non-compliance and must achieve compliance for *10 consecutive trading days* within *30 calendar days*. Nasdaq’s automated computer system tracks compliance with these requirements for each listed company.
- If the deficiency is based on insufficient net tangible assets (former maintenance standards), shareholders’ equity (new maintenance standards), total assets, total revenue, or pretax income, the notice is usually triggered by public filing of an SEC report (typically a Form 10-K or 10-Q) disclosing the deficiency.

Determination Letter. If the company is not in compliance within the time period prescribed in the deficiency notice, Nasdaq sends a “determination letter” informing the company that Nasdaq has determined that the company does not meet the standards for continued listing. The company then has seven days to appeal the determination. Under Nasdaq rules, the company must publicly announce within seven calendar days that it has received a determination letter and the basis for the delisting.

Appeal to Nasdaq Panel. The company’s appeal may be made through a written submission to, or at an oral hearing before, a Nasdaq listing qualifications panel of two or three persons selected by Nasdaq. The panelists are independent representatives of the business community and cannot be employees of the NASD or any of its subsidiaries. If

an oral hearing is requested, it is generally held within 45 calendar days. The listed company must pay a fee of \$5,000 for an oral hearing and \$4,000 for a written appeal.

Plan of Compliance. In the appeal, company representatives present a “plan of compliance” – the company’s plan to achieve and sustain compliance with the Nasdaq maintenance standards. Without a credible plan, delisting is usually swift and certain. The company cannot merely assert that its stock will trade above the minimum price.

Decision. The Nasdaq panel renders its decision, typically within two to four weeks after the written submission or hearing. If the decision is to delist, the delisting becomes effective at the close of trading on the day the company is informed of the decision.

Further Appeals. The company may appeal the Nasdaq panel’s delisting decision to the Nasdaq Listing and Hearing Review Council within 15 calendar days, and the Review Council may on its own motion elect to review any decision within 45 calendar days. The NASD Board of Governors may, in its discretion, review any decision by the Review Council. Aggrieved issuers may also appeal any Nasdaq decision to the SEC or Federal court. Appeals beyond the Nasdaq panel do not delay delisting and are rarely pursued.