The Uptick Rule of Short Sale Regulation – Can it Alleviate Downward Price Pressure from Negative Earnings Shocks?

Lynn Bai[1]
Fuqua School of Business
Duke University

This Draft, December 2006

ABSTRACT

This paper examines the effect of the uptick rule (including the bid test applicable to NASDAQ stocks) of short sale regulations on stock prices and short selling activities immediately after negative earnings surprises that occurred during the period of May to November 2005. It compares price paths and short selling activities of stocks restricted by the uptick rule with stocks that were exempted from the rule as a result of the SEC's Pilot Program. The study has not found any evidence that prices of stocks subject to the rule declined at a slower speed than prices of exempted stocks at times of stress. The two groups of stocks had similar levels of short sale volumes despite the rule's prohibition on short selling at minus or zero-minus ticks. For NYSE and AMEX stocks, our study shows that market short orders whose immediate executions were barred by the uptick rule found execution opportunities against the upcoming buy orders within 15 minutes after their conversion into limit orders at the legally shortable price. For NASDAQ stocks, our study shows that up bids occurred with high frequency after negative earnings surprises and jointly with price improvements they offered generous execution opportunities to short sale orders.

Section 1 Introduction

A short sale is a sale of a security that the seller does not own or any sale that is consummated by the delivery of a security borrowed by the seller. SEC Rule 10a-1(a)(1) under the Securities Exchange Act of 1934 provides that a listed security may

[1] The author is at Duke University, Fuqua School of Business. Box 90120, Durham, NC 27708. Email is lb9@duke.edu. The author thanks Michael Brandt, Alon Brav, James Cox and Robert Whaley for comments. The author is responsible for all errors in this paper.

be sold short either at a price above the price at which the immediately preceding sale was effected (plus tick), or at the last sale price if it is higher than the last different price (zero-plus tick). Short sales are not permitted on minus ticks or zero-minus ticks, subject to narrow exceptions. Rule 10a-1 applies only to securities listed on the New York Stocks Exchange and American Stock Exchange and does not apply to short sales in NASDAQ securities. Until August 1, 2006 when NASDAQ became a stock exchange, short sales in NASDAQ stocks were subject to NASD Rule 3350, which prohibited short sales in NASDAQ National Market (NNM) securities at or below the best bid when the best bid displayed was below the preceding best bid[2]. After NASDAQ became a stock exchange on August 1, 2006, NASD Rule 3350 became NASDAQ Rule 3350 with certain modifications[3] and governs short sales in NASDAQ securities. The sample period of this paper was prior to August 1, 2006 and thus we use the term NASD Rule 3350 when referring to the bid test applicable to NASDAQ securities. Moreover, we will refer to Rule 10a-1 and NASD Rule 3350 collectively as the "uptick rule" in this paper unless the context requires a distinction of one from the other.

Rule 10a-1 was first adopted in 1938 for the purpose of, among others, "preventing short sellers from *accelerating a declining market* by exhausting all

---

[2]The NASD's bid test, as specified in NASD Rule 3350, applied to short sale transactions in NASDAQ NNM securities executed on the SuperMontage or the NASD's Alternative Display Facility (ADF), but not to NASDAQ Small Cap, OTCBB and other securities traded over-the-counter. Moreover, no short sale price test applies to short sales of NASDAQ NMS securities executed away from SuperMontage and the ADF.

[3] One such modification was an exemption from the bid test granted to stocks underlying the NASDAQ 100 index. This exemption was approved by the SEC on September 13, 2006.

remaining bids at one price level, causing successively lower prices to be established by long sellers" (emphasis added)[4].

Rule 10a-1(e) lists numerous exemptions from the uptick rule, which include, among others, the odd-lot dealer exemption[5], the exemption that allows a specialist or market maker to execute a short sale for its own account at a zero-minus tick[6], and the exemption for bona fide arbitrage activities[7]. NASD Rule 3350 exempted registered NASDAQ market makers in connection with bona fide market making activity and options and warrants market makers for hedging activities[8].

---

[4]SEC Concept Release: Short Sales. Release No. 34-42037; File No. S7-24-99, Page 4 of 22. The other two purposes of the uptick rule are: (i) allowing relatively unrestricted short selling in an advancing market, and (ii) preventing short selling at successively lower prices, thus eliminating short selling as a tool for driving the market down.

[5] The uptick rule does not apply to an odd-lot dealer or an exchange with which the dealer is registered for such security, or any over-the-counter sale by a third market maker to offset odd-lot orders of customers, or any sale by an odd-lot dealer to liquidate a long position which is less than a round lot if such sale does not change the position of such odd-lot dealer or such market maker by more than the unit of trading.

[6] See SEC Rule 10a-1(e) 5 (i) under the Securities Exchange Act of 1934. In addition, in order to resolve the conflict between the uptick rule and the requirement that market makers provide firm quotes, Rule 10a-1(e)(5)(ii) permits market makers to execute transactions at their offer following a trade-through, and (e)(11) permits non-market makers to effect a short sale at a price equal to the price associated with their most recently communicated offer up to the size of that offer, so long the offer was at a price, when communicated, that was permissible under Rule 10a-1.

[7] Rule 10a-(e)7 says that the uptick rule does not apply to "Any sale of a security for a special arbitrage account by a person who then owns another security by virtue of which he is, or presently will be, entitled to acquire an equivalent number of securities of the same class as the securities sold; provided such sale, or the purchase which such sale offsets, is effected for the bona fide purpose of profiting from a current difference between the price of security sold and the security owned …". For example, a person may sell short securities without regard to the uptick rule to profit from a current price differential based upon a convertible security that entitles him to acquire an equivalent number of securities of the securities sold short. He must subsequently tender the instrument for conversion to obtain the underlying securities and complete the arbitrage in order to satisfy the terms of the exception. Rule 10a-(e)8 further provides an exemption of any sale of a security registered on a US securities exchange for a special international arbitrage account for the bona fide purpose of profiting profit from the price difference between a US securities market and a foreign securities market.

[8] See NASDAQ Rule 3350 (c), (h)(1), (i)(i).

The effects of the uptick rule have been subject to government sponsored studies and debates for numerous times during the past few decades. In 1963, the SEC included an examination of short selling in response to the request by Congress for a study of the securities markets[9]. The study observed that the ratio of short sales to total volume increased in declining markets and concluded that the short sale rules did not prevent the harmful effects of short selling that the rules were designed to prevent. However, the study acknowledged the shortage of data upon which a more thorough analysis could be built and recommended improvements in short sale data collection. In 1976, the SEC ordered a public investigation of the feasibility and effects of certain proposed changes in the short sale regulation including a suspension of the uptick rule[10]. The SEC received 12 comment letters in response to the 1976 proposals. Eight commenters, including the NYSE and AMEX, strongly opposed to any suspension of the uptick rule for the reason that the suspension would have damaging effects such as accelerating price declines and increasing volatility[11]. In 1980, the SEC withdrew the proposals, principally due to public comments opposing the elimination of the uptick rule on short selling. In 1991, the House Committee on Government Operations released a report on short selling[12], which report made numerous findings and recommendations, including that the uptick rule acted as a price stabilizing force and should be retained. In 1999, the SEC issued a concept release, requesting public

---

[9] Securities and Exchange Commission, Report of Special Study of Securities Markets, H.R. Doc. No. 95, 88th Cong., 1st Sess. (1963).
[10] Securities Exchange Act Release No. 13091 (December 21, 1976).
[11] SEC Concept Release: Short Sales. Release No. 34-42037; File No. sS7-24-99, Page 6 of 22.
[12] Short-Selling Activity in the Stock Market: Market Effects and the Need for Regulation (Part 1) (House Report), H.R. Rep. No. 102-414 (1991), reprinted CCH Federal Securities Law Reports Number 1483 Part II.

comments on change concepts in regard to short sale regulations such as an implementation of a uniform bid test or a complete removal of the uptick rule[13]. In the concept release, the SEC stated that numerous changes had occurred since the House Committee study of short sale regulations which might have diminished the need for the uptick rule in its current form. The SEC requested public opinion on a number of specific questions regarding the effects of the uptick rule, including: “Does Rule 10a-1 continue to serve a valid purpose in a declining market by preventing short sellers from accelerating declines in securities prices, or “depressing” the market?”[14] In October 2003, the SEC proposed new rules on short sale regulation and solicited public comments[15]. The proposed rules included descriptions of a planned pilot program whereby the SEC would suspend the application of the uptick rule on stocks with high levels of liquidity in order to gather data for analyzing how the uptick rule affects market prices, volatility, liquidity and trading activities. The Pilot Program was formally implemented on May 2, 2005 via Regulation SHO[16] on one third of Russell 3000 index constituent stocks, initially for a period of one year until April 28, 2006 and then extended until August 6, 2007.

This paper discusses the intraday price effect of the uptick rule. In particular, it discusses whether the uptick rule, by prohibiting short sales at down ticks or zero-minus ticks, has the effect of reducing short sale volumes and thus alleviating

[13] SEC Concept Release: Short Sales. Release No. 34-42037; File No. sS7-24-99.
[14] SEC Concept Release: Short Sales. Release No. 34-42037; File No. sS7-24-99, Page 16.
[15] Securities Exchange Act Release No. 34-48709 (October 23, 2003).
[16] Securities Exchange Act of 1934, Release No. 50104, July 28, 2004.

downward price pressures in declining markets. This hypothesis was an important argument in support of the adoption of the uptick rule in 1938 but its validity in the current market framework, particularly after the reduction of the minimum price variation to one cent, has been questioned by some market participants and put forth for debate by the SEC[17]. An empirical verification of this hypothesis undoubtedly carries a substantial weight in the current debate of whether the uptick rule should be abandoned.

The price effect of short sale regulations has been an area of keen interest in financial economic research. There are two major components to short sale regulations: the requirement of stock borrowing before short sales and the uptick rule. Thus far, there have been a number of papers that study the price effect of short sale regulations from the angle of traders' inability to borrow stocks. These papers examine the relation between market-to-book ratio and subsequent returns over a period of time, or the relation between institutional ownership of stocks, which is a proxy for the difficulty in stock borrowing, and subsequent returns. They reached different conclusions as to whether short sale regulations in general, or the inability to borrow stocks in particular, have caused overpricing. There have also been a number of

[17] See, for example, comment letter by Howard Teitlman (Dated December 31, 2003) to SEC's proposed changes to short sales: "With the introduction of decimalization several years ago, many stocks trade in a penny spread. The short sale rule is far less relevant now that stocks have such a tight spread"; and comment letter by Willkie, Farr and Gallagher on behalf of institutional clients in which the commenter recommended that the Commission refrain from adopting amendments to Rule 10a-1 until decimalization was implemented in the market. WFG stated that because the effects of decimalization were unknown, a better approach might be to watch the market response to the current Rule 10a-1 under decimalization.

papers that study whether short sale regulations have the effect of reducing the severity of market panic. Their approach was to compare the skewness in daily stock return distributions across jurisdictions that have different degrees of short sale restrictions. They found no evidence that short sale regulations have reduced the severity of market panic.

This paper extends existing literature in two directions: First, it focuses on the price effect of the uptick rule rather than the price effect of the stocks borrowing requirement or the joint effect of these two components of short sale regulations. Secondly, it compares the intraday price path of restricted and unrestricted stocks in studying whether the uptick rule reduces the severity of downward pressure on prices. We believe this is a more direct approach to studying this question than analyzing the skewness in daily return distributions. The SEC's Pilot Program offers a window of opportunity which makes this comparison feasible.

In studying the intraday price effect of the uptick rule, we took the following approach. First, we identified negative earnings surprises for pilot and nonpilot stocks during the period of May 2, 2005 to November 30, 2005. This period provided events of two or three earning reports for most of the stocks included in the study. Negative earning surprises were identified by comparing the actual quarterly earnings per share with the consensus analyst forecast. Negative earnings surprises are considered a major cause of stress in stock prices and thus provide good opportunities to study the price effect of the uptick rule. To reduce the possibility of misclassification of positive earnings surprises as negative earnings surprises, we further restricted our sample events to those which caused a negative first response in price movements, i.e., negative overnight returns after earnings announcements. We showed, via the Wilcoxon Rank Sum test, that our sample earnings surprises were comparable to those typically seen in the past three years, and that our sample events exhibited signs of stress such as lower returns and higher short sale volumes compared to days before earnings announcements.

Next, we examined if there was any difference in overnight price adjustments between pilot and nonpilot stocks from market close that occurred prior to earnings announcement to market open immediately after earnings announcement. A regression of the overnight return on the pilot dummy and other variables revealed no difference in the overnight return between pilot and nonpilot stocks. We then ran a cross sectional regression of stock returns during different time periods on the first trading day after earnings announcements (the “Event Day”) on a pilot dummy, lagged return and other variables such as firm characteristics. We ran this regression for every 15 minutes from 9:30am to 11:30am, and then for every 30 minutes from 11:30am to 2:00pm, and finally for every 60 minutes from 2:00pm to market close at 4:00pm (these times are collectively called “Designated Times” throughout this paper). We used both cumulative returns and noncumulative returns in our regressions and found no evidence that the uptick rule supported prices of stocks that were subject to stress.

We performed robustness checks by restricting our sample first to stocks with high trading volumes on the Event Day, then to stocks and Designated Time periods of high negative net order flow, and then to stocks without active options trading. All these exercises found, consistently, a lack of difference in the intraday returns between pilot and nonpilot stocks.

Next, we compared the time that it took for the intraday returns of pilot and nonpilot stocks to reach a threshold level of -3% (a level which indicated the presence of a price pressure) by running a regression of this time on a pilot dummy and other variables such as the stock's liquidity and firm characteristics. We found no evidence that pilot stocks took a shorter period of time to reach this negative return level. Further more, we ran regressions of stocks' intraday return volatility and skewness to examine how these measures differed between pilot and nonpilot stocks. If the uptick rule were supporting prices, we would expect to see lower volatility and less negative skewness in the returns of nonpilot stocks. The regressions revealed no systematic difference in the volatility and skewness of the two groups of stocks.

Since the common belief was that the uptick rule could limit short volumes and thus support prices, the lack of difference in the intraday returns of pilot and nonpilot stocks prompted us to examine whether short sale volumes differed between these two groups of stocks. We compared short volumes at market open and at Designated Times on the Event Day, and found that for NYSE and AMEX stocks, short sale volumes of pilot stocks were higher than those of nonpilot stocks at market open but not during regular trading hours. For NASDAQ stocks, short sale volumes of pilot stocks were lower than those of nonpilot stocks at market open but there was no difference between the two groups of stocks during regular trading hours.

To identify the sources of execution opportunities that "neutralized" the intended restrictive effect of the uptick rule, we analyzed short volumes at different relations among the minimum shortable price (the "MSP", i.e., the lowest price without violating the uptick rule), the execution price and the prevailing quotes. For NYSE and AMEX stocks, the uptick rule was preventing immediate executions for most of the times but market short sale orders were able to be matched with buy orders soon after their conversion into limit orders at the MSP. For NASDAQ stocks, the bid test was not binding for a majority of the times and, together with price improvements, provided generous execution opportunities to short sales.

The rest of this paper proceeds as follows: Section 2 reviews literature on short sale constraints, Section 3 discusses the SEC pilot program in detail, Section 4 describes the data and compares characteristics of pilot and nonpilot stocks in the sample, Section 5 compares overnight and intraday price movements of pilot and nonpilot stocks, Section 6 compares short sale volumes of the two groups of stocks and provides explanations to our finding of lack of restrictiveness of the uptick rule, Section 7 concludes this paper.

Section 2 Literature Review

Our paper relates closely to the literature that discusses whether short sale constraints impede price decline when the market is subject to downward pressure. Representative papers in this field include Bris, Goetzmann and Zhu (2003) and Charoenrook and Daouk (2005). Both papers study the skewness of returns in equity markets around the world with varying degrees of short sale constraints. The former finds that lifting short sale restrictions is associated with increased negative skewness in individual stock returns, but there is no compelling evidence that short sale constraints prevent or mitigate severe price declines at the market level. The latter finds no evidence of any difference in the skewness of returns and the probability of a market crash.

Our paper also connects to the literature on whether short sale constraints cause overpricing. Representative papers in this area include Miller (1977), which establishes a theory that short-sale constrained securities become overpriced when investors disagree about their values. Similarly, Diamond and Verrecchia (1987) finds that short sale constraints cause overpricing. Jones and Lamont (2002) empirically shows that stocks that are costly to borrow have a higher market-to-book ratio and low subsequent returns, consistent with the overpricing hypothesis. Wu and Guo (2004) studies the properties of speculative equilibrium when the investors' initial wealth is finite and when short selling is allowed. They find that equilibrium prices decrease as short selling increases, and price volatility increases in short selling. Duffie, Garleanu and Pedersen (2002) provides a model of the determination of prices, lending fees, and short interest. The model shows that the prospect of lending fees may push the initial price of a security above even the most optimistic buyer's valuation of the security's future dividends. A higher price can thus be obtained with some shorting than if shorting is disallowed. As lending fees decline, so does the valuation of the marginal investor, leading to a decline in the price. Asquith, Pathak and Ritter (2004) studies how stock returns are related to institutional ownership, a proxy for the easiness in stock borrowing. It has not found statistically reliable underperformance of a portfolio of short sale constrained stocks or a monotonic relation between institutional ownership and subsequent returns. Boehme, Danielsen and Sorescu (2003) tests Miller (1977)'s theory that short-sale constrained securities become overpriced when investors disagree about their value. They find that neither the presence of short-sale constraints, nor a high dispersion of investor beliefs is independently sufficient to provide overpricing. However, when both conditions are present, there is evidence of overpricing. Lamont (2004) tests whether overpricing increases as firms deliberately raise the level of short sale constraints (e.g., stock splits, threatened lawsuit). They find only weak evidence at best that deliberate short squeezes can temporarily raise stock prices.

Our contribution to the above areas of research lies in our focus on the price effect of the uptick rule itself, rather than the effect of the stock borrowing requirement or the joint effect of these two components of short sale regulations. Also, we study the effect of the uptick rule by comparing directly the intraday price paths of restricted stocks and unrestricted stocks after negative shocks rather than the skewness of daily returns. We believe that this is a more direct approach for studying whether the uptick rule has served the purpose of alleviating downward price pressures.

Our analysis also touches upon the execution quality of short sale orders when stocks are subject to the uptick rule. Representative papers in this area include Alexander and Peterson (1999), which uses short-sell tick data for 300 NYSE stocks during the month of May 1996 to compare the probability of execution, the time to execution, and the frequency of price improvements of short sale orders and regular sale orders. They find that the average time lag between submission of short sale orders and their executions is less than 10 minutes, which is substantially longer than regular sell orders. They also find that short sale orders are cancelled or unfilled more often than regular sell orders. Alexandar and Peterson (2002) studies the execution quality of short-sell orders (the probability of execution and the time to execution) around the time of decimal pricing to see whether the move to teenies reduces the effects of the uptick rule. They find that most market orders were easier to execute in declining markets due to reduced depth throughout the order book, and most at-the-quote limit orders were more difficult to execute in advancing markets.

Concurrent with our study, Diether, Lee and Werner (2006) studies the effect of the uptick rule on various market quality measures such as the spread, volatility and short sale volume by comparing these measures before and after the start of the pilot program. The study has found that for NYSE stocks, the suspension of the upick rule has increased the spreads but only for stocks with high short-sale activities, and for NASDAQ stocks, the suspension of the bid test is not associated with any significant change in the spread. In addition, the study has found no evidence to suggest that pilot NYSE and NASDAQ stocks experienced more down-side volatility after the suspension of the uptick rule. The uptick rule has resulted in more ask-side depth and more orders executed above the mid-quote, and this phenomenon is more evident for NYSE stocks than for NASDAQ stocks.

Other research topics in the field of short sale constraints include the impact of short sale constraint on the efficiency in price adjustments toward full information value (representative papers include Diamond and Verrecchia (1987), Dey (2001), Ofek, Richardson and Whitelaw (2002), and Jiang, Fung and Cheng (2001)), the information content of short selling (representative papers include Christophe, Ferri and Angel (2004), Arnold, Butler, Crack, and Zhang (2002), Daske, Richardson and Tuna (2005), and Diether, Lee and Werner (2005)), and impact of options trading on the efficacy of short sale constraints (representative papers include Figlewski and Webb (1993), Danielsen and Sorescu (2001), and Mayhew and Mihov (2004)). Since our paper does not directly address these topics, we will not discuss their related papers in any detail.

Section 3 SEC's Pilot Program

On May 2, 2005, the SEC started a Pilot Program whereby one third of the Russell 3000 index constituent stocks were exempted from the uptick rule initially for a period of one year until April 28, 2006 and subsequently extended up to August 6, 2007[18]. The purpose of the Pilot Program was for the SEC to collect data to study the effect of the uptick rule on stock prices, volatility, liquidity and trading behavior.

There were 3 categories of pilot stocks: Category A securities were never subject to the uptick rule, Category B securities were not subject to the rule from 4:15 pm ET until the open of the consolidated tape the next day (4:00am). All other securities were included in Category C and were not subject to the rule from the close of the consolidated tape (8:00pm ET) until the open of the consolidated tape the next day. Category A pilot stocks are the subject of this study and are referred to as the "pilot stocks" throughout this paper.

The Russell 3000 index consists of 3000 US stocks with the largest market capitalization and is re-constructed annually to ensure new and growing equities are reflected. According to the SEC's Pilot Order[19] that established the Pilot Program, in selecting pilot stocks, the SEC first excluded 32 stocks that were not NASDAQ securities, listed on NYSE, or listed on American Stock Exchange because short sales

[18] "Order Extending Term of Short Sale Pilot", Securities Exchange Act of 1934, Release No. 53684, April 20, 2006.
[19] SEC Release No. 50104, "Order Suspending the Operation of Short Sale Price Provisions for Designated Securities and Time Periods", July 28, 2004.

in those securities are not subject to the uptick rule[20] any way. Next, the SEC also excluded stocks whose initial public offerings or spin-offs commenced after April 30, 2004. After the above exclusions, the SEC sorted the remaining stocks into 3 groups according to their listing exchanges: AMEX, Nasdaq NNM and NYSE, then ranked the securities in each group by average daily dollar volume over the one year period from June 25, 2003 through June 25, 2004. In each group, the SEC then selected every 3rd stock from the remaining stocks, starting from the second stock on the list.

The names of the stocks included in the pilot program were announced on June 25, 2004 in the Pilot Order. Stocks designated as pilot stocks remained so except in limited circumstances (such as a delisting of a security from an exchange and its trading as an OTCBB security). Name changes of securities included in the pilot list did not affect their status. If a security included in the pilot changed its name and ticker symbol, then the security would remain in the pilot but would be identified by its new name and ticker symbol. Mergers and other business combinations involving securities included in the pilot program might affect their status. For example, if a Category A pilot security merged with another Category A pilot security, then the security resulting from the transaction would be a Category A pilot security. However, if a Category A pilot Security merged with a Category B pilot security or a Category C pilot security, then the status of the security resulting from the transaction would

[20] The uptick rule applies only to securities listed on a securities exchange and thus does not apply to short sales in NASDAQ securities. Short sales in NASDAQ stocks are subject to NASD Rule 3350, which also has an uptick rule that is similar to Rule 10a-1 but uses the best bid instead of the last trade price as the reference point.

depend on the market capitalization of the companies involved in the transaction. The company with the larger market capitalization, based on the most recent share number and price information as of the close of trading on the day before the transaction was announced, would have the pilot status of its securities applied to the security resulting from the transaction.

During the period of the pilot program, each exchange provided a daily update of the lists of Category A pilot securities and Category B pilot securities for which they maintain the primary listing. In our study, we have included only pilot (nonpilot) stocks that remained on the pilot (nonpilot) list throughout the period of May 2, 2005 to November 30 2005.

Section 4 Data Sample and Descriptive Statistics on Pilot and Nonpilot Stocks

Our basic approach was to identify events of negative earnings surprises and compare the overnight and intraday price behaviors and short selling activities of pilot and nonpilot stocks on the Event Day.

We started our sample selection with a list of 900 pilot stocks and 2000 nonpilot stocks that maintained their pilot or nonpilot status from May 2, 2005 to November 30, 2005. For each stock, we obtained the consensus (median) analyst forecast and the actual EPS from IBES during the sample period. We defined negative earnings surprises as events in which the actual EPS was lower than the consensus analyst forecast. There were about 1500 such events after excluding commercial banks and REITs from our sample. We collected earnings announcement times from news wires reporting the events and further eliminated about 200 events in which earnings were announced during regular trading hours or for which we could not ascertain whether the announcements were made before, after or during regular trading hours. Since our database of earnings report and analyst forecasts showed a median gap of 17 or 18 days between the last calculation day of forecasts and the actual earnings release, it was possible that new and positive information on earnings was brought to the market during this period but not recorded in the database used in our study. To reduce the possibility of misclassification of positive earnings surprises as negative earnings surprises, we further restricted our sample events to those which caused a nonpositive first response in price movements, i.e., events with negative overnight returns.

We obtained shares outstanding for sample stocks as of the end of 2004 and book values as of the end of April 2005 from COMPUSTAT and calculated the market-to-book ratio and market capitalization for each sample stock by using the close prices on the day immediately before the Event Day. We further excluded outliers and stocks for which data were unreported in the database and retained 945 events in our sample.

Table 1 Panel A shows the exchange listing of sample stocks. The number of pilot stocks that remained in our sample was about 49% of that of nonpilot stocks, roughly in line with the SEC's pilot/nonpilot ratio of 50%. The weights of NYSE, NASDAQ and AMEX stocks in our sample were also in line with the SEC's original design in the Pilot Order. About 17% and 18% of pilot and nonpilot stocks had multiple appearances in the sample.

Table 1 Panel B compares pilot and nonpilot stocks in terms of market capitalization, trading volume, options trading volume, market-to-book ratio and earnings surprise levels. Options trading volume was calculated for each sample stock by taking an average of its daily combined number of call and put options traded during April 2005. Pilot stocks had higher market capitalizations and trading volumes but lower options trading volumes. About 30% of both pilot and nonpilot stocks had no options trading, which percentage was consistent with the SEC's initial design of the Pilot Program. Pilot and nonpilot stocks had comparable market-to-book ratios and earnings surprise levels. Pilot stocks had a slightly bigger time gap between IBES' last calculation of median analyst forecast and the actual earnings release, but we do not believe this difference caused more noise in our event identification for pilot stocks because we filtered our event selection by including only events that had both negative earnings surprises as well as negative first responses in price movements, i.e., negative overnight returns.

Table 1 Panel C compares the sample average negative earnings surprises with those of Russell 3000 stocks in the previous three years (January 2002 to April 2005), the daily returns and short sale volumes (scaled by shares outstanding) on the Event Day with those on nonevent days. Nonevent days were defined as the two-week period starting from three weeks before earnings announcements. Daily returns and short sale volumes on every other trading day during this two-week period were averaged and compared with the daily returns and short sale volumes on the Event Day. The sample surprises were comparable to those in the previous three years in the mean, median and standard deviation, although they were more negatively skewed. The Wilcoxon Rank Sum Test did not reject the null hypothesis that sample surprises had a similar distribution to those of historical events. Event Day returns appeared to be lower than nonevent day returns according to the mean, median, and skewness numbers, while Event Day short sale volumes appeared to be higher. These visual impressions were confirmed by the Wilcoxon Rank Sum Test and the histograms shown in Figure 1. These numbers and figures confirmed the representativeness of our sample events to the negative earnings shocks typically seen in the recent history and the presence of stress on the Event Day. As we will show in the sections to follow, our study did not reveal any restrictive effect of the uptick rule on intraday price movements and short selling activities. We do not believe that this finding was caused by any abnormal "mildness" of the surprise magnitudes of our sample events compared to those typical of recent history or any inertia in the stock market after receiving the negative earnings shocks.

Section 5 Overnight and Intraday Price Effect of the Uptick Rule

Since earnings announcements occurred either before or after regular trading hours in our sample events, we began our comparison of the price adjustment process by examining overnight returns of pilot and nonpilot stocks. It was possible that earnings shocks were fully absorbed in open prices and thus not reflected in price movements during regular trading hours. Before we show our findings in this regard, we will discuss briefly how open prices are set at NYSE, AMEX, NASDAQ and regional exchanges.

5.1 Overnight Trading and Market Open System of NYSE, AMEX, NASDAQ and Regional Exchanges

With the exception of Archipelago Exchange whose regular trading hours are from 4:00am to 8:00pm ET, regular trading hours of exchanges to which the uptick rule applies starts from 9:30am to 4:00pm ET. Most exchanges have after-hour crossing sessions but they last no later than 6:30pm[21]. There are no overnight trading programs sponsored by any of the exchanges from 8:00pm to 4:00am the next day. In addition to exchange-sponsored after-hour crossing sessions, Electronic Communication Networks (ECNs) are also major venues for after-hour trading. Their

[21] Both the New York Stock Exchange and American Stock Exchange provide crossing sessions in which matching buy and sell orders can be executed at 5:00 p.m. at the exchanges' 4:00 p.m. closing prices. In addition, four regional exchanges currently have post-primary trading sessions: the Boston Stock Exchange ("BSE") and the Philadelphia Stock Exchange ("Phlx") have post-primary sessions that operate from 4:00 p.m. to 4:15 p.m.; the Chicago Stock Exchange ("CHX") operates their post-primary sessions until 4:30 p.m. Since October 29, 1999, the CHX has also operated an "E-Session" to handle limit orders from 4:30 p.m. to 6:30 p.m.

operation hours vary but typically do not extend beyond 8pm ET[22]. After-hour trading can be influenced by earnings information released after market close at 4:00pm.

Among the three categories of pilot stocks, Category A pilot stocks were never subject to the uptick rule. Category B pilot stocks were exempt from the uptick rule from 4:15pm to the time the consolidated tapes opens the next day. All other stocks belong to Category C and were exempt from the uptick rule from the time the consolidated tape was closed to the time the tape opened the next day. Since April 2005 the consolidated tape opens at 4:00am and closes at 8:00pm[23].

The stocks in our sample were either listed on NYSE or AMEX or traded at NASDAQ NNM. At NYSE and AMEX, limit and market orders to be executed at the open were submitted to the specialist overnight who determined the opening price. If the market-clearing price determined by customer orders were close to the previous-day's close, the specialist had the option of not participating in the opening batch auction. In this case, the market-clearing price was the opening price. If the market-clearing price was not near the previous day's close, then the specialist's obligation to maintain a fair and orderly market required the specialist to participate in the batch

---

[22] A short list of typical brokers that offer ECN access and the extended hours available is listed below. This list is meant to be illustrative, not exhaustive: Ameritrade (via Island ECN): Hours: 8am-8pm Eastern; limit orders only during extended hours. E*Trade (via Archipelago ECN), Hours: 8am-8pm Eastern; limit orders only during extended hours. Fidelity (via Redibook), Hours: 7:30-915am and 4:15-8:00pm EST; restrictions on order types. Harris Direct (via Redibook ECN), Hours: 8-9:15am and 4:15-7pm Eastern; limit orders only; round lots. Schwab (via Redibook ECN), Hours: 7:30-9:15am and 4:15-8pm Eastern, Monday - Friday; limit orders only.

[23] The change was caused by ArcaEx's adoption of new trading hours from 4:00am to 8:00pm.

auction and mitigate the price change by either buying to increase the price or selling to decrease the price. If the market-clearing price was far from the previous day's close, the specialist could request a floor governor to deem the obligation to maintain a small price change too onerous and delay the opening to give market participants a chance to change their orders. The specialist would then post a potential opening price range. New orders were then placed within the new price range. If the new clearing price was outside the posted range, the process repeated with a new posted price range until specialist found a market-clearing price. In addition to delays caused by an order imbalance, NYSE trading could be delayed in the face of a specific news release, initiated either by the company, which informed the exchange of the news release, or by the exchange itself in anticipation of news from another source. The uptick rule also played a role at market open in the sense that short sale orders for execution at market open price could not be executed at the open price if the open price was a down tick from the previous day's close price. Regional exchanges that trade NYSE or AMEX listed stocks typically set the open prices equal to the open prices of the primary exchanges.

NASDAQ NNM regular trading session started at 9:30am, but pre-market trading started at 7:30am. Starting from April 2005, there were 3 sessions of NASDAQ pre-market trading: (1) the quote/order entry session from 7:30am to 8:00am ET, during which quotes could be updated, opened and broadcast, but no automatic execution could occur. (2) 8:00 - 9:25am ET, during which time automatic execution could occur but volume was typically negligible. Market makers transmitted their bid-ask quotes, observed other dealers' quotes and identity and revised their own quotes in response to the quotes of others. Pre-opening quotes differed from quotes in regular trading hours in that they were nonbinding while dealers were required to honor their quotes for the minimum quantity of up to 1,000 shares during regular trading hours. In addition, market makers were under no obligation to quote during the pre-opening period but were required to provide two-way quotes during regular trading hours. (3) 9:25-9:30am, during which time NASDAQ opened and entered quotes for any participant with no open interest. If the firm chose to zero out its quotes overnight, NASDAQ would enter a quote for the participant of $.01 bid and $2000 ask. If the firm chose not to zero out its quotes overnight, NASDAQ would enter quote based on the last update by the firm. At 9:30 am, NASDAQ market makers began entering trades into the system. Individual market makers were expected to report transactions in chronological sequence within 90 seconds of execution. These conditions prevailed throughout the trading day. NASDAQ implemented an Opening Cross in late 2004 to provide execution opportunities to on-open orders. Starting from 7:30am, NASDAQ systems began to accept such orders. At around 9:28am, NASDAQ systems began disseminating information about order imbalance in the opening book along with an indicative opening price. Opening Cross occurred at 9:30am when the opening book and the NASDAQ Market Center continuous book are brought together to create a single NASDAQ opening cross. Following the cross, regular market hours trading proceed as usual.

5.2 *Comparison of Overnight Returns*

Overnight returns were calculated as $\ln(P_{t,open}) - \ln(P_{t-1,close})$, where P_{open} was the price at 9:30am when the regular trading sessions of the primary exchanges began on the Event Day, and $P_{t-1,close}$ was the market close price at 4:00pm on the day before the Event Day. Summary statistics of overnight returns are reported in Table 2. Pilot and nonpilot stocks had comparable mean and median overnight returns, but nonpilot stocks were slightly more negatively skewed. Their identical maximum value of '0' was due to our restriction of sample selection to events with nonpositive overnight returns. The standard deviations of the two groups of stocks were similar. Figure 2 shows the histograms of the overnight returns after adjusting for overnight market returns. The summary statistics and the histogram do not suggest any difference in the overnight returns of the two groups of stocks.

We ran a cross-sectional regression of the overnight return (after adjusting for overnight market return) of each sample stock on a pilot dummy, earnings surprise, an interaction term of pilot and surprise, a dummy variable for NASDAQ stocks, an interaction term of the pilot dummy and the NASDAQ dummy, and firm characteristics of market capitalization and market-to-book ratio. The NASDAQ dummy variable was intended to capture any difference of NASDAQ stocks from NYSE and AMEX stocks because, as Alexander and Peterson (1999) has shown, the NASDAQ bid test under NASD Rule 3350 was less restrictive than Rule 10a-1 that applied to NYSE and AMEX stocks. Moreover, NASDAQ stocks traded outside NASDAQ NNM were typically exempted from the bid test[24]. We used the overnight returns of Russell 3000 iShare ETF to proxy for overnight market returns. This ETF tracks the performance of Russell 3000 index and its liquidity level is reasonably high compared to other Russell 3000 ETFs. Regression results are reported in Table 3. The coefficient on the pilot dummy was negative but statistically insignificant with a *t* statistics of -1.19. Moreover, the coefficient on the pilot dummy and surprise interaction term was insignificant, suggesting that pilot stock returns were no different from nonpilot stocks returns even when the magnitude of negative surprises were high. NASDAQ stocks had lower overnight returns compared to NYSE and AMEX stocks but within the NASDAQ stock group, there was no difference between pilot and nonpilot stocks.

For NYSE and AMEX stocks, the uptick rule applied to short selling at market open prices[25]. Thus, if the open price was lower than the previous day's close price, short sale orders in nonpilot stocks could not be executed while short sale orders in pilot stocks could. It is interesting to note that this regulatory disparity did not cause any difference in the open price.

5.3 Comparison of Intraday Returns

[24] For example, by AMEX Rule 7.02, AMEX has exempted short sales of NASDAQ stocks from the bid test.
[25] The NASDAQ bid test does not apply to short sales at market open.

After finding that the uptick rule had no impact on the open price of stocks, we proceeded to examine whether the rule affected the intraday price paths by comparing returns of pilot and nonpilot stocks at Designated Times on the Event Day. If the uptick rule was indeed slowing price decline at times of stress, we expected to see pilot stocks to have lower returns during most periods. For intraday returns, we calculated returns between each Designated Time as well as cumulative returns since market open. Price data were obtained from TAQ. Summary statistics for noncumulative returns are provided in Table 2 Panel A and summary statistics for cumulative returns are provided in Table 2 Panel B.

For noncumulative returns, pilot stocks actually had higher (rather than the expected lower) mean and median returns from 9:30am to 10:45am than nonpilot stocks. Afterwards, pilot stocks had lower mean returns in 7 out of 10 periods, and lower median returns in 3 out of 10 periods. Pilot stocks returns were slightly more negatively skewed than nonpilot stocks in just about half of the time periods. The standard deviations of pilot and nonpilot stocks were comparable. On a cumulative basis, pilot stocks actually had higher mean and median returns and were less negatively skewed than nonpilot stocks throughout the entire Event Day. In sum, these numbers do not suggest that returns of pilot stocks were systematically lower than returns of nonpilot stocks.

For noncumulative returns, we ran cross-sectional regressions of returns (after adjusting for market returns)[26] on a pilot dummy, earnings surprise, an interaction term of pilot and surprise, positive net order flow during the Designated Time period, negative net order flow, an interaction of pilot stock and negative net order flow, the NASDAQ dummy, the interaction of pilot stock and NASDAQ dummy, market capitalization, market-to-book ratio, market-adjusted return in the previous period, and historical volatility which was calculated by taking the average of $\ln(\Pr ice_h) - \ln(\Pr ice_l)$ on April 1, 5, 13, 18, 21, 29, 2005 for each Designated Time period. $\Pr ice_h$ was the highest price and $\Pr ice_l$ was the lowest price of each period. April was the month immediately before the start of the Pilot Program. Our selection of the dates within this month for the purpose of calculating historical volatility and later on historical liquidity was arbitrary but the selected dates covered each day of a week and the beginning, middle and end of the month. Net order flow was defined as $\frac{BI - SI}{BI + SI}$, where BI was buyer-initiated trade volumes and SI was seller-initiated trade volumes. Whether an order was buyer or seller initiated was determined by the Lee and Ready (1991) algorithm, i.e., a trade was buyer initiated if $price > midquote$ and seller initiated if $price < midquote$. Trades with $price = midquote$ could be initiated by either the buyer or the seller and thus were not included in the calculation of order imbalance. Since the uptick rule might have caused some seller-initiated market short orders to be converted into limit orders at the legally shortable prices, these trades

[26] We also ran a regression of returns not adjusted for market return but included market return as an explanatory variable. The results were highly consistent with the regression of market-adjusted return. We will make these results available upon request.

would appear to be buyer-initiated under the above algorithm when indeed they were initiated by short sellers. Thus, we excluded short sale orders from the calculation of order imbalance. Regression results are reported in Table 3 Panel B. The coefficients on the pilot dummy were insignificant throughout the Event Day except for the period of 9:45 – 10:00 am. However, the sign of the coefficient for this period was positive, indicating (and consistently with the summary statistics) that pilot stocks actually had higher returns than nonpilot stocks during this period. There was also no evidence that pilot stocks with higher degrees of negative shocks had lower returns than their nonpilot counterparts because the coefficients on the interaction term of pilot and surprise were insignificant for all time periods. We also plotted histograms for each time period and they were visually consistent with the above regression results. Due to limitation in space, we do not provide these histograms in this paper but will make them available upon request. Positive net order flows were typically associated with higher returns during early hours of trading, but negative net order flows did not have any significant impact on returns. The coefficients on the NASDAQ dummy and the pilot and NASDAQ interaction term were mostly insignificant, suggesting the lack of difference between NASDAQ and NYSE/AMEX stocks and between NASDAQ pilot and nonpilot stocks.

We also ran a regression of cumulative returns (after adjusting for market returns) on the above mentioned variables except lag 1 returns and report the results in Table 4. There, we saw more striking evidence in regard to the lack of supporting effect of the uptick rule on stock prices. The coefficients on the pilot dummy were significant but positive for each period since 10:00 am. This was because higher returns of pilot stocks during early trading periods were carried over to subsequent periods through accumulation.

5.4 Robustness Checks

We performed 3 robustness checks on the intraday return regression results discussed above. First, we restricted our sample to stocks with big increases in daily trading volume from nonevent days because previous research has documented strong positive correlation between high trading volumes and market stress levels. Next, we restricted our sample to periods of high negative net order flow as the imbalance toward stronger selling interest was likely to produce consecutive down ticks that barred the immediate execution of short sale orders. Finally, the existence of an active put options market provided an alternative trading channel to short sellers by allowing them to buy put options instead of shorting stocks. Through arbitrage and hedging trades of options market makers and other market professionals, the increased interest in put options might eventually be transformed into short sales in the underlying stocks but some of these trades were likely subject to the arbitrage exemptions and market maker exemptions granted by Rule 10a-1(e) and NASD Rule 3350. The effect of the uptick rule on stocks without active options trading might be more acute. Therefore, we restricted our sample to stocks without an active options market.

Corresponding to our first robustness check, we divided our sample stocks into 10 groups according to the changes in their trading volumes on the Event Day from their trading volumes on nonevent days. We restricted our sample to stocks belonging to the top 3 groups and provided summary statistics of the intraday returns of the stocks in the restricted sample in Table 5. First note that the ratio of pilot and nonpilot stocks in this reduced sample was roughly 1-2, which was similar to the ratio for the full sample and in line with the SEC's design of the Pilot Program. There was no indication that this reduced sample of high volumes stocks were disproportionally filled by pilot stocks. The Wilcoxon Rank Sum Test showed that the returns for stocks in this reduced sample were indeed lower than the other stocks in the full sample with mostly negative Z statistics throughout the Event Day. Table 6 reports regression results for this reduced sample, which were consistent with the results for the full sample discussed in previous paragraphs.

Corresponding to our second robustness check, we ranked stocks and Designated Time periods according to the value of the net order flow defined in section 5.3 and used observations belonging to the three groups with the biggest negative net order flow. The regression results of this reduced sample are reported in Table 7. The pilot dummy was insignificant throughout the Event Day. The interaction term of the pilot dummy and earnings surprise was significant in only 3 out of 15 Designated Time periods, and their signs were inconsistent.

Corresponding to our third robustness check, we restricted our sample to stocks without an active options market and ran the same regression discussed in section 5.3 based on this reduced sample. The results, which are reported in Table 8, still suggested no difference in the intraday returns between pilot and nonpilot stocks, even for stocks with negative net order flows and stocks with big negative earnings surprises.

5.5 Comparison of Time to Reach a Specified Level of Negative Return

To further examine whether prices of pilot stocks declined faster than nonpilot stocks after receiving negative shocks, we specified a level of negative intraday return and compared the speed at which pilot and nonpilot stocks reached this level. We first identified the lowest price for each sample stock on the Event Day. We had about 120 observations with the minimum intraday cumulative returns lower than -10% at some time on the Event Day, about 210 observations with the minimum intraday returns between -5% and -10%, and about 150 observations with the minimum intraday returns between -3% and -5%. The remaining 450 observations had the minimum intraday returns higher than -3%. We arbitrarily picked -3% as the threshold level for our purpose of comparing the speed of price decline because this level gave us enough observations (more than 480) and was big enough a level of decline to suggest the existence of a downward price pressure. The characteristics of the stocks in our sample are reported in Table 9.

The ratio of pilot to nonpilot stocks in the remaining sample was 144/340, roughly in line with the ratio of the SEC's design of the Pilot Program. The average level of the lowest point in the intraday cumulative return was -.08 for pilot stocks, slightly higher than -.09 for nonpilot stocks. The median time that pilot stocks took to reach their minimum intraday prices was 97 minutes, about 40 minutes shorter than that for nonpilot stocks. Again, pilot stocks in the remaining sample had bigger market capitalizations, but the market-to-book ratio, volatility and earnings surprises were comparable for both groups of stocks. Historical volatility was calculated by taking the average of the daily volatility (proxied by the difference in the log of highest price and the log of lowest price) on April 1, 5, 13, 18, 21, and 29, 2005.

For each stock in the remaining sample, we then identified the point in time when the cumulative intraday return was closest to our pre-specified level of -0.03. We regressed this time on a pilot dummy, earnings surprise, the market return (proxied by the returns on Russell 3000 iShares ETF), the stock's market capitalization, market-to-book ratio, historical volatility, and historical liquidity (proxied by the average ratio of the daily trading volume on April 1, 5, 13, 18, 21 and 29 to the stock's shares outstanding). The regression results are reported in Table 10. The insignificant *t* statistics on the pilot dummy indicated a lack of difference in the time to reach -0.03 intraday return between pilot and nonpilot stocks, confirming our previous finding that the prices of pilot stocks did not decline faster than nonpilot stocks after negative earnings shocks.

5.6 Comparison of Intraday Return Volatility and Skewness

As a final check on our finding of a lack of price supporting effect of the uptick rule from empirical tests described above, we ran regressions of return volatility (proxied by squared excess returns) and return skewness (proxied by excess returns raised to the third power) on variables defined in section 5.3. If the uptick rule were supporting prices, we would expect to see lower volatility and less negative skewness in the returns of nonpilot stocks. The results of these regressions are shown in Tables 11 and 12, respectively. The coefficients on the pilot dummy and on the interaction term of the pilot dummy and negative net order flow were insignificant for each time period in both regressions. The coefficients on the interaction term of the pilot dummy and earning surprises were insignificant except for the period of 13:00 – 14:00 in the volatility regression and for the periods of 9:45 – 10:00 and 13:00 – 14:00 in the skewness regression. These results did not suggest that there was any systematic difference between pilot and nonpilot stocks in terms of return volatility and skewness.

In sum, we found no evidence that the uptick rule provided support to stock prices after negative earnings shocks. Since the hypothesis that the uptick rule impedes price decline builds on the belief that the rule reduces short sale volume by prohibiting execution of short sale orders at minus or zero minus ticks, we next examined whether the pilot stocks had a higher short sale volume than nonpilot stocks at market open and Designated Times on the Event Day.

Section 6 Comparison of Short Sale Volumes

Per request of the SEC at the beginning of the Pilot Program, each stock exchange made tick by tick short sale data available to the public. With the exception of the NASD ADF, which recorded short sales executed at the NASDAQ NNM for a limited number of stocks, each exchange recorded only short sales that were executed on that particular exchange. We combined the short sale data from each exchange and constructed a time series of executed short sales for each stock in our sample for the period of May 2 to November 30, 2005. To study changes in short sale volumes on the Event Day from nonevent days, we obtained short sale volumes for every other trading day during a two-week period starting from three weeks before the Event Day. We took the average of short sale volumes on nonevent days for each time interval examined and subtracted this average from the Event Day short sale volumes. We then divided the difference by the stock's nonevent day average[27]. We studied how changes in short sale volumes, calculated both on a noncumulative basis for each time period between Designated Times and on a cumulative basis since market open, relate to the pilot or nonpilot status of the stock.

6.1 *Comparison of Short Sale Volumes at Market Open*

Summary statistics of change in short sale volumes at market open are reported in Table 13. They show that pilot stocks had a higher mean and median short sale

[27] We also scaled the difference by the stock's shares out standing and by total trading volumes, respectively, and calculated the change in this ratio for each sample stock from its historical level. We then repeated each regression discussed in this section using the change in this ratio as the dependant variable. The results were consistent with those reported in this section.

volume at market open. Table 14 Panel A reports the results of a cross-sectional regression of changes in open short sale volumes on a pilot dummy, earnings surprise, an interaction term of pilot and earnings surprise, a dummy for NASDAQ stocks and an interaction term of pilot and the NASDAQ dummy, market return and firm characteristics. We included dummy variables for NASDAQ stocks because the uptick rule applied to NYSE and AMEX stocks at market open by referencing to the previous close price but the NASD bid best did not apply to NASDAQ stocks at market open. How the market open short volumes differed between pilot and nonpilot stocks could depend on where the stocks were traded. The regression revealed a highly significant and positive coefficient on the pilot dummy, a highly significant and positive coefficient on NASDAQ dummy, and a highly significant but negative coefficient on the interaction term of the pilot dummy and the NASDAQ dummy. These suggested that for NYSE and AMEX stocks, pilot stocks had significantly higher open short volumes than nonpilot stocks. This was hardly surprising because the uptick rule applied to short sales at market open and our sample was restricted to stocks with negative overnight returns. It is worth noting that the higher short sale volumes of pilot stocks at market open did not cause specialists to set lower open prices for pilot stocks as evidenced by the lack of difference in overnight returns between the two groups of stocks discussed earlier. The higher market open short volumes for NASDAQ stocks relative to NYSE and AMEX stocks were likely reflective of the inapplicability of the bid test at market open. Within the group of NASDAQ stocks, pilot stocks had lower short volumes at market open. This was likely reflective of short sellers taking advantage of the inapplicability of the bid test at market open and placing short sale orders before regular trading hours began. Despite the difference between the open short volumes of pilot and nonpilot stocks, open short sale volumes accounted for just a small fraction of total Event Day short sale volumes - for NYSE and AMEX stocks, the ratio averaged 2.4% for pilot stocks and 1.4% for nonpilot stocks; for NASDAQ stocks, the ratio averaged 1.7% for pilot stocks and 2.5% for nonpilot stocks. Thus, the difference at market open was unlikely to have any significant impact on the pattern of short selling activities during regular trading hours.

6.2 Comparison of Intraday Short Sale Volumes

We compared intraday short sale volumes of pilot and nonpilot stocks on both noncumulative basis as well as cumulative basis. Summary statistics of noncumulative intraday short sale volumes for each period between Designated Times and cumulative short sale volumes since market open are reported in Table 13. For noncumulative intraday short sale volumes, pilot stocks had a higher mean in 9 out of 15 time periods, and a higher median in 11 out of 15 periods. We ran cross-sectional regressions of changes in noncumulative short sale volumes for each time period between Designated Times on a pilot dummy, earnings surprise, interaction of pilot and surprise, positive net order flow, negative net order flow, a NASDAQ dummy, an interaction term of the NASDAQ dummy and the pilot dummy, market return, firm’s market capitalization, market-to-book ratio, lag1 change in short sale volumes (except for the first time period of 9:30 – 9:45), lag1 return and historical volatility. For the time period of 9:30

– 9:45, we used overnight returns for lag1 returns. The results are reported in Table 14 Panel B. The coefficients on the pilot dummy were insignificant for each of 15 time periods. The coefficients on the interaction term of pilot and surprise were significant in 1 period but its sign was positive, suggesting again that pilot stocks with bigger negative earnings shocks had lower (rather than the expected higher short sale volumes). Periods of high order imbalance, both positive and negative, were associated with lower short volumes, but there was no difference between pilot and nonpilot stocks at such times as indicated by the insignificant coefficients on the interaction term of the pilot dummy and negative net order flow. There was also evidence that short sale volumes NASDAQ stocks had higher short volume than NYSE-AMEX stocks and that short volume decreased in firm size.

The results of regressions on changes in short sale volumes calculated on a cumulative basis are reported in Table 14 Panel C. The coefficients on the pilot dummy were insignificant throughout the Event Day and again mostly with negative signs. The coefficients on the interaction terms of pilot and earnings surprise, pilot and negative net order flow were also insignificant. Other findings were also consistent with regressions of noncumulative short sale volumes.

We were surprised at the finding of the lack of difference in short sale volumes between pilot and nonpilot stocks. There are two potential explanations for this result: (1) the uptick rule was indeed restricting but short sale interest in nonpilot stocks was higher than that in pilot stocks so the executed short volumes were similar for these two groups of stocks. Two factors could potentially lead to this result. First, short sale orders for nonpilot stocks could not be executed at market open due to the restriction of the uptick rule, causing a higher concentration of short sale interest during regular trading hours. This explanation could apply only to NYSE and AMEX stocks. Secondly, if nonpilot stocks had less active options market so that traders who were interested in shorting the stocks had fewer opportunities to buy put options, then short sale interest in nonpilot stocks could indeed be higher than that in pilot stocks. In that case, the equivalence of executed short sale volumes between the two groups of stocks would not offer conclusive evidence as to whether the uptick rule was restrictive. (2) The short sale interest in pilot stocks and nonpilot stocks was similar, and short sale orders found execution opportunities with 15 minutes of their placement despite the restriction of the uptick rule.

Explanation (1) appears to be implausible. As shown in Table 1 Panel B pilot and nonpilot stocks had similar characteristics such as market capitalization, market-to-book ratio, and earnings surprises. Moreover, the proportions of stocks without options trading were comparable for the two groups (30% for pilot and 32% for nonpilot), and for stocks with options trading, the options volume was typically higher for nonpilot stocks. In terms of short volume at market open, although this volume was lower for nonpilot stocks that were listed on NYSE or AMEX due to the application of the uptick rule (see Table 14 Panel A), short volume at market open accounted for about 2% of the total short sale volume on the Event Day. Such a small fraction was unlikely to have caused any meaningful difference in the short sale interest during regular trading hours on the Event Day.

If pilot and nonpilot stocks had similar levels of short sale interest, then our finding of the lack of difference in the executed short sale volumes during regular trading hours between pilot and nonpilot stocks was an indication that execution opportunities were not restricted by the application of the uptick rule. To see this, suppose there are two traders who want to sell 100 shares of stock Z at market prices. Trader R is subject to the uptick rule but Trader UR is exempt from the rule. During a specified time interval (e.g., 15 minutes), the proportion of the time during which the best bid is higher or equal to the minimum shortable price (MSP) is $T\%$, and the proportion of time during which the best bid is lower than the minimum shortable price is $1-T\%$. MSP is defined as the price at which short sales are not prohibited by the uptick rule. When the best bid is higher than or equal to the MSP, market short orders can be executed immediately at the bid without violating the uptick rule. At such times, Trader R and Trader UR have similar execution opportunities. When the bid is lower than the MSP, Trader R cannot execute his short sales without price improvement from specialists. For purpose of this proof, we assume that a fraction of $\theta\%$ of his orders receive price improvements and are executed at the MSP. In contrast, Trader UR can execute short sales at the bid without restrictions. Let X= the total number of shares that can be sold in the market during the period when bid>=MSP, and Y= the total number of shares that can be sold in the market during the period when bid<MSP. Since Traders R and UR have equal execution opportunities during the time when bid>=MSP, Trader UR can have at most $\frac{1}{2}X$ shares sold during this period. However since he also has opportunities to short sell during times when bid<MSP, he may not fully utilize opportunities when bid>=MSP. Let's assume that Trader UR executes short sales during times when bid>=MSP and when bid<MSP by the ratio of $\frac{T\%}{1-T\%}$. Also, we assume that Trader UR is able to short sell all 100 shares during the specified time interval. This assumption is consistent with Alexander and Peterson (1999), which shows that the fill rate for unrestricted sell orders is higher than 95%. Thus, during periods when bid>=MSP, Trader UR is able to short sell $\min[T\%100, \frac{1}{2}X]$ shares, and during periods when bid<MSP, Trader UR is able to short sell $100-\min[T\%100, \frac{1}{2}X]$. If the uptick rule is in place, Trader R can short sell $\max[X-T\%100, \frac{1}{2}X]$ shares at times when bid>=MSP and $\theta\%[100-\max(X-T\%100, \frac{1}{2}X)]$ at times when bid<MSP. The aggregate short sell volume of Traders R and UR is

$$\max[X-T\%100, \frac{1}{2}X] + \theta\%[100-\max(X-T\%100, \frac{1}{2}X)] + \min[T\%100, \frac{1}{2}X] + 100-\min[T\%100, \frac{1}{2}X] \qquad (1)$$

If the uptick rule is lifted, Trader R can short sell in the same way as Trader UR, i.e., he short sells $\min[T\%100, \frac{1}{2}X]$ when bid>=MSP and 100-$\min[T\%100, \frac{1}{2}X]$ when bid<MSP. The total short sell volume is $\min[T\%100, \frac{1}{2}X]*2 + [100 - \min(T\%100, \frac{1}{2}X)]*2$ (2). If the shares that Trader R can short sell is less than his desired number of 100, i.e., $\max[X - T\%100, \frac{1}{2}X] + \theta\%[100 - \max(X - T\%100, \frac{1}{2}X)] < 100$, then the total short sale volume given by formula (1) is lower than the total short sale volume given by formula (2).

Similarly, it can be shown that if execution opportunities under the uptick rule are insufficient to accommodate short sale demand, volume of executed marketable limit short sale orders will also increase once the rule is abandoned. This is because addition execution opportunities are created during periods when the bid is equal to or higher than the price limit but lower than the MSP. The method of proof is similar to that shown above for market orders and will not be repeated here.

A few factors could potentially lead to the equivalence of short volumes between pilot and nonpilot stocks: (1) the frequent occurrence of market conditions when the rule was not binding, that is, MSP<=bid for market short sale orders and MSP<=ask for limit short sale orders, which allowed short selling at the prevailing quotes without violating the rule, (2) even though the uptick rule was nonbinding in only limited periods of times, such times were most efficiently utilized such that most of the short sale orders concentrated in these periods; (3) the exemptions to the rule, that is, short sale order were mostly placed by market professionals or arbitrageurs who were exempt from the rule, (3) the provision of price improvements by specialists to short orders up to the MSP so that they could be executed without violating the rule, and (4) sufficient buy interest to provide execution opportunities to short orders that had been converted to limit orders at the MSP. In the following subsection, we will analyze these scenarios by examining short volumes occurring at different relations among the bid, the ask, the MSP and the execution price.

6.3 Did Upticks or Zzero-plus Ticks Occur Frequently to Make the Uptick Rule Inapplicable Most of the Times?

To answer this question, we merged TAQ Consolidated Quote data with TAQ Consolidated Trade data in time sequence, calculated the MSP at each point in time and compared it with the prevailing bid. The time during which the MSP was lower than or equal to the best bid was categorized as "nonbinding" and was aggregated for each Designated Time period on the Event Day. We then took the ratio of the aggregated nonbinding times (in seconds) to the total number of seconds for each Designated Time period. In doing so, we separated NYSE and AMEX listed stocks from NASDAQ stocks because, as discussed in earlier sections, they were subject to different short sale rules and there was a disparate application of the short sale rule on

NASDAQ stocks by different exchanges. The summary statistics on the nonbinding time ratio for NYSE and AMEX stocks are reported in Table 15 Panel A. They showed that nonbinding times accounted for only about 8-12% of the Event Day for nonpilot stocks. Moreover, the ratio for nonpilot stocks was actually lower than the ratio for pilot stocks (averaged at about 8-14%). These numbers did not support the hypothesis that unrestrictive execution opportunities occurred with high frequency to render the uptick rule inapplicable for most of the times. In contrast to NYSE and AMEX stocks, the nonbinding time ratios for NASDAQ stocks, which are reported in Table 15 Panel B accounted for 50 -60% of the time. To see whether this difference was caused by economic conditions in the market or by the artificial difference in the short sale rules that apply to the two groups of stocks differently, we re-calculated the mean and median nonbinding time ratios of NYSE-AMEX stocks but using NASDAQ's bid test. The results, which are reported in Table 15 Panel C, showed comparable ratios to those of NASDAQ stocks and the *t* test confirmed the indifference throughout the Event Day except for the period of 14:00 – 15:00. The restrictiveness of NYSE and AMEX rules relative to the NASDAQ rules can be illustrated with the following data. On November 2, 2005, at 9:52:24 am, stock AEL's best bid moved from 11.51 to 11.55. Under the NASDAQ's bid test, this increase in bid would permit short selling at any price. However, under Rule 10a-1, we would have to examine whether the previous trade occurred at a down tick. The previous trade occurred at 9:52:19 am at the price of $11.63, which was a down tick compared to the earlier trade at $11.65. Thus, under Rule 10a-1, short sellers could only trade at

\$11.64 or higher. Since this price was higher than the prevailing best bid, market short orders could not be executed immediately.

In sum, the nonbinding time ratios for NYSE and AMEX stocks were too low to explain why there was no difference between the short volumes of pilot and nonpilot stocks. The ratios for NASDAQ stocks were much higher and could potentially explain the lack of difference between pilot and nonpilot stocks. In the following paragraphs we will examine the distribution of short volumes at different scenarios to see whether that was indeed the case.

6.4 Were Short Sellers Timing the Market to Concentrate Orders to Times When the Uptick Rule was Nonbinding?

We sought to answer this question and the questions in the next paragraphs by analyzing the relation among the MSP, the prevailing bid and ask and the execution price when short sales occurred. The relation between the MSP and the quotes would tell us whether short sales occurred at times when the uptick rule was binding, the relation between the prices and the quotes would tell us whether the trades involving short sales were initiated by sellers or buyers. Following Lee and Ready (1991) algorithm, we treated trades with $price < midquote$ as seller initiated and trades with $price > midquote$ as buyer initiated. The relation between the MSP and execution prices would tell us whether the short sales were exempt from the uptick rule, either under the Pilot Program or any of the exemptions listed in Rule 10a-1(e) and NASD

Rule 3350. The different combinations of the above elements resulted in 45 execution scenarios listed in Table 16. For each stock in the sample and for each Designated Time period on the Event Day, we calculated the short sale volumes in each scenario and their weight in the total short sale volumes. We then calculated the average of the ratio for each scenario for pilot stocks and nonpilot stocks, respectively. Due to limitation in space, we do not provide the ratios for all scenarios in this paper, but provide a selected number of ratios that are important to our discussion in Table 17 Panels A – C. None of the scenarios exhibited high variation across different Designated Time periods so we took an average of the ratios across different Designated Time periods for each scenario.

Table 17 Panel A compares pilot and nonpilot stocks in terms of the short volumes at times when the uptick rule was not binding, i.e., $MSP \le bid$ for seller-initiated short sales and $MSP \le ask$ for buyer-initiated short sales. For NYSE and AMEX stocks, about 32% of short volumes for pilot stocks and 67% of short volume for pilot stocks occurred at such times. Did the high short volume occurring at nonbinding times mean short sellers were timing the market and concentrating their orders to such times to avoid the uptick rule? We believe not. The scenario $bid < MSP = short\ price = ask$ accounted for 38.96% of the total short volume for nonpilot stocks and most of the difference in the ratio between pilot and nonpilot stocks. Arguably this scenario could be explained as short sellers entering limit orders at the ask when it was equal to the MSP so that the uptick rule would not bar execution. However, this hypothesis could not explain why short sellers were less inclined to utilize opportunities when $MSP < ask$ as suggested by the low ratios for scenarios $MSP < bid < short\ price = ask$ and $MSP = bid < short\ price = ask$. Jointly they accounted for only 10% of the total short volume. In addition, scenarios $MSP \le short\ price \le bid$ jointly accounted for only 11% of the total short volume. These scenarios captured short sales initiated by the seller when the uptick rule was not binding. The big difference between scenarios $bid < MSP = short\ price = ask$ and $MSP \le short\ price \le bid$ could not plausibly be explained by short sellers favoring limit orders to market orders. Alexander and Peterson (1999) has shown that there were more market short orders than limit short orders during its sample period of May 1996. The scenario $bid < MSP = short\ price = ask$ was more likely reflective of the story that market short orders whose immediate execution were barred by the uptick rule were converted to limit orders at the MSP, which in turn were matched with the upcoming buy orders. Short sale volumes that could be explained by concentration of short selling to nonbinding times accounted for at most 25% of the total short volumes.

For NASDAQ stocks, about 66% of the total short sale volumes occurred at times when the bid test was not binding[28], significantly higher than the ratio for NYSE and AMEX stocks, but roughly in proportion to the nonbinding time ratios shown in

[28] About 25% (24.5% for pilot stocks and 26.8% for nonpilot stocks) of total short sale volumes occurred at times when the bid best was binding but without violating the bid test due to price improvements at or above the MSP.

Table 15 Panel B. Although differences between pilot and nonpilot stocks in some scenarios were statistically significant, they were not economically significant. The scenario $bid < MSP = short\ price = ask$ accounted for about 4% of total short sale volumes for both pilot and nonpilot stocks, in contrast to the striking difference between these two groups for NYSE and AMEX stocks.

6.5 Could Exemptions Explain the Lack of Difference in Short Volumes between Pilot and Nonpilot Stocks?

For NYSE and AMEX stocks, Rule 10a-1(e) provide numerous exemptions from the uptick rule, mostly to market professionals and arbitrageurs. If short sale orders were mostly placed by traders who were subject to exemptions, the suspension of the uptick rule on pilot stocks naturally would not have any impact on short volumes and returns. To examine whether this was the case, we compared pilot and nonpilot stocks in terms of short volumes at prices lower than the MSP and thus in violation of the uptick rule. The idea was that if most of the players in the short selling market were subject to exemptions in the first place, we should not see any significant increase in exempt short volumes after the uptick rule was suspended. In other words, the exempted short volumes of pilot stocks should not be significantly higher than those of nonpilot stocks. The results are reported in Table 17 Panel B. Exempted short sales accounted for 49.81% of the total short volumes for pilot stocks, 42.19% of which occurred at times when the uptick rule was binding, i.e., when $MSP > bid$ for seller-initiated trades and $MSP > ask$ for buyer-initiated trades. In comparison, exempt short sales accounted for only 7.7% of the total short sales for nonpilot stocks, 6.46% of which occurred at times when the uptick rule was binding. For pilot stocks, seller-initiated exempt short sales accounted for about 30% of the total short volume, while buyer-initiated accounted for only about 10% of the total short sales. For nonpilot stocks, the volumes for seller-initiated short sales were slightly lower than the volume for buyer-initiated short sales. The big difference between pilot and nonpilot stocks in exempt short volumes was not at all surprising as it was the direct result of suspending the uptick rule on pilot stocks. It also suggested that market professionals who benefited from the exemptions under Rule 10a-1(e) were not the only players in the short selling market and thus exemptions alone could not explain why the uptick rule did not make any difference in the short sale volumes.

For NASDAQ stocks, short sales executed in violation of the bid test accounted for 13.8% for pilot stocks and 7.04% for nonpilot stocks. While the difference was economically significant, the number was not nearly as dramatic as that for NYSE and AMEX stocks. Since the bid test was nonbinding for about 60% of the times, and these times absorbed about 60% of the total short volume, short orders in pilot stocks whose executions relied on exemptions provided by the Pilot Program were greatly reduced and thus we were not surprised at the reduced difference between pilot and nonpilot stocks listed on NASDAQ.

6.6 So Where Did Nonpilot Stocks Find Execution Opportunities that Offset the Difference in Exempt Short Volumes Caused by the Regulatory Disparity?

For NYSE and AMEX stocks, the previous paragraphs have shown that the uptick rule was indeed limiting short sales at down tick and zero-minus ticks, but the overall short volumes for pilot and nonpilot stocks remained the same. It must be that nonpilot stocks found more execution opportunities elsewhere that made up the difference caused by the disparate application of the uptick rule. In this subsection, we explore additional (relative to pilot stocks) execution opportunities received by nonpilot stocks outside the exempt short sale group by ranking the execution scenarios in which nonpilot stocks had higher short volumes than pilot stocks. The results are reported in Table 17 Panel C1. Nonpilot stocks had higher short volumes than pilot stocks in 14 out of 45 scenarios, among which scenario $bid < MSP = short\ price = ask$ ranked the highest with a striking difference of 28.96%. This scenario alone offset 65% (28.96%/49.81%) of the surplus short volumes of pilot stocks due to the suspension of the uptick rule. As discussed earlier, this scenario was likely reflective of the matching of market buy orders with short orders which were initially placed as market orders but converted into limit orders at the MSP when the uptick rule barred immediate execution. Two observations could be made out of the higher ratio of nonpilot stocks in this scenario: First, nonpilot stocks had more limit orders piling at the MSP than pilot stocks. This was hardly surprising because pilot stocks were not restricted by the uptick rule so market short orders arriving at the trading floor when $bid < MSP$ could be executed immediately without being converted into limit orders at the MSP. Second, most of the converted short orders were successfully executed (rather than unfilled or cancelled) by matching with buy orders within 15 minutes (the shortest time span we used in this intraday study) of their conversion.

Scenario 2 in which $MSP = short\ price = bid$ had the second highest ranking with a difference of 3.66%. In this scenario, market short sales were matched with the bid which was equal to the MSP. The higher short volume of nonpilot stocks in this scenario suggested more efficient utilization of the window of opportunities when the uptick rule was nonbinding. Scenario 4 in which $bid < MSP = short\ price < ask$ with $price > midquote$ had a difference of 2.36%. In this scenario, trade was more likely buyer initiated and "price improved" by a short sale order up to the MSP level. It was again an indication that short sellers were more efficiently utilizing opportunities when the uptick rule was nonbinding. Scenarios 3 in which $bid < MSP = short\ price < ask$ and $short\ price < midquote$ had a difference of 3.18%. It was likely initiated by market short sale orders but because $bid < MSP$, the short sale could not be executed at the bid price. Instead of letting the order convert to a limit order at the MSP level and waiting for execution against future buy orders, the specialist or a floor broker offered price improvement to the short sale order and allowed it to be executed immediately. Scenario 5 in which $bid < MSP = short\ price < ask$ and $short\ price = midquote$ had a difference of 1.78%. Trades in this scenario could be either seller initiated and thus same as scenario 3 or buyer initiated and thus same as scenario 5. However, since the short price was at the midquote, we could not ascertain trade initiation and thus treated it as a separate scenario.

In sum, scenarios 1 through 5 had a cumulative difference of 39.94%, offsetting most of the surplus volumes of pilot stocks attributed to the suspension of the uptick rule. They represented 3 main sources of execution opportunities received by short sellers in nonpilot stocks: (1) There was sufficient buy interest matching with market short orders after their conversion into limit orders at the MSP, (2) short sellers subject to the uptick rule were utilizing more efficiently the times when the uptick rule was not binding to execute their trades, and (3) specialists or floor brokers were providing price improvements to short sale orders up to the MSP to allow for their immediate execution. The first factor was the dominating factor among the three.

The story was completely different for NASDAQ stocks. As shown in Table 17 Panel C2, there was not any dominating scenario that made up the 7% difference in short sale volumes due to the suspension of the bid best on pilot stocks. The biggest positive difference between nonpilot and pilot stocks was 1.11% given by scenario $Bid < MSP = Short\,\mathrm{Pr}ice = Ask$, which was hardly significant in the economic sense. In sum, the bid test was not binding on short selling for 60% of the times, allowing for more than 60% of short sales to take place during such periods without violating the rule. When the rule was binding, short sellers received price improvements at or above the MSP level so that another 25% of short sales occurred during such period without violating the rule. As a result, only 13% of the short selling in pilot stocks relied on the exemptions provided by the Pilot Program, leading to a scant 7% difference between short volumes of pilot and nonpilot stocks that were violating the bid test. This difference was made up in 15 scenarios in which nonpilot stocks had higher short volumes, none of which was economically dominating.

6.7 Robustness Check

For NYSE and AMEX stocks, we performed a robustness check of the results on the distribution of short sale volumes with a sample of paired stocks, each pair consisting of one pilot stock and one nonpilot stock with similar levels of short sale volume and trade volume as well as market capitalization. In doing so, we first assigned ranks to market capitalization, trade volume scaled by shares outstanding, and short volume scaled by trade volume of sample stocks for the Designated Times. There were 10 ranks for each criterion. We then paired observations for pilot and nonpilot stocks that occurred in the same Designated Time period and had the same rank in all 3 criteria. For example, during 14:00 – 15:00 on the Event Day, pilot stock A had a trade volume rank of 8 and a short sale volume rank of 9. Nonpilot stock B also had rank 8 for trade volume and rank 9 for short volume during the same time period. Both stocks were large stocks with rank 9 for market capitalization. These two observations would form a pair for the purpose of our exercise discussed in this paragraph. There were 635 such pairs. We calculated the ratio of the short volume at each of the 45 scenarios to the total short volume for pilot and nonpilot stocks in the paired sample for each Designated Time period. The results were highly consistent with results obtained from the full sample. To conserve space, we do not provide all these ratios in this paper but will summarize a few important data in Table 18.

Table 18 Panel A compares the percentage of short volumes at times when the uptick rule was nonbinding, the exempted short volumes and exempted short volumes at times when the uptick rule was nonbinding. These numbers were similar to those for the full sample reported in Table 17. For example, short volume ratios at times when the uptick rule was unrestrictive were 32.05% for pilot stocks and 66.70% for nonpilot stocks in the full sample, and the ratios were 31.14% and 66.48% for pilot and nonpilot stocks in the paired sample. Short volumes with prices lower than the MSP accounted for 49.81% for pilot stocks and 7.7% for nonpilot stocks in the full sample, and the ratios were 51.68% and 7.98% in the paired sample. The ratios for short volumes occurring with prices lower than the MSP at times when the uptick rule was restrictive were 42.19% for pilot stocks and 6.46% for nonpilot stocks in the full sample, and the ratios were 44.43% for pilot stocks and 6.72% for nonpilot stocks in the paired sample.

Table 18 Panel B ranks the scenarios in which nonpilot stocks had higher short volumes than pilot stocks for the paired sample. As in the full sample, scenario $bid < MSP = short\ price = ask$ showed the biggest difference between nonpilot and pilot stocks. The numbers confirmed that scenario 1 – 6 in Table 17 Panel C2 made up most of the differences in short volumes caused by the disparate application of the uptick rule. Scenario 1 was reflective of the matching of buy orders with market short orders that had been converted to limit orders at the MSP, scenarios 2 and 4 were reflective of short sellers's more efficient utilization of opportunities when the uptick rule was unrestrictive, and scenarios 3 was reflective of price improvements to market short orders up to the MSP level. Scenario $bid < MSP < short\ price < ask$ with $short\ price = midquote$ had a high ranking difference in the paired sample but an insignificant *t*-statistics.

6.8 Were the Results Robust for Periods of High Negative Order Imbalance?

The previous paragraphs have shown that market short sale orders for NYSE and AMEX stocks that were converted into limit orders at the MSP were executed against the upcoming buy orders in the next 15 minutes and thus the disparate application of the uptick rule did not result in any difference in short volumes between pilot and nonpilot stocks. A question that follows is whether converted short orders were still able to find execution opportunities at times when the market experienced a substantial negative imbalance between buy and sell orders, i.e., there was more selling interest than buying interest in the market, a character typical of markets that were subject to stress. In Section 5.3, we divided our sample stocks and associated Designated Time periods into 10 groups according to their net order flow. In the exercises discussed below, we restricted our sample to NYSE and AMEX stocks and observations in Designated Time periods belonging to the group with the highest negative order imbalance. The restricted sample had about 700 observations with a pilot-nonpilot ratio of 302/446 and a mean net order flow of -0.76 for pilot stocks and -0.73 for nonpilot stocks.

We repeated the analysis of short sale order execution scenarios described in Table 16 but with a reduced sample of observations that belonged to the group of the biggest negative order imbalance. The results, which are reported in Table 19 Panel A and Panel B, are highly consistent with those reported in Table 17 in every criterion. Short volume ratios at times when the uptick rule was unrestrictive were 32.05% for pilot stocks and 66.70% for nonpilot stocks in the full sample, and the ratios were 32.68% and 67.29% for pilot and nonpilot stocks in the reduced sample. Short volumes with prices lower than the MSP accounted for 49.81% for pilot stocks and 7.7% for nonpilot stocks in the full sample, and the ratios were 48.96% and 7.19% in the reduced sample. The ratios for short volumes occurring with prices lower than the MSP at times when the uptick rule was restrictive were 42.19% for pilot stocks and 6.46% for nonpilot stocks in the full sample, and the ratios were 41.31% for pilot stocks and 6.04% for nonpilot stocks in the reduced sample. Table 19 Panel B ranks execution scenarios in which nonpilot stocks had higher short volumes than pilot stocks according to the magnitude of difference between the short volumes of the two groups of stocks. The ranks were almost identical to those of the full sample reported in Table 17 Panel C1. The numbers confirmed that the matching of market buy orders with limit short orders that were converted from market short orders, plus more efficient utilization of execution opportunities when the uptick rule was nonbinding and price improvements made available to nonpilot stocks to avoid the restriction of the uptick rule, eliminated the restrictive effects of the uptick rule on nonpilot stocks.

6.9 A Comment on the Effect of the Uptick Rule in the 1 Cent Minimum Tick Move Environment

In the Introduction section of this paper, we cited statements by some market participants who doubted the usefulness of the uptick rule after the reduction in the minimum tick to 1 cent. The results of our study lend some support to those statements in the sense that the reduction in the tick size led to more frequent occurrences of the MSP being lower than the ask and a reduction in the depth across the order book. According to the study of Alexander and Peterson (2002), both factors made it easier for the execution of market short orders after their conversion into limit orders. Table 20 shows that the MSP was between the quotes in about 25% of the times in our sample, at which times market short orders that were converted into limit orders at the MSP had priority in the execution queue ahead of existing limit orders in the book. The MSP was equal to the ask for about 30-35% of the times and higher than the ask for about 40-45% of times in our sample. Existing limit orders in the book at the same price level or lower had priority over the converted short sale orders at those times. If the level of the MSP changed before converted short orders were executed, the unexecuted orders would be deemed limit short orders at the new MSP level and take priority after existing limit orders in the book at the same price level. Since the Pilot

Program did not make the data on initial order submissions available to the public, we could not determine the actual time gap between order submission and execution, although the results of our study suggested that it was not longer than 15 minutes.

Section 7 Conclusion

This paper examines the effect of the short sale uptick rule on the overnight and intraday price movements and short sale volumes. We took advantage of the SEC pilot program that started on May 2, 2005 where by one-third of Russell 3000 Index constituent stocks were exempted from the uptick rule and compared the returns and short sale volumes of pilot stocks to those of nonpilot stocks at market open and at different times on the day immediately after negative earnings surprises. We found no evidence that the uptick rule had reduced the speed of price decline on those days, nor any evidence that the rule was limiting short sale volumes during regular trading hours. By analyzing executed short volumes at different relations among the minimum shortable price, the execution price and the prevailing quotes, we found that the short sale uptick rule for NYSE and AMEX stocks and the bid test for NASDAQ stocks were not reducing short sale volumes for different reasons. For NASDAQ stocks, up bids occurred for about 60% of the times and absorbed 61-66% of the short sale volumes for pilot and nonpilot stocks. Price improvements which allowed executions of short orders at or above the legally shortable price levels when the bid test would otherwise prevent execution of short orders at the bid absorbed another 25-27% of the total short volume. The availability of execution opportunities through these two factors significantly reduced the reliance on the exemption granted by the Pilot Program and as a result, the Pilot Program caused only 7% of difference in short sale volume between pilot stocks and nonpilot stocks. This narrow difference was easily eliminated by price improvements and short sellers' increased utilization of limit orders at the ask to avoid the restriction of the bid test.

For NYSE and AMEX stocks, neither the frequency of occurrence of upticks or zero-plus ticks (which occurred for only 10-12% of the times) nor exemptions to the uptick rule could explain why the uptick rule was not reducing short sale volumes; rather, market short orders whose immediate executions were barred by the uptick rule were able to find execution opportunities from the upcoming market buy orders shortly after their conversion into limit orders at the legally shortable prices. There was also evidence of more efficient utilization of execution opportunities when the uptick rule was not binding and price improvements from specialists or floor brokers up to the legally shortable prices. We believe that the reduction of minimum tick movement to 1 cent has made it easier for short orders to be executed by allowing the minimum shortable prices to be lower than the best ask more often and reducing depth at each price level across the order book. Our paper lends support to the viewpoint of some market participants that the reduction in the minimum tick size had made it difficult for the uptick rule to limit short selling activities as originally intended by Congress.

REFERENCES

Alexander, Gordon J., and Mark A. Peterson, 2002, Implications of a Reduction in Tick Size on Short-Sell Order Execution, *Journal of Financial Intermediation* 11, 37-60.

Alexander, Gordon J., and Mark A. Peterson, 1999, Short Selling on the New York Stock Exchange and the Effect of the Uptick Rule, *Journal of Financial Intermediation* 8, 90-116.

Angel, J. James, Stephen E. Christophe, and Michael G. Ferri, 2003, A Close Look at Shorting Selling on Nasdaq, *Financial Analysts Journal* 59, 6-?.

Arnold, Tom, Alexander W. Butler, Timothy Falcon Crack, and Yan Zhang, 2002, The Information Content of Short Interest: A Natural Experiment, Working paper, Louisiana State University.

Asquith, Paul, Parag A.Pathak, and Jay R. Ritter, 2004, Short Interest, Institutional Ownership, and Stock Returns, Working paper, M.I.T. Sloan School of Management.

Boehme, Rodney D., Bartley R. Danielsen, and Sorin M. Sorescu, 2003, Short Sale Constraints, Differences of Option, and Overvaluation, Working paper, Wichita State University.

Bris, Arturo, William N. Goetzmann, and Ning Zhou, 2003, Efficiency and the Bear: Short Sales and Markets around the World, Working paper, National Bureau of Economic Research.

Charoenrook, Anchada, and Hazem Daouk, 2005, A Study of Market-Wide Short-Selling Restrictions, Working paper, Vanderbilt University.

Christophe, Steven E., Michael G. Ferrie, and James J. Angel, 2004, Short-Selling Prior to Earnings Announcements, *Journal of Finance*, 59,1845-1875.

Daske, Holger, Scott A. Richardson, and Irem Tuna, 2005, Do Short Sale Transactions Precede Bad News Events? Working paper, University of Pennsylvania.

Danielsen, Bartley R. and Sorin M. Sorescu, 2001, Why Do Option Introductions Depress Stock Prices? A Study of Diminishing Short-Sale Constraints, Working paper, DePaul University.

Dey, Malay K., 2001, Order Time, Multiple Shocks, and Short Selling in Security Price Adjustment, Working paper, University of Massachusetts.

Diamond, Douglas W., and Robert E. Verrecchia, 1987, Constraints on Short-Selling and Asset Price Adjustment to Private Information, *Journal of Financial Economics* 18, 277-311.

Diether, Karl B., Kuan-Hui Lee, and Ingrid M. Werner, 2005, Can Short-sellers Predict Returns? Daily Evidence, Working paper, Ohio State University.

Diether, Karl B., Kuan-Hui Lee, and Ingrid M. Werner, 2006, It's SHO Time! Short-Sale Price-Tests and Market Quality, Working paper, Ohio State University.

Duffie, Darrell, Nicolae Gârleanu, and Lasse Heje Pedersen, 2002, Securities Lending, Shorting, and Pricing, *Journal of Financial Economics* 66, 307-339.

Figlewski, Stephen, and Gwendolyn P. Webb, 1993, Options, Short Sales, and Market Completeness, *Journal of Finance*, 48, 761-777.

Henry, Olan T., and Michael McKenzie, 2005, The Impact of Short Selling on the Price-Volume Relationship: Evidence from Hong Kong, Working paper, RMIT University.

Hoontrakul, Pongsak, Peter J. Ryan, and Stylianos Perrakis, 2001, The Volume-Return Relationship under Asymmetry of Information and Short Sales Prohibitions, Working paper, Chulalongkorn University.

Jiang, Li, Joseph K.W. Fung, and Louis T.W. Cheng, 2001, The Lead-Lag Relation Between Spot and Futures Markets under Different Short-Selling Regimes, *Financial Review*, 36, Issue 3.

Jarrow, Robert, 1980, Heterogeneous Expectations, Restrictions on Short Sales, and Equilibrium Asset Prices, *Journal of Finance*, 35, 1105-1113.

Jones, Charles M., and Owen A. Lamont, 2002, Short-sale constraints and stock returns, *Journal of Financial Economics*, 66, 207-239.

Kraus, Alan and Amir Rubin, 2005, The Effect of Index Option Initiation on Volatility in the Presence of Heterogeneous Beliefs and Short Sale Constraints, Working paper, University of British Columbia.

Lamont, Owen A., 2004, Go Down Fighting: Short Sellers vs. Firms, Working paper, International Center for Finance, Yale University.

Lamont, Owen A., and Jeremy C. Stein, 2004, Aggregate Short Interest and Market Valuations, Working Paper, National Bureau of Economic Research.

Mayhew, Stewart, and Vassil Mihov, 2004, Short Sale Constraints, Overvaluation, and the Introduction of Options, Working paper, U.S. Securities and Exchange Commission.

Miller, Edward, 1977, Risk, Uncertainty and Divergence of Opinion, *Journal of Finance* 32, 1151-1168.

Nagel, Stefan, 2003, Short Sales, Institutional Investors, and the Book-to-Market Effect, Working Paper, London School of Business.

Ofek, Eli, Matthew Richardson, and Robert F. Whitelaw, 2002, Limited Arbitrage and Short Sales Restrictions: Evidence from the Options Markets, Working paper, National Bureau of Economic Research.

Powers, Michael R., David M. Schizer, and Martin Shubik, 2003, Market Bubbles and Wasteful Avoidance: Tax and Regulatory Constraints on Short Sales, Cowles Foundation Discussion Paper No. 1413, Cowles Foundation for Research in Economics, Yale University.

Safieddine, Assem, and William J. Wilhelm, Jr., 1996, An Empirical Investigation of Short-Selling Activity Prior to Seasoned Equity Offerings, *Journal of Finance* 51, 729-749.

Singal, Vijay, and Lily Xu, 2005, Do Short Sellers Know More? Evidence from a Natural Experiment, Working paper, Virginia Tech.

Wu, Ho-Mou, and Wen-Chuung Guo, 2004, Asset price volatility and trading volume with rational beliefs, *Economic Theory* 23, 795-829.

Table 1 Characteristics of Sample Stocks

Panel A Composition of Sample Stocks by Listing Exchanges

Sample includes events which had both negative earnings surprises and negative overnight returns. Multiple Appearance reports the number of stocks that appear more than once in the sample.

	Total Number	NYSE	%	NNM	%	AMEX	%
Exchange Listing							
Pilot Stocks	311	164	52.73%	141	45.34%	6	1.93%
Nonpilot Stocks	634	327	51.50%	293	46.29%	14	2.21%
Multiple Appearance							
Pilot Stocks	56/311						
Nonpilot Stocks	109/634						

Table 1 Characteristics of Sample Stocks

Panel B Comparison of Pilot and Nonpilot Stocks

Market capitalization was calculated by multiplying shares outstanding as of the end of 2004 by the close price on the trading day before the Event Day. Market-to-book ratio was calculated as the close price on the trading day before the Event Day divided by the book value as of April 30, 2005. Trade volume was the average daily dollar trading volume during December of 2004. Options volume was the average daily number of contracts traded for put and call options during April of 2005. Earnings surprise was calculated as (actual EPS - median analyst forecasts)/price, where price was the close price on the last day of the fiscal quarter to which the actual EPS and analyst forecasts applied. Time between earnings forecast and release was the number of days lapsed between the forecast and the release.

	# Observation	Mean	Median	Maximum	Minimum	Stdev
Market Cap. ($mil.)						
- Pilot	311	$3,861	$764	$198,192	$36	$15,170
- Nonpilot	634	$3,002	$713	$175,391	$37	$10,122
Market-to-Book Ratio						
- Pilot	311	2.89	2.18	68.64	0.48	4.44
- Nonpilot	634	3.31	2.18	63.73	0.25	5.01
Trade Volume ($mil)						
- Pilot	311	$25,826	$6,373	$556,083	$117	$51,089
- Nonpilot	634	$18,477	$5,144	$504,547	$157	$41,433
Options Volume (# contracts)						
- Pilot	311	1,486	108	53,771	0	5,277
- Nonpilot	634	1,645	154	91,451	0	6,499
Stocks without Options						
- Pilot	93					
- Nonpilot	205					
Earnings Surprise						
- Pilot	311	-0.007	-0.002	0	-0.44	0.03
- Nonpilot	634	-0.005	-0.002	0	-0.33	0.02
Time between Earnings Forecast and Release						
- Pilot	311	17	18	54	0	9
- Nonpilot	634	16	14	55	0	9

Table 1 Characteristics of Sample Stocks

Panel C Comparison of Sample and Historical Earnings Surprises, Event Day Returns, and Event Day Short Sale Volumes

"Earnings Surprises" were calculated as (actual EPS - median analyst forecasts)/price, where price was the close price on the last day of the fiscal quarter to which the actual EPS and analyst forecasts applied. Historical earnings surprises were negative quarterly earnings surprises from January 1, 2002 to April 30, 2005. "Daily Return" was calculated as $\ln(P_{t,close}) - \ln(P_{t,open})$, where $P_{t,close}$ and $P_{t,open}$ were the stock's close and open prices on the Event Day. "ShortVolm/Shares Outstdg" were daily short sale volumes on the Event Day scaled by shares outstanding. Historical daily returns (daily short sale volumes) were calculated as the average of daily returns (daily short sale volumes) on every other trading day during a two-week period starting from three weeks before earnings announcements and ending one week before earnings announcements.

	Surprise	Daily Return	ShortVolm/Shares Outstdg
Mean			
- History	-0.01	-0.001	0.002
- Sample Event	-0.01	-0.01	0.01
Median			
- History	-0.002	-0.001	0.001
- Sample Event	-0.002	-0.01	0.004
Maximum			
- History	0	0.12	0.01
- Sample Event	0	0.21	0.07
Minimum			
- History	-0.45	-0.12	0
- Sample Event	-0.44	-0.39	0
Stdev			
- History	0.03	0.02	0.002
- Sample Event	0.02	0.06	0.01
Skewness			
- History	-8.7	-0.15	2.16
- Sample Event	-14.76	-1.00	3.59
Wilcoxon Rank Sum Test			
- Z statistics	1.13	-6.69	7.08
- One-sided *p* value	0.13	<0.0001	<0.0001

Table 2 Summary Statistics of Overnight and Intraday Returns

Panel A Overnight and Noncumulative Intraday Return

Overnight returns were calculated as $\ln(P_{t,open}) - \ln(P_{t-1,close})$, where $P_{t,open}$ was the market open price on the Event Day, $P_{t-1,close}$ was the market close price on the day before the Event Day. Intraday returns were calculated as the difference in log prices at the Designated Times on the Event Day.

	Overnight	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean																
- Pilot	-0.04	-0.004	-0.001	0.0004	0.0003	-0.0004	-0.001	-0.0004	-0.0003	-0.001	0.00003	-0.0002	0.001	-0.002	0.001	0.001
- Nonpilot	-0.04	-0.006	-0.003	-0.002	-0.002	-0.002	-0.0005	0.00005	0.001	-0.001	0.0003	-0.0003	-0.001	-0.001	0.001	0.001
Median																
- Pilot	-0.02	0	0	0	0	0	0	0	0	-0.001	0.0004	0	0	-0.001	0	0
- Nonpilot	-0.02	-0.005	-0.001	-0.001	-0.001	-0.001	0	0	0.0004	-0.001	0	0	-0.0005	-0.001	0.001	0
Maximum																
- Pilot	0	0.20	0.07	0.05	0.05	0.04	0.03	0.05	0.05	0.05	0.07	0.05	0.05	0.04	0.05	0.02
- Nonpilot	0	0.20	0.09	0.06	0.07	0.03	0.04	0.05	0.05	0.05	0.06	0.05	0.06	0.07	0.06	0.02
Minimum																
- Pilot	-0.30	-0.20	-0.17	-0.03	-0.07	-0.03	-0.03	-0.05	-0.06	-0.04	-0.06	-0.05	-0.04	-0.05	-0.04	-0.02
- Nonpilot	-0.54	-0.21	-0.14	-0.09	-0.06	-0.07	-0.03	-0.05	-0.05	-0.06	-0.05	-0.04	-0.06	-0.06	-0.05	-0.02
Stdev																
- Pilot	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.005
- Nonpilot	0.06	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.005
Skewness																
- Pilot	-2.37	-0.13	-2.20	0.50	-0.71	0.21	0.02	-0.65	-0.80	0.06	0.70	0.17	0.83	-0.47	0.66	0.78
- Nonpilot	-3.39	0.32	-1.09	-1.01	-0.09	-1.47	-0.11	0.26	-0.07	-0.19	0.39	0.43	0.32	-0.03	0.14	-0.01

Table 2 Summary Statistics of Overnight and Intraday Returns

Panel B Cumulative Intraday Return

Intraday cumulative returns were calculated as $\ln(P_t) - \ln(P_{t,open})$, where P_t was the stock price at Designated Times on the Event Day and $P_{t,open}$ was the market open price.

	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean															
- Pilot	-0.004	-0.005	-0.004	-0.004	-0.004	-0.005	-0.006	-0.006	-0.007	-0.007	-0.007	-0.007	-0.009	-0.008	-0.01
- Nonpilot	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.015	-0.014	-0.015	-0.015	-0.015	-0.016	-0.017	-0.016	-0.02
Median															
- Pilot	0	-0.001	-0.002	-0.002	-0.001	-0.002	-0.002	-0.002	-0.01	-0.004	-0.003	-0.004	-0.004	-0.004	-0.003
- Nonpilot	-0.005	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Maximum															
- Pilot	0.20	0.19	0.17	0.19	0.18	0.17	0.17	0.17	0.16	0.16	0.17	0.16	0.17	0.17	0.17
- Nonpilot	0.20	0.19	0.17	0.17	0.18	0.18	0.18	0.18	0.17	0.18	0.18	0.18	0.18	0.21	0.21
Minimum															
- Pilot	-0.20	-0.22	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.24	-0.24	-0.27	-0.26	-0.26	-0.27	-0.27
- Nonpilot	-0.21	-0.24	-0.28	-0.31	-0.33	-0.29	-0.35	-0.33	-0.38	-0.36	-0.33	-0.34	-0.35	-0.39	-0.39
Stdev															
- Pilot	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
- Nonpilot	0.03	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06
Skewness															
- Pilot	-0.13	-0.92	-0.69	-0.61	-0.78	-0.82	-0.75	-0.63	-0.50	-0.51	-0.58	-0.50	-0.44	-0.61	-0.63
- Nonpilot	0.32	-0.31	-0.76	-0.89	-1.12	-0.79	-1.03	-1.15	-1.23	-1.13	-1.13	-1.01	-1.07	-0.99	-1.06

Table 3 Regression of Overnight Excess Return and Intraday Excess Return

The regression of overnight excess return was based on the model:

$$R_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 NNM_i + \beta_5 Pilot_i * NNM_i + \beta_6 \ln(MC_i) + \beta_7 \ln(MtB_i) + \varepsilon_{i,t}$$

The regression of intraday excess return was based on the model:

$$R_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI^{+}_{i,t} + \beta_5 OI^{-}_{i,t} + \beta_6 Pilot_i * OI^{-}_{i,t} + \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i$$
$$+ \beta_9 \ln(MC_i) + \beta_{10} \ln(MtB_i) + \beta_{11} R_{i,t-1} + \beta_{12} HVol_i. + \varepsilon_{i,t}$$

For the overnight excess return regression, "$R_{i,t}$" was the excess return of stock *i* over the market return from market close on the day before the Event Day to market open on the Event Day. Overnight return of stock *i* was calculated as $\ln(P_{t,open}) - \ln(P_{t-1,close})$, and overnight return of the market was proxied by the overnight return of the iShare Russell 3000 ETF. For the intraday excess return regression, "$R_{i,t}$" was the excess return of stock *i* over the market return during periods between each Designated Times on the Event Day.

"Pilot" was a dummy variable that took the value of 1 if the stock was a pilot stock and 0 otherwise. "Srps" was earnings surprise calculated as (actual EPS - median analyst forecast)/(price as of end of the fiscal quarter). "Pilot*Srps" was an interaction term of "Pilot" and "Srps". "NNM" was a dummy variable that took the value of 1 if the stock was listed on NASDAQ and 0 otherwise. "Pilot*NNM" was an interaction term of "Pilot" and "NNM". "OI^{+}" was the positive net order flow for the Designated Period t that took the value of (BI - SI)/(BI + SI) if the value >=0 and 0 otherwise, where "BI" and "SI" were the number of traded shares that were buyer-initiated and seller-initiated, respectively. "OI^{-}" was the negative net order flow that took the value of (BI - SI)/(BI + SI) if the value < 0 and 0 otherwise. "MC" was the stock's market capitalization calcualted as the close price on the day before the Event Day multiplied by shares outstanding as of the end of 2004. "MtB" was the stock's market-to-book ratio calculated as the close price on the day before the Event Day divided by the stock's book value at the end of April 2005. "$Return_{i,t-1}$" was the return of the stock during the time period immediately before current period t. "HVol" was the stock's historical volatility calculated by taking the average of $\ln(Price_h) - \ln(Price_l)$ on April 1, 5, 13, 18, 21, 29, 2005 for each Designated Time period, where Priceh was the highest price and Pricel was the lowest price of the time period. *t*-statistics are in parentheses.

Panel A Overnight Return Regression

Intercept	Pilot	Srps	Pilot*Srps	NNM	Pilot*NNM	MC	MtB	Adj. R^2
-0.08	-0.01	-0.01	-0.01	-0.02	0.01	0.002	0.001	0.05
(-2.82)*	(-1.19)	(-0.12)	(-0.09)	**(-5.33)***	(1.14)	(1.81)	(0.67)	

* Significant at 5% level.

Panel B Intraday Return Regression

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	MC	MtB	$R_{i,t-1}$	HVol	Adj. R^2
9:45	-0.06	0.01	0.01	0.07	0.01	-0.001	-0.01	0.003	-0.01	-0.02	-0.003	0.002	0.003	0.02
	(-2.76)*	(1.63)	(0.08)	(0.39)	**(3.01)***	(-0.14)	(-0.62)	(0.92)	(-1.88)	(-0.93)	(-0.09)	**(2.21)***	(1.87)	
10:00	-0.03	0.005	-0.06	0.12	0.001	0.001	0.004	0.003	-0.001	0.04	-0.14	0.001	-0.001	0.01
	(-2.18)*	**(2.34)***	(-1.15)	(1.93)	(0.26)	(0.31)	(0.71)	(1.49)	(-0.29)	**(2.3)***	(-1.23)	**(2.09)***	(-0.78)	
10:15	-0.001	-0.0002	0.03	-0.03	0.003	0.003	-0.01	-0.001	0.002	0.07	-0.02	0.00004	-0.0003	0.01
	(-0.1)	(-0.13)	(0.85)	(-0.75)	(1.68)	(1.37)	(-1.66)	(-0.94)	(0.93)	**(2.81)***	(-0.35)	(0.12)	(-0.52)	
10:30	-0.01	0.002	-0.02	-0.01	0.002	0.001	0.001	0.002	-0.0002	-0.03	-0.08	0.0003	-0.001	0.01
	(-0.95)	(1.58)	(-0.55)	(-0.23)	(0.91)	(0.70)	(0.31)	**(2.15)***	(-0.12)	(-1.12)	(-1.15)	(0.90)	**(-2.48)***	
10:45	-0.02	0.001	-0.01	0.03	0.005	-0.002	0.003	-0.002	0.004	0.05	-0.01	0.001	0.00002	0.04
	(-3.77)*	(0.85)	(-0.27)	(1.06)	**(2.91)***	(-0.96)	(1.32)	(-1.83)	**(2.45)***	(1.62)	(-0.87)	**(3.56)***	(0.05)	
11:00	-0.004	0.001	0.01	-0.004	0.004	0.0003	0.001	-0.0002	-0.002	-0.02	0.08	0.0001	-0.0002	0.01
	(-0.71)	(1.01)	(0.69)	(-0.16)	**(2.99)***	(0.23)	(0.50)	(-0.29)	(-1.73)	(-0.77)	(0.85)	(0.56)	(-0.59)	
11:15	-0.01	-0.00003	-0.03	0.04	0.004	0.001	-0.0002	-0.001	-0.001	0.12	0.06	0.0003	-0.001	0.03
	(-1.13)	(-0.03)	(-1.48)	(1.38)	**(2.7)***	(0.98)	(-0.1)	(-0.63)	(-0.66)	**(3.35)***	(0.60)	(1.18)	(-1.45)	
11:30	0.003	-0.0003	0.01	-0.03	0.0002	0.001	0.003	-0.001	0.00004	0.04	-0.04	-0.0001	0.0002	0.01
	(0.63)	(-0.33)	(0.63)	(-1.26)	(0.13)	(1.10)	(1.77)	(-0.68)	(0.04)	(1.41)	(-0.33)	(-0.45)	(0.65)	
12:00	-0.01	-0.0002	-0.05	0.03	0.001	0.001	0.002	-0.001	0.001	0.17	0.11	0.0002	-0.0001	0.01
	(-0.77)	(-0.14)	(-1.85)	(1.00)	(0.64)	(0.61)	(0.69)	(-0.91)	(0.95)	**(3.84)***	(0.99)	(0.62)	(-0.22)	
12:30	-0.002	0.0001	-0.01	0.03	-0.0004	0.001	0.002	0.001	0.001	0.06	-0.09	0.0002	-0.0003	0.001
	(-0.37)	(0.09)	(-0.42)	(1.03)	(-0.25)	(0.84)	(0.88)	(0.63)	(0.68)	**(2.11)***	(-0.9)	(0.59)	(-0.7)	
13:00	0.0005	0.001	0.01	-0.03	0.0005	-0.0001	-0.0001	0.0003	-0.002	0.03	-0.05	-0.0001	0.001	0.002
	(0.10)	(0.91)	(0.41)	(-1.33)	(0.36)	(-0.04)	(-0.05)	(0.42)	(-1.86)	(1.16)	(-0.58)	(-0.29)	**(2.5)***	
14:00	-0.004	0.002	-0.06	0.01	-0.001	0.003	-0.001	0.001	-0.002	-0.14	-0.04	0.0001	0.0004	0.01
	(-0.56)	(1.81)	**(-2.03)***	(0.34)	(-0.3)	(1.32)	(-0.3)	(1.03)	(-1.14)	**(-3.22)***	(-0.48)	(0.42)	(0.90)	
15:00	0.005	-0.0002	-0.02	-0.01	0.003	-0.003	0.003	0.001	-0.001	0.07	-0.14	-0.0002	-0.001	0.003
	(0.55)	(-0.15)	(-0.54)	(-0.33)	(1.13)	(-1.21)	(0.85)	(0.60)	(-0.43)	(1.84)	(-1.49)	(-0.57)	(-1.19)	
15:55	0.02	0.0003	-0.05	0.03	-0.002	0.001	0.005	0.001	0.002	-0.04	-0.11	-0.001	-0.0003	0.01
	(1.94)	(0.23)	(-1.5)	(0.65)	(-0.69)	(0.34)	(1.21)	(0.62)	(1.15)	(-1.21)	(-1.28)	(-1.83)	(-0.61)	
16:00	0.001	-0.0003	0.02	0.00	0.001	0.0004	0.0002	-0.0002	0.0003	0.01	0.02	0.00001	-0.00004	-0.002
	(0.20)	(-0.42)	(1.28)	(-0.04)	(1.47)	(0.56)	(0.17)	(-0.5)	(0.44)	(0.39)	(0.29)	(0.07)	(-0.16)	

* Significant at 5% level.

Table 4 Regression of Cumulative Intraday Excess Return

The regression of cumulative intraday excess return was based on the model:

$$R_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI^+_{i,t} + \beta_5 OI^-_{i,t} + \beta_6 Pilot_i * OI^-_{i,t}$$
$$+ \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i + \beta_9 \ln(MC_i) + \beta_{10} \ln(MtB_i) + \beta_{11} HVol_i. + \varepsilon_{i,t}$$

"$R_{i,t}$" was the excess cumulative return of stock i over the cumulative market return during Designated Time periods on the Event Day. Market return was proxied by the return on the iShare Russell 3000 ETF. "Pilot" was a dummy variable that took the value of 1 if the stock was a pilot stock and 0 otherwise. "Srps" was earnings surprise calculated as (actual EPS - median analyst forecast)/(price as of end of the fiscal quarter). "Pilot*Srps" was an interaction term of Pilot and Srps. "OI+" was the positive net order flow for the Designated Period t that took the value of (BI - SI)/(BI + SI) if the value >=0 and 0 otherwise, where "BI" and "SI" were the number of traded shares that were buyer-initiated and seller-initiated, respectively. "OI -" was the negative net order flow that took the value of (BI - SI)/(BI + SI) if the value < 0 and 0 otherwise. "Pilot*OI -" was an interaction term of Pilot and OI-. "NNM" was a dummy variable that took the value of 1 if the stock was listed on NASDAQ and 0 otherwise. "Pilot*NNM" was an interaction term of Pilot and NNM. "MC" was the stock's market capitalization calculated as the close price on the day before the Event Day multiplied by shares outstanding as of the end of 2004. "MtB" was the stock's market-to-book ratio calculated as the close price on the day before the Event Day divided by the stock's book value at the end of April 2005. "HVol" was the stock's historical volatility calculated by taking the average of ln($Price_h$) - ln($Price_l$) on April 1, 5, 13, 18, 21, 29, 2005 for each Designated Time period, where $Price_h$ was the highest price and $Price_l$ was the lowest price of the time period. t -statistics are in parentheses.

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	MC	MtB	HVol	Adj. R^2
9:45	-0.05	0.01	0.01	0.08	0.01	0.002	-0.01	0.001	-0.01	0.002	0.0026	-0.01	0.01
	(-2.25)*	(1.50)	(0.16)	(0.45)	**(2.39)***	(0.23)	(-0.69)	(0.22)	(-1.77)	(1.81)	(1.77)	(-0.37)	
10:00	-0.08	0.01	-0.04	0.10	0.02	-0.003	0.0004	0.001	-0.01	0.003	0.002	-0.01	0.02
	(-3.18)*	**(2.34)***	-0.37	(0.77)	**(2.61)***	(-0.32)	(0.03)	(0.41)	(-1.63)	**(2.72)***	(1.16)	(-0.06)	
10:15	-0.07	0.01	0.01	0.01	0.02	0.004	-0.01	0.0001	-0.01	0.003	0.002	0.09	0.02
	(-2.75)*	**(2.52)***	(0.07)	(0.04)	**(2.12)***	(0.33)	(-0.49)	(0.02)	(-1.45)	**(2.3)***	(0.83)	(0.44)	
10:30	-0.08	0.01	-0.01	0.41	0.03	0.01	-0.02	0.003	-0.01	0.003	-0.0002	0.12	0.02
	(-3.12)*	**(2.35)***	(-0.13)	(1.81)	**(2.39)***	(0.70)	(-0.98)	(0.62)	(-0.92)	**(2.69)***	(-0.1)	(0.41)	
10:45	-0.11	0.01	-0.03	0.08	0.03	0.01	-0.01	0.002	-0.004	0.004	0.0003	-0.01	0.02
	(-3.73)*	**(2.26)***	(-0.27)	(0.57)	(1.90)	(0.83)	(-0.53)	(0.39)	(-0.54)	**(3.31)***	(0.13)	(-0.18)	
11:00	-0.11	0.01	-0.01	0.03	0.03	0.01	-0.01	0.003	-0.01	0.004	-0.0004	0.08	0.03
	(-3.71)*	**(2.68)***	(-0.05)	(0.21)	**(2.32)***	(0.84)	(-0.48)	(0.67)	(-1.37)	**(3.31)***	(-0.17)	(0.14)	
11:15	-0.09	0.01	-0.04	0.12	0.01	0.02	-0.01	0.003	-0.01	0.004	0.0001	-0.49	0.02
	(-2.87)*	**(2.35)***	(-0.36)	(0.75)	(1.03)	(1.76)	(-0.74)	(0.70)	(-1.2)	**(2.65)***	(0.05)	(-0.85)	
11:30	-0.10	0.01	-0.05	0.12	0.01	0.03	-0.01	0.004	-0.01	0.004	-0.0003	-0.91	0.03
	(-3.16)*	**(2.43)***	(-0.36)	(0.76)	(0.98)	**(2.35)***	(-0.65)	(0.84)	(-1.21)	**(3.01)***	(-0.13)	(-1.32)	

* Significant at 5% level.

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	MC	MtB	HVol	Adj. R^2
12:00	-0.11	0.01	-0.09	0.17	0.02	0.03	-0.02	0.003	-0.01	0.004	-0.0004	-0.32	0.03
	(-3.16)*	**(2.16)***	(-0.67)	(1.03)	(1.39)	(1.94)	(-0.93)	(0.60)	(-1.06)	**(2.96)***	(-0.18)	(-0.61)	
12:30	-0.10	0.01	-0.08	0.20	0.03	0.02	-0.01	0.005	-0.01	0.005	-0.001	-0.96	0.03
	(-3.07)*	**(2.28)***	(-0.64)	(1.17)	(1.88)	(1.18)	(-0.36)	(0.94)	(-0.93)	**(2.94)***	(-0.32)	(-1.69)	
13:00	-0.11	0.01	-0.09	0.12	0.03	0.005	0.004	0.003	-0.01	0.005	0.0002	-0.86	0.02
	(-3.23)*	**(2.38)***	(-0.64)	(0.71)	(1.72)	(0.30)	(0.19)	(0.69)	(-1.15)	**(3.03)***	(0.08)	(-1.42)	
14:00	-0.11	0.01	-0.15	0.13	0.02	0.004	-0.0004	0.004	-0.01	0.005	0.001	-0.77	0.02
	(-3.02)*	**(2.48)***	(-1.08)	(0.77)	(1.44)	(0.26)	(-0.02)	(0.77)	(-1.2)	**(2.85)***	(0.36)	(-1.71)	
15:00	-0.10	0.01	-0.18	0.14	0.03	-0.01	-0.003	0.005	-0.01	0.004	0.0002	-1.06	0.02
	(-2.81)*	**(2.12)***	(-1.3)	(0.78)	(1.82)	(-0.39)	(-0.14)	(0.95)	(-1.17)	**(2.66)***	(0.08)	**(-2.46)***	
15:55	-0.08	0.01	-0.42	0.35	0.02	-0.01	0.003	0.01	-0.01	0.004	-0.0003	-0.90	0.02
	(-2.24)*	**(2.09)***	**(-2.82)***	(1.88)	(1.14)	(-0.32)	(0.11)	(1.13)	(-0.95)	**(2.07)***	(-0.11)	**(-2.32)***	
16:00	-0.09	0.01	-0.21	0.18	0.04	0.004	-0.03	0.01	-0.01	0.004	0.0003	-1.87	0.02
	(-2.52)*	(1.44)	(-1.43)	(0.95)	(1.79)	(0.23)	(-0.98)	(1.25)	(-0.94)	**(2.26)***	(0.12)	**(-2.54)***	

* Significant at 5% level.

Table 5 Summary Statistics of Stocks with High Trade Volumes

Sample stocks were divided into 10 groups according to their Event Day trade volumes in decending order. This table provides statistics on the mean and median excess returns of stocks in the top 3 groups and the results of Wilcoxon Rank Sum Test used to compare excess returns of stocks with high trading volumes and those of stocks belonging to the other 7 groups. The Excess return of a stock was defined as its return over the market return (proxied by the return on the iShare Russell 3000 ETF) for each Designated Time period on the Event Day.

	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
# of Observations															
- Pilot	87	85	90	90	89	90	90	90	90	90	89	90	90	90	90
- Nonpilot	183	189	189	191	191	191	191	191	191	191	191	191	191	189	189
Mean Excess Return															
- Pilot	-0.012	-0.003	-0.001	-0.001	-0.002	-0.002	-0.001	-0.0005	-0.003	-0.001	-0.001	0.001	-0.003	0.002	0.001
- Nonpilot	-0.018	-0.009	-0.004	-0.003	-0.005	-0.002	-0.001	0.0004	-0.001	-0.0002	-0.001	-0.002	-0.001	0.001	0.001
Median Excess Return															
- Pilot	-0.008	-0.0001	0.0001	-0.001	-0.001	-0.001	-0.002	0.0001	-0.002	-0.0003	-0.001	-0.001	-0.003	0.001	0.001
- Nonpilot	-0.015	-0.006	-0.002	-0.002	-0.002	-0.001	-0.001	0.0001	-0.001	-0.0003	-0.0003	-0.001	-0.001	0.002	0.001
Wilcoxon Rank Sum Test															
- Z statistics	**-6.91**	**-4.89**	**-2.61**	**-2.38**	**-4.07**	**-2.86**	**-2.44**	-0.53	-1.64	-0.73	-1.46	-1.36	**-2.08**	**2.00**	**2.18**
-Pr<Z	<.0001	<.0001	0.005	0.01	<.0001	0.002	0.01	0.30	0.05	0.23	0.07	0.09	0.02		
-Pr>Z														0.02	0.01

Table 6 Regression of Intraday Excess Return of Stocks with High Trade Volume

Sample stocks were divided into 10 groups according to the percentage change in their trading volumes on the Event Day from their average daily trading volumes during the pre-earnings release period as defined in Table 1 Panel C. Stocks belonging to the top 3 groups were used in the following regression. Other variables were defined as in Table 3. t-statistics are in paranthesis.

$$R_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI^+_{i,t} + \beta_5 OI^-_{i,t} + \beta_6 Pilot_i * OI^-_{i,t} + \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i$$
$$+ \beta_9 \ln(MC_i) + \beta_{10} \ln(MtB_i) + \beta_{11} R_{i,t-1} + \beta_{12} HVol_i. + \varepsilon_{i,t}$$

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	MC	MtB	$R_{i,t-1}$	HVol	Adj. R^2
9:45	-0.09	0.02	-0.23	2.94	0.03	-0.01	0.01	-0.002	-0.01	0.003	0.001	-0.06	0.02	0.06
	(-1.74)	**(2.17)***	**(-1.98)***	**(3.16)***	**(2.39)***	(-0.96)	(0.34)	(-0.31)	(-0.68)	(1.18)	(0.43)	(-1.5)	(0.16)	
10:00	-0.04	0.01	-0.06	1.06	-0.002	0.003	-0.0002	0.01	-0.003	0.002	-0.003	0.02	-0.27	0.03
	(-1.34)	**(2.37)***	(-0.83)	(1.88)	(-0.21)	(0.40)	(-0.01)	(1.62)	(-0.4)	(1.15)	(-1.55)	(0.69)	(-0.84)	
10:15	-0.01	-0.003	-0.004	-0.05	-0.00001	0.01	-0.01	-0.001	0.01	0.001	-0.001	0.12	-0.04	0.02
	(-0.66)	(-0.76)	(-0.09)	(-0.15)	(0.00)	(1.78)	(-1.26)	(-0.39)	(1.25)	(0.75)	(-1.03)	**(2.75)***	(-0.28)	
10:30	-0.01	0.002	-0.02	0.11	-0.002	0.004	0.0003	0.01	-0.0001	0.001	-0.002	0.04	-0.56	0.01
	(-0.7)	(0.74)	(-0.45)	(0.36)	(-0.38)	(0.91)	(0.04)	**(2.49)***	(-0.03)	(0.76)	(-1.89)	(0.76)	**(-2.06)***	
10:45	-0.04	0.001	-0.004	0.20	0.01	-0.004	0.002	-0.004	0.01	0.002	0.0005	0.08	-0.003	0.06
	(-2.79)*	(0.19)	(-0.12)	(0.74)	(1.96)	(-0.97)	(0.40)	**(-2.3)***	(1.65)	**(2.61)***	(0.58)	(1.48)	(-0.39)	
11:00	-0.002	0.003	0.02	0.03	0.002	0.001	-0.001	-0.0003	-0.004	0.0001	-0.001	-0.05	-0.10	-0.01
	(-0.17)	(1.13)	(0.62)	(0.12)	(0.69)	(0.32)	(-0.1)	(-0.16)	(-1.56)	(0.13)	(-1.12)	(-0.98)	(-0.43)	
11:15	-0.01	0.001	-0.05	0.25	0.01	0.001	0.003	-0.001	0.0003	0.0004	-0.0004	0.08	0.33	0.02
	(-0.78)	(0.23)	(-1.53)	(0.94)	(1.87)	(0.43)	(0.51)	(-0.79)	(0.10)	(0.63)	(-0.46)	(1.13)	(1.46)	
11:30	0.01	-0.0002	0.01	0.22	0.001	0.001	-0.0002	-0.002	0.0001	-0.0004	-0.0002	-0.04	0.35	-0.03
	(0.56)	(-0.09)	(0.34)	(0.97)	(0.39)	(0.17)	(-0.04)	(-1.01)	(0.05)	(-0.59)	(-0.22)	(-0.82)	(1.33)	
12:00	-0.005	-0.002	-0.04	-0.22	0.002	-0.003	0.01	0.001	0.01	0.0002	0.0002	0.23	-0.22	0.01
	(-0.31)	(-0.61)	(-1.03)	(-0.76)	(0.45)	(-0.74)	(1.59)	(0.48)	(1.47)	(0.20)	(0.24)	**(2.96)***	(-0.91)	
12:30	0.001	0.001	-0.02	0.30	-0.01	0.01	-0.001	0.002	-0.001	0.0001	-0.0001	0.17	-0.33	0.01
	(0.08)	(0.35)	(-0.42)	(1.01)	(-1.31)	(1.39)	(-0.21)	(1.08)	(-0.2)	(0.09)	(-0.13)	**(2.82)***	(-1.2)	
13:00	-0.0003	0.003	0.003	-0.17	0.001	-0.003	0.003	0.002	-0.01	-0.0001	0.002	-0.004	-0.17	0.00
	(-0.02)	(1.41)	(0.08)	(-0.74)	(0.27)	(-0.96)	(0.58)	(1.18)	**(-2.11)***	(-0.22)	**(2.18)***	(-0.09)	(-0.71)	
14:00	0.01	0.002	0.01	-0.43	-0.01	0.01	-0.01	0.004	-0.003	-0.0003	-0.0004	-0.03	-0.43	0.02
	(0.52)	(0.64)	(0.26)	(-1.48)	(-1.74)	**(2.09)***	(-0.83)	**(2.14)***	(-0.83)*	(-0.43)	(-0.39)	(-0.46)	(-1.91)	
15:00	0.03	0.00001	-0.08	-0.29	0.0001	-0.0002	-0.001	0.003	-0.01	-0.001	-0.002	0.16	-0.46	0.05
	(1.64)	(0.00)	(-1.74)	(-0.84)	(0.01)	(-0.03)	(-0.09)	(1.06)	(-1.41)	(-1.58)	(-1.48)	**(2.30)***	**(-2.09)***	
15:55	0.02	0.001	-0.08	0.18	-0.01	-0.01	0.01	-0.001	0.002	-0.001	-0.0004	0.03	-0.17	-0.01
	(0.76)	(0.39)	(-1.7)	(0.52)	(-0.89)	(-1.12)	(0.93)	(-0.35)	(0.57)	(-0.67)	(-0.33)	(0.51)	(-0.8)	
16:00	0.001	-0.001	0.02	0.01	-0.001	0.001	-0.0001	-0.0004	0.001	0.00001	-0.00003	0.06	0.07	-0.02
	(0.18)	(-0.46)	(1.29)	(0.07)	(-0.47)	(0.40)	(-0.03)	(-0.37)	(0.66)	(0.03)	(-0.06)	**(2.30)***	(0.44)	

* Significant at 5% level.

Table 7 Regression of Intraday Excess Return of Stocks with High Negative Order Imbalance

Observations for all sample stocks and Designated Time periods were divided into 10 groups according to the value of the net order flow defined as in Table 3. Stocks and Designated Time periods that were in the top 3 groups of biggest negative net order flow were used in the following regression. Other variables were defined as in Table 3. t-statistics are in paranthesis.

$$R_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 NNM_i + \beta_5 Pilot_i * NNM_i + \beta_6 \ln(MC_i) + \beta_7 \ln(MtB_i) + \beta_8 R_{i,t-1} + \beta_9 HVol_i. + \varepsilon_{i,t}$$

	Intercept	Pilot	Srps	Pilot*Srps	NNM	Pilot*NNM	MC	MtB	$R_{i,t-1}$	HVol	Adj. R^2	# Observation
9:45	-0.05	0.003	-0.004	0.02	-0.003	0.004	0.002	-0.001	-0.03	-0.01	-0.02	199
	(-1.31)	(0.49)	(-0.05)	(0.04)	(-0.62)	(0.43)	(1.11)	(-0.34)	(-0.53)	(-0.26)		
10:00	-0.04	0.01	0.11	0.85	0.01	0.002	0.002	-0.001	0.03	0.05	0.11	238
	(-1.45)	(1.76)	(0.66)	**(3.28)***	(1.82)	(0.46)	(1.24)	(-0.59)	(0.70)	(0.17)		
10:15	-0.001	-0.0004	0.18	-0.17	-0.003	0.01	-0.0001	-0.002	-0.01	0.41	0.04	261
	(-0.04)	(-0.18)	**(2.19)***	(-1.09)	(-1.16)	(1.81)	(-0.1)	**(-2.5)***	(-0.18)	**(1.99)***		
10:30	-0.03	0.002	0.01	0.15	0.004	0.001	0.001	-0.001	0.09	-0.10	0.05	288
	(-2.31)*	(1.10)	(0.16)	(1.26)	**(2.63)***	(0.50)	**(2.17)***	(-1.2)	(1.85)	(-0.59)		
10:45	-0.02	0.0004	-0.08	0.09	-0.002	0.002	0.001	-0.001	-0.06	-0.01	0.03	301
	(-1.77)	(0.24)	(-1.19)	(1.28)	(-1.07)	(0.94)	(1.77)	**(-1.97)***	(-1.07)	(-1.09)		
11:00	-0.001	0.0004	0.06	-0.04	0.001	-0.003	-0.0001	-0.0003	-0.04	0.14	-0.01	279
	(-0.07)	(0.32)	(1.17)	-0.84	(0.63)	(-1.33)	(-0.18)	(-0.39)	(-0.78)	(0.94)		
11:15	-0.02	-0.0002	0.05	-0.05	-0.0004	-0.001	0.001	-0.00001	0.08	-0.02	0.02	294
	(-2.26)*	(-0.18)	(1.09)	(-1.04)	(-0.31)	(-0.38)	**(2.27)***	(-0.03)	(1.25)	(-0.13)		
11:30	-0.01	-0.001	0.02	-0.04	0.002	-0.004	0.0004	0.0005	0.18	-0.52	0.08	304
	(-0.82)	(-0.73)	(0.84)	(-1.54)	(1.65)	**(-2.2)***	(0.97)	-0.67	**(3.32)***	**(-2.75)***		
12:00	-0.0001	-0.001	0.11	-0.11	0.001	-0.002	-0.0001	-0.00002	-0.04	-0.02	-0.02	269
	(-0.01)	(-0.56)	(1.35)	(-1.33)	(0.66)	(-0.83)	(-0.10)	(-0.03)	(-0.54)	(-0.1)		
12:30	-0.02	-0.001	0.003	0.01	0.002	-0.0002	0.001	-0.0002	-0.004	-0.18	-0.01	300
	(-1.64)	(-0.39)	(0.12)	(0.40)	(1.57)	(-0.10)	(1.70)	(-0.25)	(-0.08)	(-1.10)		
13:00	0.01	0.002	-0.14	0.12	0.001	-0.004	-0.0004	0.001	0.14	-0.28	0.04	271
	-0.79	(1.42)	**(-2.52)***	**(2.11)***	(0.49)	(-1.77)	(-0.89)	-1.63	**(2.63)***	(-1.80)		
14:00	-0.004	-0.001	0.04	-0.01	-0.001	0.005	0.0003	0.0001	-0.29	-0.32	0.07	248
	(-0.34)	(-0.38)	(0.51)	(-0.13)	(-0.58)	(1.77)	(0.56)	-0.12	**(-3.36)***	(-1.94)		
15:00	0.02	-0.002	0.18	-0.20	-0.001	-0.001	-0.001	-0.00003	0.04	-0.21	0.03	253
	(1.38)	(-1.19)	**(2.91)***	**(-3.14)***	(-0.47)	(-0.38)	(-1.13)	(-0.03)	(0.74)	(-1.37)		
15:55	0.01	0.001	0.12	0.34	0.002	-0.002	-0.0004	-0.001	0.02	-0.07	0.00	243
	(0.71)	(0.54)	(1.64)	(0.93)	(1.22)	(-0.72)	(-0.61)	(-0.59)	(0.35)	(-0.57)		
16:00	0.01	0.0003	0.04	0.06	-0.002	-0.001	-0.0003	-0.0001	-0.01	0.09	0.04	336
	(1.36)	(0.39)	(1.33)	(1.48)	**(-1.99)***	(-0.74)	(-1.16)	(-0.29)	(-0.25)	(0.91)		

* Significant at 5% level.

Table 8 Regression of Intraday Excess Return of Stocks without Active Options Trading

The following regression was based on a reduced sample of stocks without active options trading. Variables were defined as in Table 3. t-statistics are in parenthesis.

$$R_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI^+_{i,t} + \beta_5 OI^-_{i,t} + \beta_6 Pilot_i * OI^-_{i,t} + \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i$$
$$+ \beta_9 \ln(MC_i) + \beta_{10} \ln(MtB_i) + \beta_{11} R_{i,t-1} + \beta_{12} HVol_i + \varepsilon_{i,t}$$

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	MC	MtB	$R_{i,t-1}$	HVol	Adj. R^2	# Observations
9:45	-0.03	0.003	0.25	0.14	0.02	-0.01	-0.02	-0.01	-0.001	0.001	0.005	0.02	0.004	0.07	259
	(-0.62)	(0.43)	(1.04)	(0.35)	**(2.32)***	(-0.7)	(-1.25)	(-1.31)	(-0.16)	(0.34)	**(2.15)***	(0.64)	(0.12)		
10:00	-0.02	0.01	-0.09	0.14	0.01	-0.002	0.01	0.01	-0.004	0.001	-0.002	0.17	-0.37	0.05	270
	(-0.56)	(1.39)	-0.46	(0.71)	(1.04)	(-0.25)	(0.55)	(1.35)	(-0.59)	(0.48)	-0.88	**(4.24)***	(-1.33)		
10:15	0.01	0.002	0.07	-0.07	0.005	0.002	-0.004	-0.002	0.00003	-0.001	-0.001	0.03	-0.002	-0.01	275
	(0.56)	(0.46)	(0.61)	(-0.58)	(1.33)	(0.46)	(-0.62)	(-0.76)	(0.01)	(-0.57)	(-0.94)	(0.78)	(-0.01)		
10:30	0.001	0.002	0.17	-0.21	0.002	-0.001	0.005	0.003	0.001	-0.00003	-0.002	-0.08	-0.33	0.04	269
	(0.06)	(0.83)	(1.80)	(-1.51)	(0.73)	(-0.19)	(0.98)	(1.79)	(0.24)	(-0.03)	**(-2.15)***	(-1.77)	(-1.73)		
10:45	-0.03	0.002	-0.08	0.08	0.01	-0.004	0.005	-0.003	0.004	0.001	0.001	0.03	-0.06	0.01	270
	(-1.57)	(0.91)	(-0.82)	(0.86)	**(2.11)***	(-1.19)	(1.09)	(-1.31)	(1.38)	(1.39)	(0.90)	(0.49)	(-0.31)		
11:00	0.002	0.0002	0.15	-0.13	0.004	0.001	0.002	-0.001	0.001	-0.0002	-0.001	0.01	0.39	0.04	263
	(0.14)	(0.11)	**(2.18)***	(-1.94)	**(2.15)***	(0.32)	(0.59)	(-1.01)	(0.52)	(-0.24)	(-1.65)	(0.28)	**(2.42)***		
11:15	-0.03	0.002	-0.11	0.09	0.004	0.001	0.004	0.0003	-0.003	0.001	0.001	0.20	0.05	0.05	272
	(-1.67)	(1.16)	(-1.37)	(1.12)	(1.64)	(0.24)	(1.13)	(0.20)	(-1.11)	(1.53)	(0.72)	**(2.97)***	(0.31)		
11:30	-0.001	0.0001	-0.02	0.01	0.0002	0.001	0.002	0.002	-0.005	0.0002	-0.001	0.02	-0.44	0.03	264
	(-0.07)	(0.07)	(-0.24)	(0.10)	(0.07)	(0.48)	(0.69)	(1.21)	(-1.89)	(0.25)	(-1.07)	(0.39)	**(-2.34)***		
12:00	0.02	0.001	0.12	-0.13	0.001	-0.001	0.01	-0.001	0.002	-0.001	-0.0001	0.34	0.24	0.04	271
	(1.16)	(0.39)	(1.29)	(-1.35)	(0.48)	(-0.46)	(1.06)	(-0.63)	(0.78)	(-1.34)	(-0.13)	**(4.28)***	(1.34)		
12:30	-0.01	0.001	-0.09	0.11	0.002	0.003	0.002	0.002	0.0005	0.001	-0.0004	-0.02	-0.23	0.00	272
	(-0.74)	(0.24)	(-1.03)	(1.22)	(0.61)	(0.99)	(0.34)	(0.94)	(0.16)	(0.81)	(-0.5)	(-0.29)	(-1.21)		
13:00	-0.02	0.002	-0.01	-0.01	0.002	-0.002	0.0002	0.001	-0.002	0.001	0.001	0.07	-0.01	-0.01	276
	(-1.45)	(0.85)	(-0.08)	(-0.08)	(0.68)	(-0.82)	(0.06)	(0.40)	(-0.76)	(1.40)	(1.54)	(1.23)	(-0.05)		
14:00	-0.002	0.004	0.04	-0.09	0.001	0.002	-0.0004	0.003	-0.004	-0.00003	0.0003	-0.13	-0.11	-0.001	285
	(-0.08)	(1.46)	(0.43)	(-0.9)	(0.24)	(0.68)	(-0.08)	(1.53)	(-1.34)	(-0.03)	(0.35)	(-1.7)	(-0.67)		
15:00	0.02	-0.001	0.15	-0.16	0.002	-0.001	0.002	0.001	-0.001	-0.001	-0.002	0.04	-0.05	-0.02	286
	(0.68)	(-0.29)	(1.37)	(-1.47)	(0.66)	(-0.22)	(0.34)	(0.28)	(-0.2)	(-0.63)	**(-2.04)***	(0.56)	(-0.3)		
15:55	0.04	0.001	-0.01	-0.004	-0.005	-0.0003	0.01	0.0003	0.01	-0.002	0.0001	-0.004	-0.02	0.01	281
	(1.67)	(0.42)	(-0.14)	(-0.03)	(-1.11)	(-0.07)	**(2.26)***	(0.12)	(1.56)	(-1.63)	(0.09)	(-0.06)	(-0.12)		
16:00	-0.001	-0.001	0.09	-0.08	0.001	0.001	-0.001	-0.002	0.003	0.0001	-0.0004	-0.01	0.12	0.01	263
	(-0.05)	(-0.9)	(1.72)	(-1.55)	(0.71)	(0.94)	(-0.46)	(-1.9)	(1.65)	(0.25)	(-0.85)	(-0.27)	(1.09)		

* Significant at 5% level.

Table 9 Comparison of Pilot and Nonpilot Stocks with Minimum Intraday Returns Lower than or Equal to -3%

	Full Sample	Sample with Minimum Intraday Return <=-3%
Number of Observations		
- Pilot	311	144
- Nonpilot	634	340
Average Minimum Cumulative Return		
- Pilot	-0.04	-0.08
- Nonpilot	-0.05	-0.09
Median Time to Reach Minimum Price		
- Pilot	37 min	97 min
- Nonpilot	65 min	140 min
Median Surprise		
- Pilot	-0.002	-0.002
- Nonpilot	-0.002	-0.002
Median Market Capitalization		
- Pilot	$764 mil	$660 mil
- Nonpilot	$711 mil	$516 mil
Median Market-to-Book Ratio		
- Pilot	2.18	2.24
- Nonpilot	2.18	2.21
Median Historical Volatility		
- Pilot	0.03	0.03
- Nonpilot	0.03	0.04

Table 10 Regression of Time to Reach -0.03 Intraday Cumulative Return

This table presents the result of regression:

$$\ln(Time_i) = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot * Srps + \beta_4 R_m + \beta_5 HVol + \beta_6 Liq_i + \beta_7 \ln(MC)_i + \beta_8 \ln(MtB)_i + \varepsilon_i$$

"$Time_i$" was the time in minutes that it took for stock i to reach an intraday cumulative return of -0.03. Pilot was a dummy variable which took the value of 1 if the stock was a pilot stock and 0 otherwise. "Srps" was earnings surprise calculated as (actual EPS - median analyst forecast)/(price as of end of the fiscal quarter). "Pilot*Srps" was an interaction term of "Pilot" and "Srps". "R_m" was the market return during the associated time period and was proxied by the return of the iShare Russell 3000 ETF. "HVol" was the average of daily volatility calculated as $\ln(P_h)$ - $\ln(P_l)$ on April 1, 5, 13, 18, 21, 29, 2005, where $Price_h$ was the highest price and $Price_l$ was the lowest price. "Liq" was the average of daily trade volume divided by shares outstanding for the same 6 days in April of 2005. "MC" was the stock's market capitalization calculated as the close price on the day before the Event Day multiplied by shares outstanding as of the end of 2004. "MtB" was the stock's market-to-book ratio calculated as the close price on the day before the Event Day divided by the stock's book value at the end of April 2005. t -statistics are in parentheses.

	Intercept	Pilot	Srps	Pilot*Srps	R_m	HVol	Liq	MC	MtB	Adj. R^2
Estimate	3.94	0.03	11.45	-13.96	-68.54	-0.98	-3.55	0.19	-0.09	0.04
t -statistics	**(3.52)**	(0.16)	(1.50)	(-1.3)	**(-3.88)***	(-0.96)	(-0.51)	**(3.57)***	(-0.9)	

* Significant at 5% level.

Table 11 Intraday Volatility Regression

The regression of intraday volatility was based on the following model. Intraday volatility was proxied by the squared return. Other variables were defined as in Table 3. *t* statistics are in parentheses.

$$R_{i,t}^2 = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI_{i,t}^{+} + \beta_5 OI_{i,t}^{-} + \beta_6 Pilot_i * OI_{i,t}^{-} + \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i$$
$$+ \beta_9 \ln(MC_i) + \beta_{10} \ln(MtB_i) + \beta_{11} R_{i,t-1} + \beta_{12} HVol_i. + \varepsilon_{i,t}$$

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	MC	MtB	$R_{i,t-1}$	HVol	Adj. R^2
9:45	6.87	0.10	-34.54	33.64	0.28	0.50	0.28	0.03	-0.03	-0.29	-0.11	-5.20	0.32	0.04
	(3.14)*	(0.25)	**(-4.07)***	(1.86)	(0.54)	(0.69)	(0.28)	(0.09)	(-0.07)	**(-2.91)***	(-0.69)	**(-2.38)***	(0.10)	
10:00	3.22	0.15	-2.98	-3.74	-0.27	0.30	-0.26	0.08	-0.43	-0.14	0.005	-8.25	10.56	0.07
	(3.63)*	(1.00)	(-0.85)	(-0.84)	(-1.15)	(1.20)	(-0.72)	(0.60)	**(-2.16)***	**(-3.51)***	(0.08)	**(-6.09)***	(1.33)	
10:15	1.13	0.02	-1.40	1.80	-0.18	0.11	0.03	0.09	-0.07	-0.04	-0.03	-3.72	-0.90	0.04
	(3.53)*	(0.38)	(-1.09)	(1.09)	**(-2.2)***	(1.19)	(0.25)	(1.94)	(-1.00)	**(-3.04)***	(-1.32)	**(-4.05)***	(-0.35)	
10:30	0.84	0.004	-0.59	-0.36	0.01	0.07	-0.01	-0.01	-0.02	-0.03	-0.01	-3.36	1.92	0.03
	(3.79)*	(0.11)	(-0.67)	(-0.20)	(0.19)	(1.22)	(-0.1)	(-0.34)	(-0.39)	**(-3.38)***	(-0.49)	**(-4.04)***	(0.86)	
10:45	0.88	0.02	-1.17	0.70	-0.11	0.10	0.04	0.04	-0.02	-0.04	0.001	-2.06	0.14	0.04
	(4.76)*	(0.66)	(-1.57)	(0.75)	**(-2.28)***	**(2.11)***	(0.57)	(1.67)	(-0.37)	**(-4.31)***	(0.08)	**(-2.26)***	(0.69)	
11:00	0.39	0.01	-0.05	0.11	-0.07	0.05	0.03	0.03	0.01	-0.02	-0.01	-1.19	3.24	0.06
	(4.07)*	(0.40)	(-0.12)	(0.23)	**(-2.98)***	**(2.21)***	(0.75)	(1.91)	(0.62)	**(-3.63)***	(-1.63)	**(-2.46)***	(1.93)	
11:15	0.78	-0.004	-0.59	0.89	-0.07	0.11	-0.09	0.04	-0.03	-0.03	-0.004	2.48	-1.80	0.04
	(5.14)*	(-0.15)	(-0.99)	(1.16)	**(-2.02)***	**(2.95)***	(-1.57)	(1.66)	(-0.91)	**(-4.68)***	(-0.38)	**(2.51)***	(-0.64)	
11:30	0.45	0.02	-0.70	1.09	-0.07	0.02	-0.01	-0.005	0.03	-0.02	-0.01	-0.86	8.99	0.03
	(3.29)*	(0.86)	(-1.25)	(1.55)	**(-2.00)***	(0.66)	(-0.14)	(-0.23)	(0.84)	**(-3.18)***	(-0.78)	(-1.02)	**(2.93)***	
12:00	0.77	0.01	-1.36	1.16	-0.17	0.14	0.06	0.02	-0.02	-0.03	0.03	-2.67	7.23	0.06
	(4.09)*	(0.31)	(-1.86)	(1.23)	**(-3.43)***	**(2.86)***	(0.72)	(0.77)	(-0.39)	**(-3.91)***	**(2.20)***	**(-2.23)***	**(2.37)***	
12:30	0.55	-0.01	-0.58	1.07	-0.06	0.08	-0.09	0.01	0.06	-0.02	0.01	2.77	6.09	0.03
	(2.83)*	(-0.27)	(-0.77)	(1.11)	(-1.19)	(1.55)	(-1.11)	(0.38)	(1.29)	**(-2.7)***	(0.41)	**(3.00)***	(1.87)	
13:00	0.38	0.003	-0.53	0.22	-0.06	0.06	0.02	0.01	-0.03	-0.02	0.005	0.16	9.35	0.03
	(2.82)*	(0.15)	(-1.00)	(0.32)	(-1.78)	(1.80)	(0.29)	(0.40)	(-0.85)	**(-2.81)***	(0.50)	(0.22)	**(3.85)***	
14:00	0.56	0.02	-3.48	3.06	-0.05	0.06	0.08	0.06	-0.06	-0.03	0.002	-0.64	8.45	0.07
	(2.69)*	(0.65)	**(-4.31)***	**(2.98)***	(-0.92)	(0.92)	(0.81)	**(2.06)***	(-1.31)	**(-2.75)***	(0.11)	(-0.50)	**(3.15)***	
15:00	1.15	0.01	-1.77	2.36	-0.20	0.25	-0.11	0.09	-0.06	-0.05	0.00	0.32	4.03	0.05
	(4.45)*	(0.13)	(-1.76)	(1.85)	**(-2.7)***	**(3.14)***	(-0.90)	**(2.36)***	(-1.16)	**(-4.18)***	-0.19	-0.27	-1.31	
15:55	0.74	0.002	-2.21	1.90	-0.11	0.09	0.11	0.09	-0.01	-0.03	0.02	-2.56	4.22	0.07
	(3.15)*	(0.04)	**(-2.38)***	(1.63)	(-1.37)	(1.20)	(0.97)	**(2.68)***	(-0.10)	**(-3.05)***	(1.18)	**(-2.76)***	(1.74)	
16:00	0.20	-0.002	0.18	-0.28	-0.01	0.01	0.01	-0.005	0.01	-0.01	-0.001	-0.09	2.58	0.05
	(4.49)*	(-0.28)	(1.03)	(-1.32)	(-0.96)	(0.96)	(0.59)	(-0.78)	(1.04)	**(-4.2)***	(-0.42)	(-0.49)	**(3.03)***	

Coefficients were scaled up by 1,000.

* Significant at 5% level.

Table 12 Intraday Return Skewness Regression

The regression of intraday return skewness was based on the model. Variables were defined as in Table 3. t -statistics are in parentheses.

$$R_{i,t}^{3} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI_{i,t}^{+} + \beta_5 OI_{i,t}^{-} + \beta_6 Pilot_i * OI_{i,t}^{-} + \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i$$
$$+ \beta_9 \ln(MC_i) + \beta_{10} \ln(MtB_i) + \beta_{11} R_{i,t-1} + \beta_{12} HVol_i. + \varepsilon_{i,t}$$

	Intercept	Pilot	Srps	Pilot*Srps	OI^{+}	OI^{-}	Pilot*OI^{-}	NNM	Pilot*NNM	MC	MtB	$R_{i,t-1}$	HVol	Adj. R^2
9:45	-0.40	0.03	4.30	-1.84	0.17	-0.01	-0.09	-0.03	-0.12	0.02	0.03	-0.49	0.34	0.02
	(-1.04)	(0.43)	**(2.86)***	(-0.57)	(1.86)	(-0.10)	(-0.49)	(-0.51)	(-1.31)	(0.91)	(1.27)	(-1.28)	(0.56)	
10:00	-0.15	-0.005	-0.19	1.49	0.04	-0.03	0.05	-0.001	0.05	0.01	0.003	0.94	-1.53	0.04
	(-1.2)	(-0.23)	(-0.39)	**(2.38)***	(1.22)	(-0.73)	(1.02)	(-0.07)	(1.70)	(1.22)	(0.29)	**(4.94)***	(-1.37)	
10:15	-0.02	-0.001	0.06	-0.05	0.01	-0.001	-0.004	-0.01	0.01	0.001	0.0003	0.20	0.24	0.01
	(-0.76)	(-0.16)	(0.58)	-0.36	(1.31)	(-0.10)	(-0.42)	**(-2.04)***	(1.50)	(0.67)	(0.16)	**(2.89)***	(1.22)	
10:30	-0.01	0.0002	0.03	-0.15	0.003	0.002	-0.004	0.003	-0.004	0.0003	-0.003	-0.09	-0.13	0.01
	(-0.50)	(0.09)	(0.60)	-1.54	(1.04)	(0.59)	-0.73	(1.90)	-1.60	(0.62)	**(-2.86)***	-1.90	-1.03	
10:45	-0.02	0.0003	0.02	0.01	0.004	-0.002	0.001	-0.003	0.004	0.001	0.0004	0.15	-0.0003	0.02
	(-2.13)*	(0.22)	(0.44)	(0.11)	(1.74)	(-0.64)	(0.19)	(-1.93)	(1.90)	**(2.00)***	(0.55)	**(3.16)***	(-0.03)	
11:00	-0.001	0.0004	0.01	-0.01	0.002	-0.0004	0.0001	0.0001	-0.001	0.00003	-0.0003	0.004	0.05	-0.001
	(-0.33)	(0.86)	(0.67)	(-0.49)	**(2.24)***	(-0.50)	(0.12)	(0.20)	(-1.58)	(0.20)	(-1.33)	(0.30)	(0.94)	
11:15	-0.01	0.001	-0.01	0.002	0.003	0.0002	0.001	0.0004	-0.002	0.0003	-0.001	0.14	0.06	0.01
	(-0.89)	(0.49)	(-0.25)	(0.06)	(1.85)	(0.16)	(0.44)	(0.43)	(-1.52)	(0.91)	(-1.21)	**(3.23)***	(0.47)	
11:30	-0.001	-0.0003	0.03	-0.04	0.0003	0.0002	0.003	0.00005	0.0005	0.0001	0.0004	0.10	-0.19	0.002
	(-0.21)	(-0.24)	(1.05)	(-1.24)	(0.22)	(0.11)	(1.12)	(0.05)	(0.32)	(0.30)	(0.80)	**(2.49)***	(-1.32)	
12:00	-0.01	-0.0003	-0.04	0.02	0.002	-0.001	0.002	-0.002	0.003	0.0002	0.0001	0.24	0.10	0.02
	(-0.65)	(-0.20)	(-1.11)	(0.58)	(1.09)	(-0.60)	(0.62)	(-1.83)	(1.56)	(0.55)	(0.26)	**(4.71)***	(0.74)	
12:30	0.001	0.0004	-0.001	0.01	0.0000	0.001	0.004	-0.001	0.003	0.0000002	0.0003	0.14	0.01	0.003
	(0.07)	(0.26)	(-0.02)	(0.23)	(0.02)	(0.48)	(0.99)	(-0.44)	(1.22)	(0.00)	(0.43)	**(3.02)***	(0.04)	
13:00	0.002	0.001	0.004	-0.01	-0.001	-0.001	0.002	0.0003	-0.002	-0.0001	0.0003	0.06	0.08	-0.003
	(0.28)	(1.19)	(0.17)	(-0.37)	(-0.51)	(-0.84)	(0.81)	(0.33)	(-1.58)	(-0.45)	(0.66)	(1.86)	(0.80)	
14:00	0.01	0.001	-0.12	0.10	-0.001	0.01	-0.004	-0.001	0.001	-0.0005	0.001	-0.19	-0.05	0.02
	(1.06)	(0.65)	**(-3.22)***	**(2.04)***	(-0.55)	**(2.32)***	(-0.86)	(-0.93)	(0.36)	(-1.10)	(1.71)	**(-3.32)***	(-0.45)	
15:00	-0.001	-0.001	0.03	-0.04	0.001	-0.001	0.003	-0.001	0.001	0.0001	0.0001	0.13	-0.08	-0.01
	(-0.08)	(-0.49)	(0.60)	(-0.61)	(0.31)	(-0.30)	(0.54)	(-0.33)	(0.21)	(0.12)	(0.08)	**(2.19)***	(-0.53)	
15:55	0.02	0.002	-0.04	0.04	-0.00001	-0.001	0.01	0.0004	0.002	-0.001	-0.001	0.05	-0.08	0.002
	(1.59)	(0.84)	(-0.93)	(0.63)	(0.00)	(-0.32)	(1.60)	(0.26)	(0.86)	(-1.52)	(-1.14)	(1.04)	(-0.72)	
16:00	-0.0001	-0.0001	0.001	0.004	0.0004	0.00005	-0.0001	-0.0002	0.0004	0.00001	0.00003	0.001	-0.001	0.004
	(-0.10)	(-0.42)	(0.17)	(0.91)	(1.94)	(0.23)	(-0.22)	(-1.77)	(1.93)	(0.21)	(0.49)	(0.37)	(-0.05)	

Coefficients scaled up by 1,000.

* Significant at 5% level.

Table 13 Summary Statistics of Change in Open and Intraday Short Sale Volume

This table reports the summary statistics of changes in the open short sale volume and intraday short sale volumes on the Event Day from the pre-earnings release period. Pre-earnings release period was defined as the two-week period starting from three weeks before earnings release and ending one week before earnings release. The averages of open and intraday short sale volumes on each trading day during this period were subtracted from the open and intraday short sale volumes on the Event Day, the differences were then divided by the pre-earnings release average.

	Open	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean																
- Pilot	3.90	10.97	10.42	9.22	7.17	7.45	6.31	7.07	7.28	5.53	4.20	5.29	3.94	4.90	3.00	2.41
- Nonpilot	3.83	10.25	10.69	11.51	6.65	6.48	5.53	6.63	5.13	5.18	4.84	4.33	4.00	3.25	3.14	3.17
Median																
- Pilot	0.84	3.32	2.56	2.47	1.72	1.83	1.75	1.65	1.80	1.76	1.16	1.51	1.46	1.66	1.49	0.51
- Nonpilot	0.09	3.62	2.78	2.39	1.65	1.74	1.50	1.65	1.63	1.44	1.14	1.36	1.48	1.17	1.16	0.77
Maximum																
- Pilot	87.95	131.00	215.83	211.58	240.71	148.86	114.38	138.42	141.21	101.97	73.03	78.62	42.51	118.89	78.85	58.62
- Nonpilot	98.66	143.50	249.46	355.89	239.14	148.09	140.02	172.63	105.61	125.98	124.23	81.11	97.79	85.87	83.08	92.13
Minimum																
- Pilot	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
- Nonpilot	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
Stdev																
- Pilot	8.48	20.20	23.71	23.30	19.53	17.79	12.57	15.61	18.26	10.68	8.51	9.86	6.91	12.82	5.85	6.18
- Nonpilot	11.12	18.56	26.30	34.50	19.57	15.18	13.60	15.36	10.32	13.52	12.32	8.94	9.76	7.25	6.68	7.74
Skewness																
- Pilot	4.70	3.24	4.88	5.73	7.76	5.12	4.09	4.21	4.74	4.11	4.27	3.40	2.88	6.04	8.06	4.86
- Nonpilot	4.75	3.72	4.98	6.62	8.26	5.08	5.48	5.66	4.01	5.91	5.79	4.35	5.97	5.99	6.55	5.23

Table 14 Regression of Open and Intraday Short Sale Volumes

The regression of changes in open short volume was based on the model:

$$\Delta S_{i,open} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 NNM_i + \beta_5 Pilot_i * NNM_i + \beta_6 R_{m,t} + \beta_7 \ln(MC)_i + \beta_8 \ln(MtB)_i + \varepsilon_{i,t}$$

The regression of changes in intraday short volume was based on the model:

$$\Delta S_{i,t} = \alpha + \beta_1 Pilot_i + \beta_2 Srps_i + \beta_3 Pilot_i * Srps_i + \beta_4 OI^+_{i,t} + \beta_5 OI^-_{i,t} + \beta_6 Pilot_i * OI^-_{i,t} + \beta_7 NNM_i + \beta_8 Pilot_i * NNM_i$$
$$+ \beta_9 R_{m,t} + \beta_{10} \ln(MC)_i + \beta_{11} \ln(MtB)_i + \beta_{12} \Delta S_{t-1} + \beta_{13} R_{i,t-1} + \beta_{14} HVol_i + \varepsilon_{i,t}$$

"ΔS" was the percentage change in $stock_i$'s short sale volume on the Event Day from the average pre-earnings release period short volume. "Pilot" was a dummy variable that took the value of 1 if the stock was a pilot stock and 0 otherwise. "Srps" was earnings surprise calculated as (actual EPS - median analyst forecast)/(price as of end of the fiscal quarter). "Pilot*Srps" was an interaction term of "Pilot" and "Srps". "NNM" was a dummy variable that took the value of 1 if the stock was listed on NASDAQ and 0 otherwise. "Pilot*NNM" was an interaction term of "Pilot" and "NNM". "OI^+" was the positive net order flow for the Designated Period t that took the value of (BI - SI)/(BI + SI) if the value >=0 and 0 otherwise, where "BI" and "SI" were the number of traded shares that were buyer-initiated and seller-initiated, respectively. "OI^-" was the negative net order flow that took the value of (BI - SI)/(BI + SI) if the value < 0 and 0 otherwise. "MC" was the stock's market capitalization calculated as the close price on the day before the Event Day multiplied by shares outstanding as of the end of 2004. "MtB" was the stock's market-to-book ratio calculated as the close price on the day before the Event Day divided by the stock's book value at the end of April 2005. "$R_{i,t-1}$" was the stock's return immediately before the current period t. For the interval of 9:30 - 9:45am, "Ri,t-1" was the stock's overnight return. "HVol" was the stock's historical volatility calculated by taking the average of $\ln(Price_h)$ - $\ln(Price_l)$ on April 1, 5, 13, 18, 21, 29, 2005 for each Designated Time period, where $Price_h$ was the highest price and $Price_l$ was the lowest price. t statistics are in parentheses.

Panel A Regression of Changes in Open Short Sale Volumes from Pre-Earnings Release Period

	Intercept	Pilot	Srps	Pilot*Srps	NNM	Pilot*NNM	R_m	MC	MtB	Adj. R^2
Market Open	10.93	2.56	7.92	-1.98	5.74	-5.17	107.08	-0.46	-0.29	0.06
	(1.81)	**(2.61)***	(0.31)	(-0.06)	**(6.32)***	**(-3.57)***	(0.96)	(-1.60)	(-0.64)	

* Significant at 5% level.

Panel B Regression of Change in Intraday Short Sale Volume

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	R_m	MC	MtB	ΔS_{t-1}	$R_{i,t-1}$	HVol	Adj. R^2
9:45	62.16	3.07	-10.50	78.72	1.82	3.95	2.66	-1.90	-5.66	302.92	-2.79	-0.64		-273.56	-17.87	0.15
	(2.79)*	(0.76)	(-0.12)	(0.45)	(0.35)	(0.54)	(0.27)	(-0.56)	(-1.14)	(0.38)	**(-2.74)***	(-0.42)		**(-11.07)***	(-0.52)	
10:00	92.60	1.45	-334.18	395.67	33.22	23.74	-34.84	17.87	-20.14	1581.95	-3.84	-0.12	0.07	-229.33	-833.27	0.01
	(1.12)	(0.10)	(-1.09)	(0.62)	(1.46)	(1.03)	(-1.01)	(1.51)	(-1.10)	(0.56)	(-1.01)	(-0.02)	(0.14)	(-1.77)	(-1.18)	
10:15	120.22	-1.22	20.01	-4.29	-9.41	12.71	-9.34	3.52	-7.41	-145.75	-5.02	-0.41	0.12	-12.53	-256.76	0.11
	(4.17)*	(-0.24)	(0.17)	(-0.03)	(-1.27)	(1.48)	(-0.77)	(0.85)	(-1.15)	(-0.14)	**(-3.79)***	(-0.20)	**(9.05)***	(-0.15)	(-1.16)	
10:30	18.83	-2.29	-16.69	66.92	-1.74	15.48	-16.64	7.29	2.19	905.27	-0.59	-1.21	0.35	-508.47	-275.59	0.23
	(0.85)	(-0.62)	(-0.19)	(0.38)	(-0.31)	**(2.72)***	(-1.87)	**(2.29)***	(0.44)	(0.97)	(-0.58)	(-0.77)	**(13.93)***	**(-6.21)***	(-1.26)	
10:45	33.12	-0.66	5.87	-93.03	-6.24	6.26	0.49	1.97	5.96	261.26	-1.32	0.05	0.17	-98.09	2.30	0.20
	(3.19)*	(-0.38)	(0.14)	(-1.80)	**(-2.38)***	**(2.32)***	(0.12)	(1.32)	**(2.53)***	(0.75)	**(-2.74)***	(0.07)	**(12.08)***	(-1.91)	(0.22)	
11:00	26.74	3.22	-217.97	294.22	-4.06	-3.36	4.51	6.87	-7.17	503.87	-0.90	-2.47	0.47	-113.14	-851.78	0.08
	(1.13)	(0.86)	**(-2.44)***	**(2.59)***	(-0.73)	-0.56	(0.47)	**(2.06)***	(-1.38)	(0.45)	(-0.84)	(-1.53)	**(6.56)***	(-0.94)	**(-2.04)***	
11:15	12.32	2.52	61.80	-122.62	-2.66	-2.85	13.39	-0.46	3.46	2098.66	-0.93	1.07	0.14	-170.38	2222.62	0.09
	(0.64)	(0.78)	(0.82)	(-0.81)	(-0.56)	-0.60	(1.75)	(-0.17)	(0.80)	**(2.03)***	(-1.06)	(0.80)	**(4.89)***	(-1.37)	**(6.28)***	
11:30	45.80	2.12	44.30	-20.66	-6.75	9.96	-2.73	6.49	-3.33	-78.81	-1.75	-0.19	0.19	253.08	-835.75	0.07
	(2.51)*	(0.68)	(0.60)	(-0.22)	(-1.48)	**(2.16)***	(-0.40)	**(2.40)***	(-0.81)	(-0.09)	**(-2.09)***	(-0.14)	**(6.37)***	**(2.27)***	**(-2.03)***	
12:00	15.73	-0.26	-19.26	28.72	-1.85	3.03	-3.33	1.77	-0.42	213.03	-0.53	-0.23	0.22	-85.74	-107.49	0.26
	(2.07)*	(-0.21)	(-0.66)	(0.78)	(-0.92)	(1.49)	(-1.02)	(1.63)	(-0.26)	(0.83)	(-1.55)	(-0.44)	**(16.57)***	(-1.81)	(-0.87)	
12:30	8.51	0.11	-69.30	78.74	-1.38	-1.63	1.13	4.39	-3.06	888.02	-0.28	-0.52	0.43	-71.09	-174.28	0.11
	(0.71)	(0.06)	(-1.50)	(1.36)	(-0.46)	-0.52	(0.24)	**(2.55)***	(-1.18)	**(2.21)***	(-0.51)	(-0.63)	**(9.33)***	(-1.21)	(-0.88)	
13:00	22.62	-0.49	34.27	-33.24	-1.71	1.56	-0.39	0.69	3.88	-515.36	-0.90	-0.26	0.35	-63.87	-57.65	0.19
	(2.34)*	(-0.31)	(0.91)	(-0.70)	(-0.68)	(0.62)	(-0.10)	(0.50)	(1.82)	(-1.64)	**(-2.05)***	(-0.38)	**(13.34)***	(-1.19)	(-0.33)	
14:00	20.64	-1.34	1.67	4.26	-2.79	1.43	-12.98	2.42	-0.65	-154.74	-0.77	0.50	0.22	-66.94	-308.70	0.11
	(2.53)*	(-1.00)	(0.05)	(0.11)	(-1.22)	(0.57)	**(-3.42)***	**(2.10)***	(-0.37)	(-0.82)	**(-2.08)***	(0.89)	**(8.36)***	(-1.35)	**(-2.85)***	
15:00	14.61	0.32	-22.29	38.29	-1.51	2.60	-1.21	1.19	2.25	-6.97	-0.52	-0.79	0.20	-47.68	-48.29	0.07
	(1.87)	(0.25)	(-0.75)	(1.03)	(-0.67)	(1.05)	(-0.34)	(1.09)	(1.37)	(-0.05)	(-1.48)	(-1.49)	**(6.69)***	(-1.35)	(-0.53)	
15:55	10.95	-0.01	-22.22	13.79	0.92	2.57	-0.01	0.90	-1.32	58.05	-0.41	0.18	0.27	-21.27	-52.06	0.21
	(2.40)*	(-0.01)	(-1.24)	(0.62)	(0.59)	(1.85)	(0.00)	(1.41)	(-1.39)	(0.58)	**(-1.98)***	(0.60)	**(14.14)***	(-1.20)	(-1.12)	
16:00	13.11	-0.54	5.36	1.34	-1.51	-0.54	3.26	0.24	1.20	622.78	-0.47	-0.40	0.34	45.35	-210.04	0.11
	(2.47)*	(-0.59)	(0.26)	(0.05)	(-1.38)	(-0.44)	(1.77)	(0.31)	(1.06)	**(2.24)***	(-1.93)	(-1.10)	**(8.81)***	**(2.10)***	**(-2.02)***	

* Significant at 5% level.

Table 14 Panel C Regression of Change in Intraday Cumulative Short Sale Volume

	Intercept	Pilot	Srps	Pilot*Srps	OI^+	OI^-	Pilot*OI^-	NNM	Pilot*NNM	R_m	MC	MtB	HVol	Adj. R^2
9:45	68.27	1.98	33.79	98.66	-2.07	12.08	-2.17	2.45	-0.40	-271.53	-2.68	-1.23	-21.77	0.05
	(5.25)*	(0.84)	(0.68)	(0.96)	(-0.68)	**(2.86)***	(-0.37)	(1.27)	(-0.14)	(-0.58)	**(-4.51)***	(-1.38)	(-1.08)	
10:00	58.84	-1.70	26.07	-32.78	-5.30	8.85	-4.45	3.63	1.31	-106.27	-2.19	-0.70	-324.53	0.05
	(5.14)*	(-0.89)	(0.58)	(-0.58)	(-1.69)	**(2.70)***	(-0.93)	**(2.18)***	(0.51)	(-0.27)	**(-4.15)***	(-0.85)	(-3.21)	
10:15	69.32	-1.45	-43.98	42.92	-5.14	12.88	-10.66	5.75	-4.08	417.45	-2.73	-0.95	-152.41	0.02
	(3.83)*	(-0.45)	(-0.60)	(0.47)	(-1.10)	**(2.39)***	(-1.41)	**(2.20)***	(-1.01)	(0.66)	**(-3.27)***	(-0.73)	(-1.08)	
10:30	45.18	-2.08	23.99	49.67	-1.54	4.90	-7.56	3.87	0.02	623.13	-1.68	-0.77	-256.14	0.05
	(4.55)*	(-1.26)	(0.61)	(0.63)	(-0.61)	(1.90)	(-1.88)	**(2.69)***	(0.01)	(1.48)	**(-3.68)***	(-1.09)	**(-2.60)***	
10:45	43.27	0.57	18.11	-3.90	-5.42	-2.01	4.63	3.71	-0.90	-564.18	-1.73	-0.58	3.07	0.03
	(3.65)*	(0.29)	(0.38)	(-0.07)	(-1.80)	(-0.66)	(1.03)	**(2.17)***	(-0.33)	(-1.43)	**(-3.16)***	(-0.68)	(0.25)	
11:00	50.52	1.42	-12.04	20.34	-6.01	3.10	3.22	3.72	0.42	166.20	-1.94	-0.06	-634.27	0.06
	(5.47)*	(0.95)	(-0.34)	(0.45)	**(-2.71)***	(1.31)	(0.87)	**(2.81)***	(0.21)	(0.37)	**(-4.60)***	(-0.09)	**(-3.86)***	
11:15	44.10	0.76	-9.38	49.63	-3.94	-0.49	2.15	3.67	-0.18	-384.83	-1.71	-0.65	-398.31	0.03
	(4.07)*	(0.42)	(-0.22)	(0.59)	(-1.50)	(-0.19)	(0.50)	**(2.38)***	(-0.07)	(-0.66)	**(-3.47)***	(-0.87)	(-1.89)	
11:30	33.14	0.72	-20.05	31.78	-4.98	4.58	0.47	3.33	0.20	90.49	-1.22	-0.34	-266.84	0.04
	(4.35)*	(0.55)	(-0.65)	(0.82)	**(-2.63)***	**(2.40)***	(0.17)	**(2.96)***	(0.11)	(0.26)	**(-3.50)***	(-0.63)	(-1.56)	
12:00	38.70	0.38	-14.90	27.15	-2.69	6.15	-1.62	3.91	0.35	61.54	-1.48	-0.34	-286.50	0.03
	(3.80)*	(0.23)	(-0.38)	(0.55)	(-1.01)	**(2.28)***	(-0.37)	**(2.69)***	(0.16)	(0.18)	**(-3.21)***	(-0.48)	(-1.73)	
12:30	37.19	-0.68	-6.86	21.71	-4.31	4.29	-5.86	3.41	-0.15	-338.54	-1.38	-0.26	-440.63	0.04
	(4.70)*	(-0.52)	(-0.22)	(0.56)	**(-2.16)***	**(2.04)***	(-1.86)	**(2.97)***	(-0.08)	(-1.26)	**(-3.85)***	(-0.47)	**(-3.35)***	
13:00	26.42	0.77	-19.34	30.84	-0.51	0.99	1.98	2.90	-0.13	-35.41	-0.97	-0.49	-267.37	0.03
	(3.66)*	(0.65)	(-0.69)	(0.87)	(-0.27)	(0.53)	(0.69)	**(2.83)***	(-0.08)	(-0.15)	**(-2.96)***	(-0.96)	**(-2.06)***	
14:00	31.56	0.67	-9.19	16.77	-6.07	2.20	2.00	3.06	-0.07	-76.77	-1.18	-0.36	-214.87	0.04
	(4.61)*	(0.59)	(-0.34)	(0.50)	**(-3.14)***	(1.04)	(0.64)	**(3.14)***	(-0.05)	(-0.49)	**(-3.82)***	(-0.75)	**(-2.41)***	
15:00	21.57	0.62	-2.46	12.22	-2.29	0.71	2.07	1.90	0.84	-147.18	-0.80	-0.23	-113.32	0.03
	(3.87)*	(0.68)	(-0.11)	(0.46)	(-1.41)	(0.40)	(0.82)	**(2.44)***	(0.72)	(-1.48)	**(-3.17)***	(-0.61)	(-1.74)	
15:55	18.20	0.76	-27.42	36.65	-0.01	1.44	1.29	1.67	0.58	37.45	-0.66	-0.30	-92.10	0.04
	(3.80)*	(0.97)	(-1.46)	(1.57)	(0.00)	(0.99)	(0.57)	**(2.51)***	(0.58)	(0.35)	**(-3.07)***	(-0.93)	(-1.88)	
16:00	18.99	0.17	-14.53	21.89	-2.69	1.44	0.36	1.66	0.11	254.42	-0.69	-0.30	-149.32	0.04
	(4.40)*	(0.22)	(-0.86)	(1.04)	**(-3.00)***	(1.43)	(0.24)	**(2.64)***	(0.12)	(1.12)	**(-3.49)***	(-1.00)	(-1.75)	

* Significant at 5% level.

Table 15 Summary Statistics of Nonbinding Time Ratio

The following tables provoide summary statistics on the percentage of time when the minimum shortable price (MSP) was lower than or equal to the prevailing best bid at each Designated Time interval on the Event Day.

Panel A NYSE and AMEX Stocks

	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean															
- Pilot	0.08	0.14	0.14	0.14	0.14	0.13	0.14	0.14	0.13	0.14	0.13	0.13	0.13	0.15	0.14
- Nonpilot	0.08	0.12	0.11	0.11	0.12	0.11	0.12	0.12	0.10	0.10	0.10	0.11	0.11	0.12	0.11
Median															
- Pilot	0.07	0.13	0.12	0.13	0.13	0.12	0.13	0.13	0.12	0.13	0.11	0.12	0.13	0.14	0.09
- Nonpilot	0.05	0.10	0.10	0.09	0.10	0.09	0.10	0.09	0.09	0.09	0.09	0.09	0.10	0.12	0.06
Maximum															
- Pilot	0.49	0.63	0.48	0.97	0.47	0.64	0.58	0.75	0.63	0.46	0.49	0.30	0.38	0.35	0.91
- Nonpilot	0.53	0.62	0.48	0.41	0.78	0.67	0.81	0.70	0.88	0.56	0.61	0.47	0.63	0.47	1.00
Minimum															
- Pilot	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Nonpilot	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stdev															
- Pilot	0.08	0.11	0.10	0.11	0.10	0.10	0.10	0.12	0.10	0.09	0.10	0.07	0.07	0.06	0.16
- Nonpilot	0.09	0.10	0.09	0.09	0.10	0.10	0.13	0.12	0.09	0.08	0.08	0.07	0.07	0.07	0.14

Table 15 Summary Statistics of Nonbinding Time Ratio

Panel B NASDAQ Stocks

	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean															
- Pilot	0.58	0.59	0.58	0.56	0.57	0.53	0.60	0.56	0.59	0.60	0.59	0.59	0.55	0.60	0.60
- Nonpilot	0.57	0.55	0.53	0.55	0.53	0.53	0.53	0.55	0.53	0.55	0.54	0.55	0.55	0.57	0.58
Median															
- Pilot	0.55	0.58	0.59	0.59	0.59	0.56	0.62	0.60	0.59	0.63	0.61	0.59	0.56	0.61	0.63
- Nonpilot	0.59	0.56	0.53	0.55	0.52	0.53	0.53	0.57	0.53	0.56	0.56	0.56	0.56	0.57	0.62
Maximum															
- Pilot	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
- Nonpilot	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00
Minimum															
- Pilot	0.02	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0
- Nonpilot	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0
Stdev															
- Pilot	0.18	0.20	0.21	0.24	0.27	0.25	0.25	0.28	0.22	0.24	0.23	0.18	0.19	0.16	0.26
- Nonpilot	0.18	0.21	0.21	0.23	0.25	0.27	0.26	0.26	0.22	0.24	0.24	0.20	0.20	0.17	0.28

Table 15 Summary Statistics of Nonbinding Time Ratio

Panel C NYSE and AMEX Stocks under NASDAQ Rule

The following table reports the mean and median nonbinding time ratio for NYSE and AMEX stocks if they were subject to the bid test applicable to NASDAQ stocks. The t test tested for equal mean in NASDAQ stocks and NYSE-AMEX stocks under the NASDAQ rule.

	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean															
- Pilot	0.46	0.44	0.58	0.60	0.59	0.56	0.60	0.59	0.57	0.61	0.61	0.61	0.60	0.59	0.58
- Nonpilot	0.49	0.50	0.58	0.58	0.60	0.62	0.61	0.63	0.62	0.63	0.62	0.63	0.61	0.60	0.59
Median															
- Pilot	0.54	0.61	0.59	0.62	0.59	0.58	0.62	0.59	0.58	0.62	0.61	0.61	0.59	0.60	0.62
- Nonpilot	0.57	0.58	0.59	0.58	0.60	0.62	0.61	0.64	0.63	0.64	0.62	0.63	0.62	0.61	0.60
T Test for Equal Mean	-1.03	-0.92	0.08	1.64	0.73	0.91	-0.29	1.24	-1.07	0.56	0.66	1.03	**(2.29)***	-0.54	-0.97
Pr>|t|	0.30	0.36	0.93	0.10	0.46	0.36	0.77	0.22	0.28	0.58	0.51	0.30	0.02	0.59	0.33

*Significant at 5% level.

Table 16 Short Sale Execution Scenarios

	Price < Bid	Price = Bid	Bid < Price < Ask	Bid < Price = Ask	Bid < Ask < Price
MSP < Bid	MSP<Price<Bid MSP=Price<Bid Price<MSP<Bid	MSP<Price=Bid	MSP<Bid<Price<Ask**	MSP<Bid<Price=Ask	MSP<Bid<Ask<Price
MSP = Bid	Price<MSP=Bid	MSP=Price=Bid	MSP=Bid<Price<Ask**	MSP=Bid<Price=Ask	MSP=Bid<Ask<Price
Bid < MSP	Price<Bid<MSP*	Price=Bid<MSP*	Bid<MSP<Price<Ask** Bid<MSP=Price<Ask** Bid<Price<MSP<Ask** Bid<Price<MSP=Ask** Bid<Price<Ask<MSP**	Bid<MSP<Price=Ask Bid<MSP=Price=Ask Bid<Price=Ask<MSP	Bid<MSP<Ask<Price Bid<MSP=Ask<Price Bid<Ask<MSP<Price Bid<Ask<MSP=Price Bid<Ask<Price<MSP

* Ask could be at any position relative to MSP.

** Each scenario was further categorized as seller-initiated with price<midquote, buyer-initiated with price>midquote and indeterminate initiation origin with price=midquote.

Table 17 Comparison of Short Volumes in Different Execution Scenarios

Panel A Short Sales at Nonrestrictive Times

This table compares pilot and nonpilot stock short volumes at times when the uptick rule was not restricting short selling. For seller-initiated short sales, this meant the minimum shortable price (MSP) was lower than or equal to the best Bid. For trades initiated by buyers, this meant that the MSP was lower than or equal to the best Ask.

		NYSE-AMEX Stocks			NASDAQ Stocks		
	Scenarios	Pilot	Nonpilot	*t* -stat	Pilot	Nonpilot	*t* -stat
Seller-initiated, Price<=Bid	MSP<Short Price<Bid	0.31%	0.29%	(-0.34)	3.14%	3.01%	(-0.45)
	MSP=Short Price<Bid	0.30%	0.87%	(7.27)*	0.00%	0.00%	
	Short Price < MSP<Bid	0.24%	0.10%	(-2.4)*	0.00%	0.01%	(1.00)
	Short Price<MSP=Bid	0.40%	0.04%	(-8.7)*	0.00%	0.00%	
	MSP<Short Price=Bid	2.10%	1.93%	(-0.89)	13.57%	13.56%	(-0.09)
	MSP=Short Price=Bid	4.57%	8.24%	(15.56)*	0.00%	0.00%	
	Subtotal	7.92%	11.47%		16.71%	16.59%	
Buyer-initiated, Price>=Ask	MSP<Bid<Short Price=Ask	0.81%	1.04%	(2.11)*	11.84%	12.87%	(2.01)*
	MSP=Bid<Short Price=Ask	2.17%	2.97%	(6.44)*	0.00%	0.00%	
	Bid<MSP<Short Price=Ask	6.07%	7.69%	(5.71)*	5.95%	6.77%	(2.14)*
	Bid<MSP=Short Price=Ask	10.01%	38.96%	(65.6)*	3.58%	4.70%	(3.57)*
	MSP<Bid<Ask<Short Price	0.15%	0.10%	(-1.25)	1.59%	1.20%	(-1.75)
	MSP=Bid<Ask<Short Price	0.16%	0.12%	(-1.18)	0.00%	0.00%	
	Bid<MSP<Ask<Short Price	0.45%	0.24%	(-3.06)*	1.51%	1.27%	(-1.27)
	Bid<MSP=Ask<Short Price	0.47%	0.26%	(-2.90)*	0.59%	0.59%	(-0.06)
	Subtotal	20.29%	51.39%		25.06%	27.39%	
Price Improvement							
Seller-initiated	MSP<Bid<Short Price<Ask	0.56%	0.67%	(1.17)	6.87%	7.86%	(2.46)*
	MSP=Bid<Short Price<Ask	0.93%	0.96%	(-0.29)	0.00%	0.00%	
Buyer-initiated	MSP<Bid<Short Price<Ask	0.74%	0.72%	(-0.53)	11.02%	11.97%	(1.80)
	MSP=Bid<Short Price<Ask	0.79%	0.80%	(-0.03)	0.00%	0.00%	
Price=Midquote	MSP<Bid<Short Price<Ask	0.35%	0.21%	(-2.32)*	2.33%	2.51%	(0.90)
	MSP=Bid<Short Price<Ask	0.47%	0.48%	(0.19)	0.00%	0.00%	
	Subtotal	3.85%	3.84%		20.22%	22.33%	
	Total	32.05%	66.70%		61.99%	66.31%	

* Significant at 5% level.

Table 17 Comparison of Short Volumes in Different Execution Scenarios

Panel B Comparison of Short Sale Volumes Violating the Uptick Rule

Panel B1

	NYSE-AMEX Stocks		NASDAQ	
Scenario	Pilot	Nonpilot	Pilot	Nonpilot
Seller-initiated, Price<=Bid	21.01%	1.35%	12.90%	6.31%
Buyer-initiated, Price>=Ask	7.88%	3.86%	0.00%	0.00%
Price Improvement, Bid<Price<Ask				
Seller-initiated, Price<Midquote	9.71%	1.05%	0.30%	0.25%
Buyer-initiated, Price>Midquote	6.86%	0.83%	0.34%	0.48%
Price=Midquote	4.36%	0.60%	0.26%	0.00%
Total	49.81%	7.70%	13.80%	7.04%

Panel B2

	NYSE-AMEX Stocks		NASDAQ	
Scenario	Pilot	Nonpilot	Pilot	Nonpilot
Binding				
Seller-initiated, Price<=Bid	20.37%	1.21%	12.90%	6.30%
Buyer-initiated, Price>=Ask	7.88%	3.86%	0.00%	0.00%
Price Improvement, Bid<Price<Ask				
Seller-initiated, Price<Midquote	9.71%	1.05%	0.30%	0.25%
Buyer-initiated, Price>Midquote	2.63%	0.25%	0.03%	0.00%
Price=Midquote	1.61%	0.08%	0.00%	0.00%
Subtotal	42.19%	6.46%	13.23%	6.55%
Nonbinding				
Seller-initiated, Price<=Bid	0.64%	0.14%	0.00%	0.01%
Price Improvement, Bid<Price<Ask				
Buyer-initiated, Price>Midquote	4.24%	0.58%	0.31%	0.48%
Subtotal	4.88%	0.72%	0.31%	0.49%
Uncertain*	2.74%	0.52%	0.26%	0.00%
Total	49.81%	7.70%	13.80%	7.04%

* Whether or not the uptick rule was binding depended on whether the trade was seller initiated or buyer initiated. Trade initiation could not be determined with accuracy when price was equal to the midquote.

Table 17 Comparison of Short Volumes in Different Execution Scenarios

Panel C Scenarios in which Nonpilot Stocks Had Higher Short Volumes than Pilot Stocks

Panel C1 NYSE and AMEX Stocks

Scenario		Weight	Diff.	*t* - stat	Cum. Diff.
Bid<MSP=Short Price=Ask	1		28.96%	(65.6)*	28.96%
- Pilot		10.01%			
- Nonpilot		38.96%			
MSP=Short Price=Bid	2		3.66%	(15.56)*	32.62%
- Pilot		4.57%			
- Nonpilot		8.24%			
Bid<MSP=Short Price<Ask, Price<Midquote	3		3.18%	(12.2)*	35.80%
- Pilot		3.56%			
- Nonpilot		6.74%			
Bid<MSP=Short Price<Ask, Price>Midquote	4		2.36%	(9.68)*	38.16%
- Pilot		4.33%			
- Nonpilot		6.69%			
Bid<MSP=Short Price<Ask, Price=Midquote	5		1.78%	(8.94)*	39.94%
- Pilot		2.81%			
- Nonpilot		4.59%			
Bid<MSP<Short Price=Ask	6		1.62%	(5.71)*	41.56%
- Pilot		6.07%			
- Nonpilot		7.69%			
MSP=Bid<Short Price=Ask	7		0.80%	(6.44)*	42.36%
- Pilot		2.17%			
- Nonpilot		2.97%			
Bid<Ask<MSP=Short Price	8		0.70%	(6.00)*	43.06%
- Pilot		0.72%			
- Nonpilot		1.43%			
MSP=Short Price<Bid	9		0.57%	(7.27)*	43.63%
- Pilot		0.30%			
- Nonpilot		0.87%			
MSP<Bid<Short Price=Ask	10		0.23%	(2.11)*	43.86%
- Pilot		0.81%			
- Nonpilot		1.04%			
MSP<Bid<Short Price<Ask, Price<Midquote	11		0.11%	(1.17)	43.97%
- Pilot		0.56%			
- Nonpilot		0.67%			
MSP=Bid<Short Price<Ask, Price<Midquote	12		0.02%	(0.29)	43.99%
- Pilot		0.93%			
- Nonpilot		0.96%			
MSP=Bid<Short Price<Ask, Price>Midquote	13		0.01%	(0.03)	44.00%
- Pilot		0.79%			
- Nonpilot		0.80%			
MSP=Bid<Short Price<Ask, Price=Midquote	14		0.01%	(0.19)	44.01%
- Pilot		0.47%			
- Nonpilot		0.48%			

* Significant at 5% level.

Table 17 Comparison of Short Volumes in Different Execution Scenarios

Panel C Scenarios in which Nonpilot Stocks Had Higher Short Volumes than Pilot Stocks

Panel C2 NASDAQ Stocks

Scenario		Weight	Diff.	*t* - stat	Cum. Diff.
Bid<MSP=Price=Ask	1				
- Pilot		3.58%	1.11%	(3.57)*	1.11%
- Nonpilot		4.70%			
Bid<MSP=Price<Ask, Price<Midquote	2				
- Pilot		4.85%	1.09%	(3.15)*	2.20%
- Nonpilot		5.94%			
MSP<Bid<Price=Ask	3				
- Pilot		11.84%	1.04%	(2.01)*	3.24%
- Nonpilot		12.87%			
MSP<Bid<Price<Ask, Price<Midquote	4				
- Pilot		6.87%	0.99%	(2.46)*	4.23%
- Nonpilot		7.86%			
MSP<Bid<Price<Ask, Price>Midquote	5				
- Pilot		11.02%	0.95%	(1.80)	5.18%
- Nonpilot		11.97%			
Bid<MSP<Price=Ask	6				
- Pilot		5.95%	0.82%	(2.14)*	6.00%
- Nonpilot		6.77%			
Bid<MSP<Price<Ask, Price>Midquote	7				
- Pilot		10.00%	0.73%	(1.55)	6.73%
- Nonpilot		10.73%			
Bid<MSP<Price<Ask, Price<Mdiquote	8				
- Pilot		5.21%	0.28%	(0.82)	7.01%
- Nonpilot		5.49%			
Price<Bid<MSP<Ask	9				
- Pilot		0.55%	0.28%	(1.80)	7.29%
- Nonpilot		0.83%			
Bid<MSP=Price<Ask, Price>Midquote	10				
- Pilot		0.34%	0.23%	(2.54)*	7.53%
- Nonpilot		0.57%			
MSP<Bid<Price<Ask, Price=Midquote	11				
- Pilot		2.33%	0.17%	(0.90)	7.70%
- Nonpilot		2.51%			
Bid<Price<MSP=Ask, Price>Midquote	12				
- Pilot		0.26%	0.13%	(2.02)*	7.83%
- Nonpilot		0.39%			
Bid<MSP=Price<Ask, Price=Midquote	13				
- Pilot		2.69%	0.02%	(0.03)	7.85%
- Nonpilot		2.70%			
Price< MSP<Bid	14				
- Pilot		0.00%	0.01%	(1.00)	7.86%
- Nonpilot		0.01%			
Bid<Price<MSP<Ask, Price>Midquote	15				
- Pilot		0.06%	0.03%		7.89%
- Nonpilot		0.09%			

*Significant at 5% level.

Table 18 Comparison of Short Volumes in Different Execution Scenarios for Paired Sample

Panel A The Mean Ratios of Pilot and Nonpilot Stocks in the Paired Sample

Sample stocks were ranked by their market capitalization, trade volume scaled by shares outstanding, and short volume scaled by trade volume for the Designated Times on the Event Day. Observations for pilot and nonpilot stocks with the same Designated Time and the same rank in all 3 criteria were paired and the mean ratios of short volumes executed in different scenarios to total short volumes were calculated.

	Nonrestrictive	Exempt	Exempt & Restrictive
Seller-initiated, Price<=Bid			
- Pilot	7.81%	22.88%	22.18%
- Nonpilot	10.56%	1.05%	1.01%
Buyer-initiated, Price>=Ask			
- Pilot	19.71%	7.88%	7.88%
- Nonpilot	52.49%	4.01%	4.01%
Price Improvement			
Seller-initiated, Price<Midquote			
- Pilot	1.58%	10.07%	10.07%
- Nonpilot	1.30%	1.33%	1.33%
Buyer-initiated, Price>Midquote			
- Pilot	1.24%	6.54%	2.60%
- Nonpilot	1.40%	1.06%	0.33%
Price=Midquote			
- Pilot	0.80%	4.24%	1.70%
- Nonpilot	0.74%	0.54%	0.05%
Total			
- Pilot	31.14%	51.61%	44.43%
- Nonpilot	66.48%	7.98%	6.72%
Difference	35.34%	-43.63%	-37.71%

Table 18 Comparison of Short Volumes in Different Execution Scenarios for Paired Sample

Panel B Scenarios in which Nonpilot Stocks Had Higher Short Volumes than Pilot Stocks for Paired Sample

Scenario	Rank in Full Sample	Weight	Diff.	*t* - stat	Cum. Diff
Bid<MSP=Short Price=Ask	1				
- Pilot		9.75%	30.47%	(27.58)*	30.47%
- Nonpilot		40.22%			
Bid<MSP<Short Price<Ask, Price=Midquote					
- Pilot		0.27%	3.60%	(1.27)	34.08%
- Nonpilot		3.87%			
MSP=Short Price=Bid	2				
- Pilot		4.55%	3.04%	(6.17)*	37.12%
- Nonpilot		7.59%			
Bid<MSP=Short Price<Ask, Price>Midquote	4				
- Pilot		3.82%	2.69%	(5.10)*	39.81%
- Nonpilot		6.51%			
Bid<MSP=Short Price<Ask, Price<Midquote	3				
- Pilot		3.98%	2.23%	(3.20)*	42.04%
- Nonpilot		6.21%			
Bid<MSP<Short Price=Ask	6				
- Pilot		5.58%	2.01%	(3.52)*	44.05%
- Nonpilot		7.59%			
Bid<MSP=Short Price<Ask, Price=Midquote	5				
- Pilot		2.86%	1.76%	(3.78)*	45.81%
- Nonpilot		4.62%			
Bid<Ask<MSP=Short Price	8				
- Pilot		0.62%	1.48%	(4.90)*	47.29%
- Nonpilot		2.10%			
MSP=Bid<Short Price=Ask	7				
- Pilot		2.10%	0.91%	(3.20)*	48.21%
- Nonpilot		3.01%			
MSP=Short Price<Bid	9				
- Pilot		0.29%	0.41%	(3.84)*	48.61%
- Nonpilot		0.69%			
MSP<Bid<Short Price=Ask	10				
- Pilot		0.72%	0.33%	(2.49)*	48.94%
- Nonpilot		1.05%			
MSP=Bid<Short Price<Ask, Price>Midquote	13				
- Pilot		0.66%	0.15%	(0.67)	49.09%
- Nonpilot		0.81%			
MSP=Bid<Short Price<Ask, Price=Midquote	14				
- Pilot		0.48%	0.09%	(0.62)	49.18%
- Nonpilot		0.57%			
MSP<Short Price<Bid					
- Pilot		0.19%	0.04%	(0.68)	49.22%
- Nonpilot		0.23%			
MSP<Bid<Short Price<Ask, Price>Midquote					
- Pilot		0.58%	0.01%	(0.07)	49.22%
- Nonpilot		0.59%			

* Significant at 5% level.

Table 19 Comparison of Short Volumes in Different Execution Scenarios for Sample of Big Negative Order Imbalance

Panel A The Mean Ratios of Pilot and Nonpilot Stocks

Observations for all sample stocks in each Designated Time period were pooled and the order imbalance for each stock and in each Designated Time period was calculated. Order Imbalance was defined in Table 3. Observations for stocks and Designated Time periods that belonged to the group of the biggest negative order imbalance were used in the following comparison.

	Nonrestrictive	Exempt	Exempt & Restrictive
Seller-initiated, Price<=Bid			
- Pilot	8.06%	21.14%	20.54%
- Nonpilot	11.62%	1.30%	1.15%
Buyer-initiated, Price>=Ask			
- Pilot	20.70%	7.97%	7.97%
- Nonpilot	51.83%	3.73%	3.73%
Price Improvement			
Seller-initiated, Price<Midquote			
- Pilot	1.54%	9.26%	9.26%
- Nonpilot	1.61%	0.97%	0.97%
Buyer-initiated, Price>Midquote			
- Pilot	1.56%	6.65%	2.43%
- Nonpilot	1.51%	0.67%	0.14%
Price=Midquote			
- Pilot	0.82%	3.94%	1.12%
- Nonpilot	0.71%	0.52%	0.05%
Total			
- Pilot	32.68%	48.96%	41.31%
- Nonpilot	67.29%	7.19%	6.04%
Difference	34.60%	-41.77%	-35.27%

Table 19 Comparison of Short Volumes in Different Execution Scenarios for Sample of Biggest Negative Order Imbalance

Panel B Scenarios in which Nonpilot Stocks Had Higher Short Volumes than Pilot Stocks

Scenario	Rank in Full Sample	Weight	Diff.	*t* - stat	Cum. Diff.
Bid<MSP=Short Price=Ask	1		28.98%	(65.9)*	28.98%
- Pilot		10.26%			
- Nonpilot		39.25%			
MSP=Short Price=Bid	2		3.65%	(15.37)*	32.63%
- Pilot		4.73%			
- Nonpilot		8.38%			
Bid<MSP=Short Price<Ask, Price<Midquote	3		2.99%	(12.52)*	35.62%
- Pilot		3.58%			
- Nonpilot		6.57%			
Bid<MSP=Short Price<Ask, Price>Midquote	4		2.28%	(9.92)*	37.90%
- Pilot		4.36%			
- Nonpilot		6.64%			
Bid<MSP=Short Price<Ask, Price=Midquote	5		1.77%	(8.85)*	39.67%
- Pilot		2.99%			
- Nonpilot		4.76%			
Bid<MSP<Short Price=Ask	6		1.58%	(5.82)*	41.26%
- Pilot		6.15%			
- Nonpilot		7.73%			
MSP=Bid<Short Price=Ask	7		0.86%	(6.47)*	42.11%
- Pilot		2.25%			
- Nonpilot		3.10%			
Bid<Ask<MSP=Short Price	8		0.63%	(5.98)*	42.74%
- Pilot		0.75%			
- Nonpilot		1.37%			
MSP=Short Price<Bid	9		0.51%	(7.29)*	43.25%
- Pilot		0.30%			
- Nonpilot		0.81%			
MSP<Bid<Short Price=Ask	10		0.20%	(2.2)*	43.45%
- Pilot		0.80%			
- Nonpilot		1.00%			
MSP<Bid<Short Price<Ask, Price<Midquote	11		0.11%	1.52	43.55%
- Pilot		0.56%			
- Nonpilot		0.66%			
MSP=Bid<Short Price<Ask, Price=Midquote	12		0.01%	0.17	43.56%
- Pilot		0.50%			
- Nonpilot		0.51%			
MSP=Bid<Short Price<Ask, Price>Midquote	13		0.00%	0.01	43.56%
- Pilot		0.83%			
- Nonpilot		0.83%			

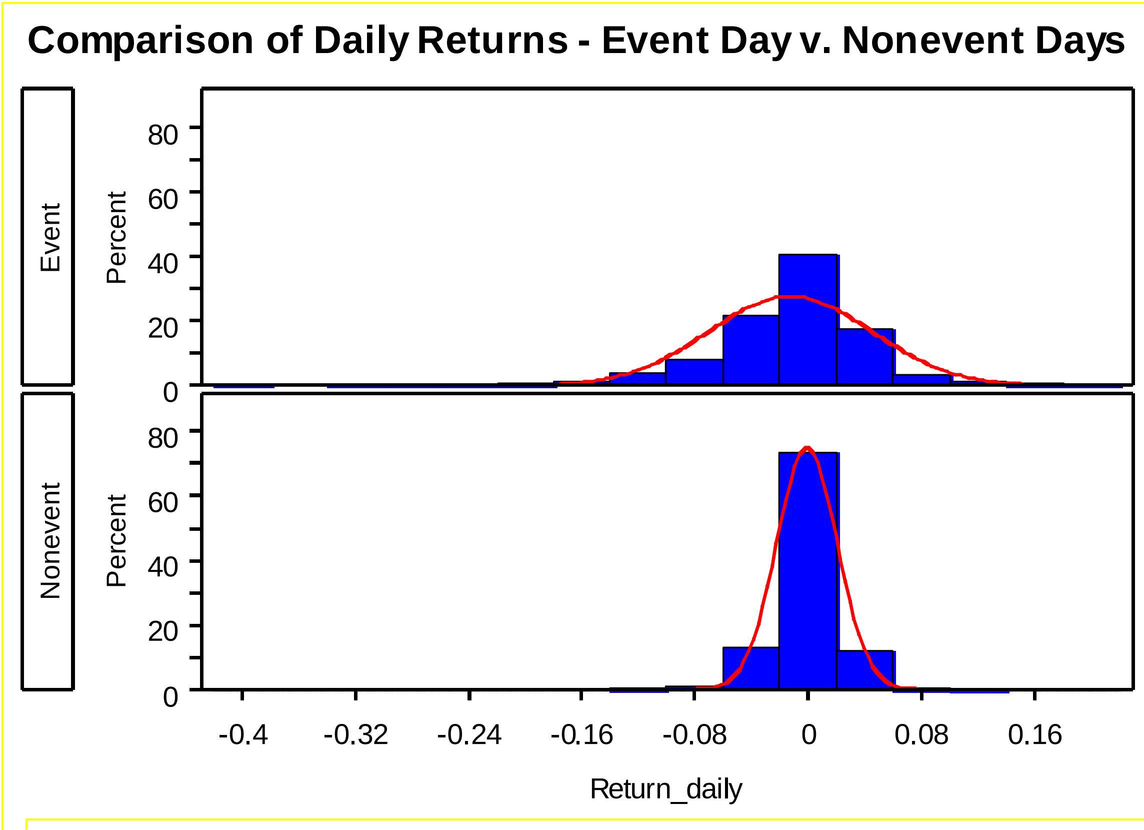
* Significant at 5% level.

Table 20 Summary Statistics of MSP Position Relative to the Ask

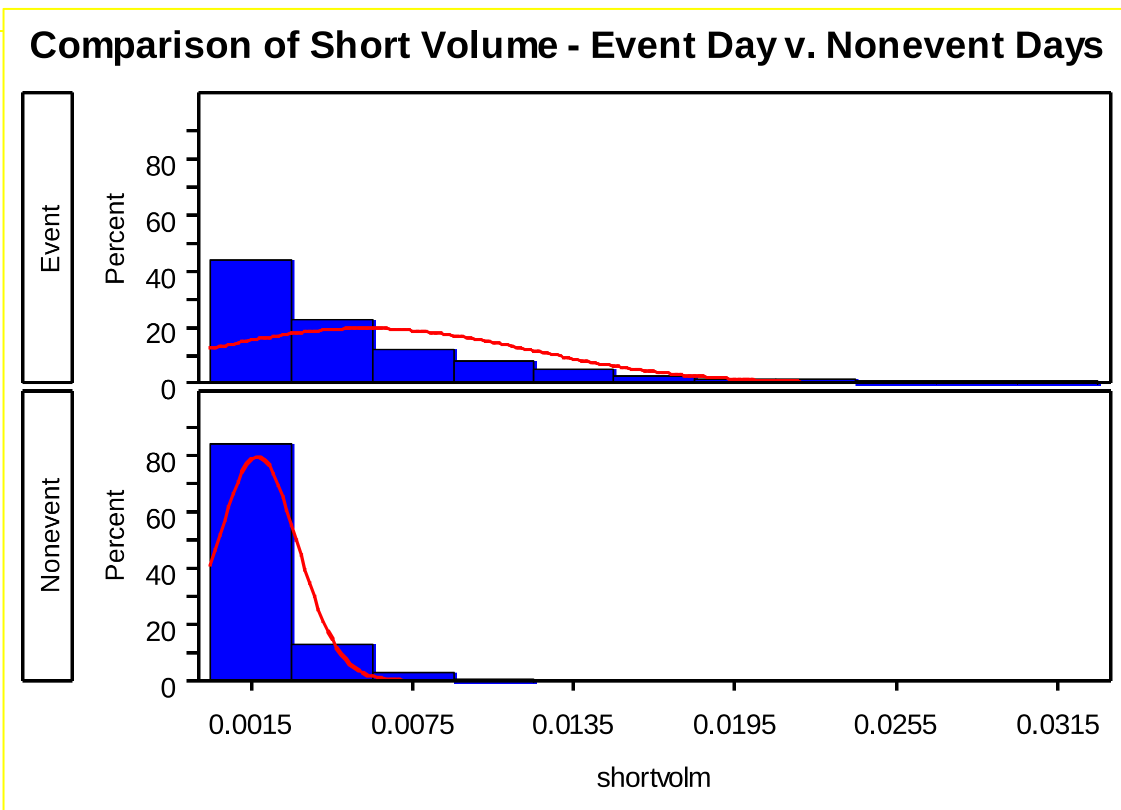
This table provoides summary statistics on the postion of the minimum shortable price (MSP) relative to the best offer when the MSP was higher than the best bid at each Designated Time interval on the Event Day for nonpilot stocks. The percentage corresponds to the percentage of time when the MSP was lower than, equal to, or higher than the best ask.

	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	12:00	12:30	13:00	14:00	15:00	15:55	16:00
Mean															
Bid<MSP<Ask	24.07%	26.20%	25.07%	25.23%	25.27%	26.90%	26.91%	27.49%	24.78%	24.46%	25.60%	24.44%	22.72%	19.99%	17.96%
Bid<MSP=Ask	26.83%	29.44%	31.18%	31.62%	32.51%	32.20%	32.61%	32.97%	35.90%	37.10%	37.03%	36.92%	37.30%	39.41%	39.88%
Bid<Ask<MSP	49.10%	44.37%	43.75%	43.14%	42.22%	40.90%	40.49%	39.54%	39.32%	38.44%	37.37%	38.64%	39.98%	40.60%	42.16%
Median															
Bid<MSP<Ask	20.71%	23.62%	21.59%	22.95%	21.53%	24.15%	23.23%	24.05%	22.34%	22.26%	22.70%	22.30%	19.24%	18.44%	14.66%
Bid<MSP=Ask	25.61%	28.32%	30.29%	30.78%	31.54%	30.75%	31.50%	32.17%	35.08%	34.84%	36.18%	34.95%	36.59%	38.67%	38.50%
Bid<Ask<MSP	48.38%	45.03%	44.43%	43.35%	42.90%	40.76%	40.75%	40.25%	40.20%	39.54%	38.92%	38.80%	40.84%	41.69%	41.43%
Stdev															
Bid<MSP<Ask	16.57%	16.31%	16.96%	16.33%	17.94%	18.34%	18.18%	19.35%	16.78%	16.34%	17.57%	14.60%	14.39%	12.53%	16.51%
Bid<MSP=Ask	13.80%	13.68%	14.28%	14.63%	14.73%	15.96%	15.58%	16.83%	16.07%	16.46%	16.18%	14.66%	14.21%	12.55%	18.20%
Bid<Ask<MSP	14.86%	12.93%	12.54%	13.01%	13.26%	14.32%	12.87%	13.65%	12.90%	12.11%	13.25%	10.60%	11.46%	10.68%	15.59%

Figure 1

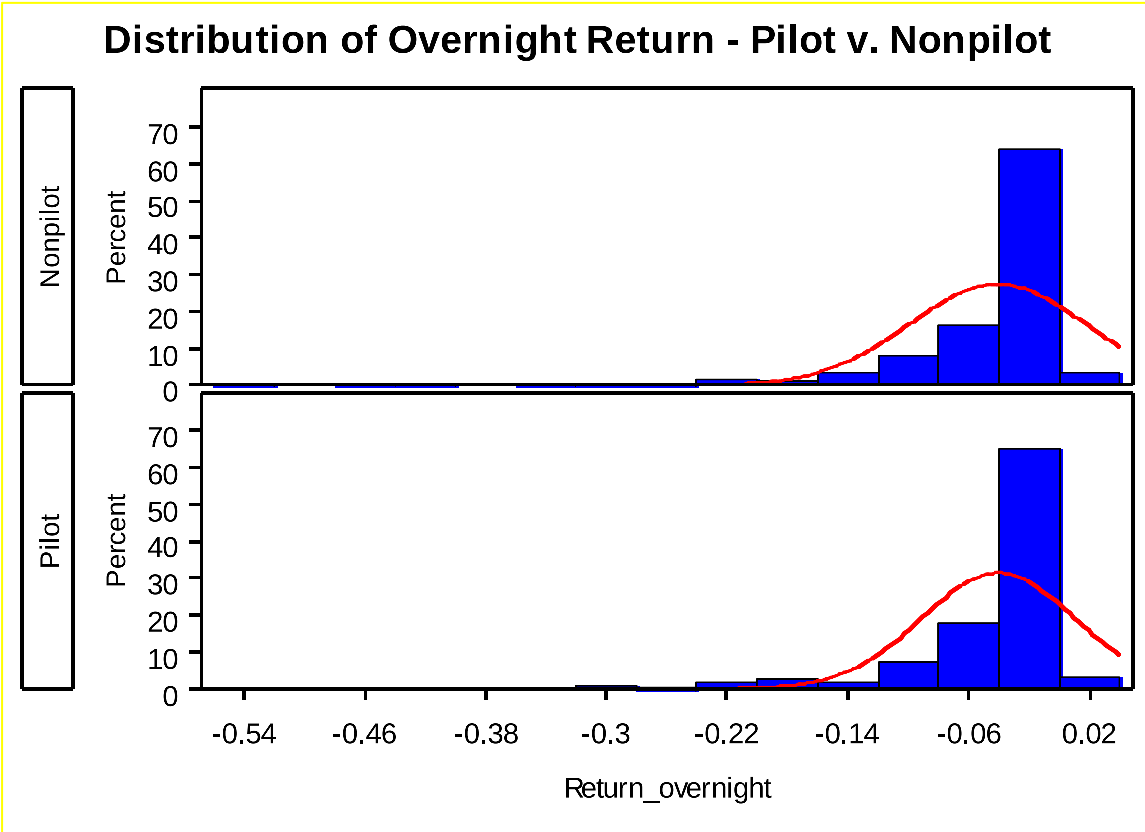


Comparison of Daily Returns - Event Day v. Nonevent Days
Event
Nonevent
Percent
80
60
40
20
0
-0.4
-0.32
-0.24
-0.16
-0.08
0
0.08
0.16
Return_daily



Comparison of Short Volume - Event Day v. Nonevent Days
Event
Nonevent
Percent
80
60
40
20
0
0.0015
0.0075
0.0135
0.0195
0.0255
0.0315
shortvolm

Figure 2


Distribution of Overnight Return - Pilot v. Nonpilot
Nonpilot
Pilot
Percent
Percent
0
10
20
30
40
50
60
70
-0.54
-0.46
-0.38
-0.3
-0.22
-0.14
-0.06
0.02
Return_overnight